APPENDIX 10.0

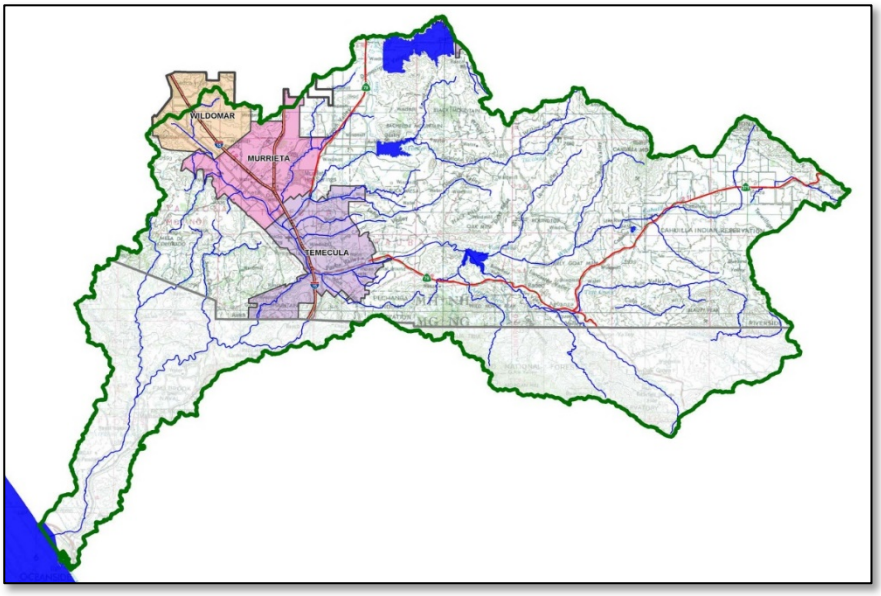
WQMP

Project Specific Water Quality Management Plan (WQMP)

A Template for preparing Project Specific Water Quality Management Plans (WQMPs) for Priority Development Projects located in the City of Wildomar.

Attention: This submittal package only applies to "Priority Development Projects" and does not apply to "Other Development Projects". Proceed only if the Applicabilty Checklist completed for your project categorizes project activities as a "Priority Development Project."

Project Title:	Wildomar Commons at Hidden Springs	**Prepared for:**	Somar Land Group, Inc. 16391 Harwich Circle Riverside, CA 92503
Development No:	Intersection of Hidden Springs Road and Clinton Keith Road, Wildomar CA	**Prepared by:**	David W. Larson, Principal, 331 S. Rio Grande St. Suite 203, Salt Lake City, UT 84101, 801-224-5335
City Project No:	Insert text here	**WQMP Type:**	☒ **Preliminary (entitlement submittal)** ☒ **Final**



Original Date Prepared: 10/15/2020

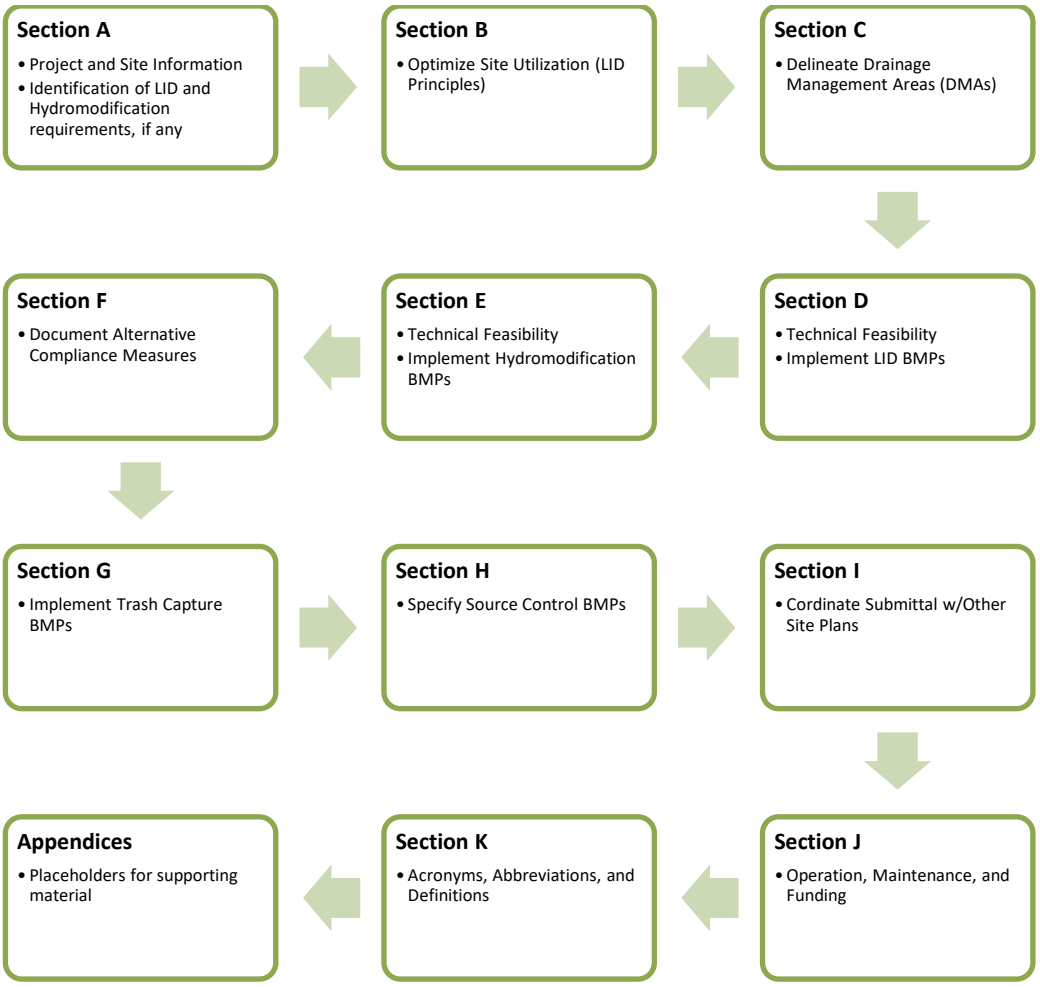
Revision Summary (post WQMP acceptance):

1	DWL	10-26-21	FINALSUBMITTAL		
MARK	**BY**	**DATE**	**REVISIONS**	**APPRV.**	**DATE**
ENGINEER				**CITY**	

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**

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 (WQPM). 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.



[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.

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Steve Macie (Somar Land Group Inc.) by David W. Larson for the Wildomar Commons at Hidden Springs project.

This WQMP is intended to comply with the requirements of the City of Wildomar for Wildomar Municipal Code Ch. 13.12 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 storm water 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 the City of Wildomar Water Quality Ordinance (Wildomar Municipal Code Ch. 13.12).

"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."

DocuSigned by:
Steve Macie
8C2DD828888E436...

2/3/2022	10-26-2021
Owner's Signature	Date
Somar Land Group Inc. (ATTN.) Steve Macie	Project Manager
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 (BMPs) 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**."

	10-26-2021
Preparer's Signature	Date
David W. Larson	Principal
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: C52991

Table of Contents

Section A: Project and Site Information 0
A.1 Maps and Site Plans 1
A.2 Identify Receiving Waters 1
A.3 Drainage System Susceptibility to Hydromodification 2
A.4 Additional Permits/Approvals required for the Project: 3
Section B: Optimize Site Utilization (LID Principles) 4
Section C: Delineate Drainage Management Areas (DMAs) 8
Section D: Implement LID BMPs 19
D.1 Full Infiltration Applicability 19
D.2 Biofiltration Applicability 21
D.3 Feasibility Assessment Summaries 23
D.4 LID BMP Sizing 24
Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs 26
E.1 Hydrologic Control BMP Selection 26
E.2 Hydrologic Control BMP Sizing 27
E.3 Implement Sediment Supply BMPs 27
Section F: Alternative Compliance 31
F.1 Identify Pollutants of Concern 32
F.2 Treatment Control BMP Selection 33
F.3 Sizing Criteria 34
F.4 Hydrologic Performance Standard – Alternative Compliance Approach 34
Section G: Implement Trash Capture BMPs 35
Section H: Source Control BMPs 36
Section I: Coordinate Submittal with Other Site Plans 37
Section J: Operation, Maintenance and Funding 38
Section K: Acronyms, Abbreviations and Definitions 39

List of Tables

Table A-1 Identification of Receiving Waters 1
Table A-2 Identification of Susceptibility to Hydromodification 2
Table A-3 Other Applicable Permits 3
Table C-1 DMA Identification 8
Table C-2 Type 'A', Self-Treating Areas 17
Table C-3 Type 'B', Self-Retaining Areas 18
Table C-4 Type 'C', Areas that Drain to Self-Retaining Areas 18
Table C-5 Type 'D', Areas Draining to BMPs 19
Table D-1 Infiltration Feasibility 20
Table D-2 Geotechnical Concerns for Onsite Infiltration 21
Table D-3 Evaluation of Biofiltration BMP Feasibility 22
Table D-4 Proprietary BMP Approval Requirement Summary 22
Table D-5 LID Prioritization Summary Matrix 23
Table D-6 DCV Calculations for LID BMPs 25
Table D-7 LID BMP Sizing 26
Table E-1 Hydrologic Control BMP Sizing 27
Table E-2 Triad Assessment Summary 30
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. 32
Table F-2 Potential Pollutants by Land Use Type 33
Table F-3 Treatment Control BMP Selection 34
Table F-4 Treatment Control BMP Sizing 34
Table F-5 Offsite Hydrologic Control BMP Sizing 35
Table G-1 Sizing Trash Capture BMPs 36
Table G-2 Approximate precipitation depth/intensity values for calculation of the Trash Capture Design Storm 36
Table G-3 Trash Capture BMPs 36
Table I-1 Construction Plan Cross-reference 38
Table I-2 Other Applicable Permits 38

List of Appendices

Appendix 1: Maps and Site Plans 45
Appendix 2: Construction Plans 46
Appendix 3: Soils Information 47
Appendix 4: Historical Site Conditions 48
Appendix 5: LID Infeasibility 49

Appendix 6: BMP Design Details 50
Appendix 7: Hydromodification 51
Appendix 8: Source Control 52
Appendix 9: O&M 53
Appendix 10: Educational Materials 60

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.

PROJECT INFORMATION	
Type of PDP:	New Development
Type of Project:	Commercial
Planning Area:	Intersection of Hidden Springs Road and Clinton Keith Road
Community Name:	Wildomar, CA.
Development Name:	Wildomar Commons at Hidden Springs
PROJECT LOCATION	
Latitude & Longitude (DMS):	Latitude: 33o35'40" Longitude: -117o14"50"
Project Watershed and Sub-Watershed:	Santa Margarita River or Santa Ana River (select one), Santa Margarita River, Wildomar
24-Hour 85th Percentile Storm Depth (inches):	0.7
Is project subject to Hydromodification requirements?	☐ Y ☒ N (Select based on Section A.3)
APN(s):	380-110-004, 9,10,14,16
Map Book and Page No.:	RS 53/92, PM 18/7, Parcel Map 6430
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Commercial
Proposed or Potential SIC Code(s)	5399
Existing Impervious Area of Project Footprint (SF)	0
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	272047.6
Total Project Area (ac)	6.25
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
Is the project exempt from Hydromodification Performance Standards?	☐ Y ☒ N
Does the project propose the use of Alternative Compliance to satisfy BMP requirements? (note, alternative compliance is not allowed for coarse sediment performance standards)	☐ Y ☒ N
Has preparation of Project-Specific WQMP included coordination with other site plans?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Is the project located within any Multi-Species Habitat Conservation Plan area (MSHCP Criteria Cell?)	☐ Y ☒ N If "Y" insert Cell Number
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)	41%D and 56%C

Project Description

The proposed project consists of a commercial center with 6 commercial/retail buildings and a carwash, located at the northwest corner of Hidden Springs Rd & Clinton Keith Rd, with 2 drainage management areas (DMA) and associated water quality modified infiltration basins. DMA-A located on the northeast portion of the site consists of a 1.3-acre drainage area that flows onto the neighboring residential site. The remaining area DMA-B consists of 7.99-acre area that flows westerly onto the adjoining parcels via a natural drainage course that confluences at Stable Lanes Way. Each of the developed flows will be mitigated below the predeveloped Q (standard construct for waterflow) prior to exiting the site. The sitewide water quality approach has 3 key point:

1. All site-flows are included into the on-site treatment BMP's (Best Management Practices) two basins are proposed for the water quality treatment of on-site flows.
2. The proposed landscape areas are drought tolerant; all pervious areas will be directed to the water quality basins.
3. Offsite flows will be captured and transported below site and exit via the historic native drainage conveyances on the neighboring parcels.

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

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

Table A-1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Murrieta Creek	Chlorpyrifos, Copper, Indicator Bacteria, Iron, Manganese, Nitrogen, Phosphorus, Toxicity	MUN,AGR,IND,PROC,GWR,REC2,WARM,WILD	None

9	Murrieta Creek	River & Stream	90252000 / 18070302	• Chlorpyrifos ◦ Natural Sources ◦ Unknown Nonpoint Source ◦ Urban Runoff/Storm Sewers	12 Miles	2010	5A	2021
				• Copper ◦ Natural Sources ◦ Unknown Nonpoint Source ◦ Urban Runoff/Storm Sewers	12 Miles	2010	5A	2019
				• Iron ◦ Natural Sources	12 Miles	2006	5A	2019
				• Manganese ◦ Source Unknown	12 Miles	2006	5A	2019
				• Nitrogen ◦ Unknown Nonpoint Source ◦ Unknown Point Source ◦ Urban Runoff/Storm Sewers	12 Miles	2006	5A	2019
				• Phosphorus ◦ Unknown Nonpoint Source ◦ Unknown Point Source ◦ Urban Runoff/Storm Sewers	12 Miles	2002	5A	2019
				• Toxicity ◦ Unknown Nonpoint Source ◦ Unknown Point Source ◦ Urban Runoff/Storm Sewers	12 Miles	2010	5A	2021

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 Watershed Management Area Analysis (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
Natural Drainage Conveyance	Native Drainage Conveyance	None	☒ Y ☐ N
			☐ Y ☐ N
			☐ Y ☐ N
Summary of Performance Standards			

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

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt

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

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

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

Table A-3 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☒ Y	☐ N
State Water Resources Control Board, Clean Water Act Section 401 Water Quality Certification	☒ Y	☐ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☒ Y	☐ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) Consistency Approval (e.g., Joint Project Review (JPR), Determination of Biological Equivalent or Superior Preservation (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 Priority Development Project (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.
Insert discussion/justification here

☒ 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. *Insert discussion/justification here*

☒ 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.

Project- Specific WQMP Site Design BMP Checklist	
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Insert discussion/justification here*	
☒ 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. *Insert discussion/justification here*	
☒ 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.

Project- Specific WQMP Site Design BMP Checklist	
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Insert discussion/justification here*	
☒ 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. *Insert discussion/justification here*	
☒ 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 storm water (not common). • Conflicts with recycled water used – where the project is conditioned to use recycled water for irrigation, this should be given priority over storm water capture as it is a year-round supply of water. • Code Compliance - If a particular use of captured storm water, and/or available methods for storage of captured storm water 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 [Insert Jurisdiction], that there is adequate demand for harvested water during the wet season to drain the system in a reasonable amount of time.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Insert discussion/justification here*	
☒ 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.

Project- Specific WQMP Site Design BMP Checklist
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Insert discussion/justification here*

Section C: Delineate Drainage Management Areas (DMAs)

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
DMA A	Mixed	56,190.90	Type D
DMA B	Mixed	333,669.60	

Add Columns as Needed

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

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

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

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

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

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

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

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

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

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

☐ Yes ☐ No ☒ N/A	Slopes will be graded toward the center of the pervious area.
☐ Yes ☐ No ☒ N/A	Soils will be freely draining to not create vector or nuisance conditions.
☐ 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	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 Area must be designed to retain the entire Design Storm runoff without flowing offsite.

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)	Storm Depth (inches)	DMA Name / ID	[C] from Table C-4=	Required Retention Depth (inches)
		[A]	[B]		[C]	[D] = $[B] + \frac{[B]\cdot[C]}{[A]}$

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

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

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

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

(Tributary Area: Self-Retaining Area)

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
DMA A	Basin A
DMA B	Basin B

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 principals 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 principals fully retain the DCV (i.e., all DMAs are Type A, B, or C), (Proceed to Section E).

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

Geotechnical Report

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

Infiltration Feasibility

Table D-1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the SMR WQMP in Chapter 2.3.3. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D-1 Infiltration Feasibility

Downstream Impacts (SMR WQMP Section 2.3.3.a)		
Does the project site…	**YES**	**NO**
…have any DMAs where infiltration would negatively impact downstream water rights or other Beneficial Uses[3]?		X
If Yes, list affected DMAs:		
Groundwater Protection (SMR WQMP Section 2.3.3.b)		
Does the project site…	**YES**	**NO**
…have any DMAs with industrial, and other land uses that pose a high threat to water quality, which cannot be treated by Bioretention BMPs? Or have DMAs with active industrial process areas?		X
If Yes, list affected DMAs:		
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet horizontally of a water supply well?		X
If Yes, list affected DMAs:		
…have any DMAs that would restrict BMP locations to within a 2:1 (horizontal: vertical) influence line extending from any septic leach line?		X
If Yes, list affected DMAs:		
…have any DMAs been evaluated by a licensed Geotechnical Engineer, Hydrogeologist, 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?		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 factored infiltration rates of less than 0.8 inches / hour? (Note: on a case-by-case basis, the City may allow a factor of safety as low as 1.0 to support selection of full infiltration BMPs. Therefore, measured infiltration rates could be as low as 0.8 in/hr to support full infiltration. A higher factor of safety would be required for design in accordance with the LID BMP Deign Handbook).		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:		

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

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.

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	N/A	N/A
Expansive Soil	N/A	N/A
Slopes	N/A	N/A
Liquefaction	N/A	N/A
Other	N/A	N/A

D.2 Biofiltration Applicability: N/A Full Infiltration BMP's will be provided.

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. No
    b. These designs can be used at sites with low infiltration rates where other feasibility factors do not preclude incidental infiltration. No, infiltration basins are adequate.

    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 City

    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 to Section F to document your alternative compliance measures.

Table D-3 Evaluation of Biofiltration BMP Feasibility

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

Proprietary Biofiltration BMP Approval Criteria N/A

If the project will use proprietary BMPs as biofiltration BMPs, then this section is completed to document that the proprietary BMPs are selected in accordance with Section 2.3.7 of the SMR WQMP. Proprietary Biofiltration BMPs must meet both of the following approval criteria:

1. Approval Criteria for All Proprietary BMPs, and
2. Acceptance Criteria for Proprietary Biofiltration BMPs.

When the use of proprietary biofiltration BMPs is proposed to meet the Pollutant Control performance standards, use Table D-4 to document that appropriate approval criteria have been met for the proposed BMPs. Add additional rows 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	☐ Proposed BMP has an active TAPE GULD Certification for the project pollutants of concern[4] or equivalent 3rd party demonstrated performance.	Insert text here
	☐ The BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification.	Insert text here
	☐ The BMP includes biological features including vegetation supported by engineered or other growing media.	Describe features here.
	☐ The BMP is designed to maximize infiltration, or supplemental infiltration is provided to achieve retention equivalent to Biofiltration with Partial Infiltration BMPs if factored infiltration rate is between 0.1 and 0.8 inches/hour.	Describe supplemental retention practices if applicable.
	☐ The BMP is sized using one of two Biofiltration LID sizing options in Section 2.3.2 of the SRM WQMP.	List sizing method used, resulting size (i.e. volume or flow), and provided size (for proposed unit)

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

D.3 Feasibility Assessment Summaries

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

Table D-5 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy			No LID (Alternative Compliance)
	1. Infiltration	2. Biofiltration with Partial Infiltration	3. Biofiltration with No Infiltration	
DMA A	☒	☐	☐	☐
DMA B	☒	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐

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?	During the entitlement process CTE South performed an infiltration test, to determine the infiltration rates of the native soils.
b) When in the entitlement process were other investigations conducted (e.g., groundwater quality, water rights) to evaluate infiltration feasibility?	CTE's Percolation test report states that ground water is 19 ½ ft deep and infiltration rates varied from 0.1-2.1 inches per hour.
c) What was the scope and results of testing, if conducted, or rationale for why testing was not	Two locations tested at DMA-A basin and the offsite basin next to Stable Lanes Rd.

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

needed to reach findings?	
d) What public health and safety requirements affected infiltration locations?	Pre-treatment needed to mitigate pollution.
e) What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	Varying rates from 0.1-2.1 suggest infiltration best on upper slopes.
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?	Varying rates from 0.1-2.1 suggest infiltration best on upper slopes.
g) What site design alternatives were considered to achieve infiltration or partial infiltration on site?	DMA-B will require an underground infiltration basin due to lack of space.
h) What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	Depth of infiltration basin.
i) What LID Principles (site design BMPs) were included in the project site design?	TC-11 Infiltration Basin.

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 for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D-7 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
DMA A	[A]		[B]	[C]	[A] x [C]			
Parking Lot/Building	*30,151.15*	*Concrete/AC*	*1.0*	*0.89*	*26,834.52*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
Landscape	*26,039.75*	*Ornamental*	*0.1*	*0.11*	*2,864.37*			
	56,190.90				29,698.89	0.7	1,732	17,031

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*		
DMA A	[A]		[B]	[C]	[A] x [C]			
Parking Lot/Building	*275,878.24*	*Concrete/AC*	*1.0*	*0.89*	*245,531.63*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
Landscape	*73,657.21*	*Ornamental*	*0.1*	*0.11*	*8,102.29*			
	331,066.02				253,633.92	0.7	14,795	57,543

[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)
Basin A	A	Infiltration Basin	1,732	17,031
Basin B	B	Infiltration Basin	14,795	57,543

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

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.

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 (10% of the 2-year runoff event up to the 10-year runoff event). 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.

☒ 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)
Basin A	A	Infiltration Basin	☐	0.391	0.145	48
Basin B	B	Infiltration Basin	☐	1.023	0.371	48
			☐			
			☐			

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 of the WQMP to determine if there are onsite Potential Critical Coarse Sediment Yield Areas or Potential

Sediment Source Areas. 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. The Sediment Supply Performance Standard is met with no further action.

☐ 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 or Option 2 below.

The applicant may refer to Section 3.6.4 of the SMR WQMP for a description of the methodology to meet the Sediment Supply Performance Standard. Select the applicable compliance pathway and complete the appropriate sections to demonstrate compliance with the Sediment Supply Performance Standard if the second box is selected above:

☐ Avoid impacts related to any PDP activities to Potential Critical Coarse Sediment Yield Areas. Proceed to Section E.3.1.

☐ Complete a Site-Specific Critical Coarse Sediment Analysis. Proceed to Section E.3.2.

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

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

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

Insert narrative description here

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

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

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

1. Determine whether the site or a portion of the site is a Significant Source of Bed Sediment Supply to the Receiving Channel (i.e., an actual verified Critical Coarse Sediment Yield Area);
2. Avoid areas identified as actual verified Critical Coarse Sediment Yield Areas in the PDP design and maintain pathways for discharge of Bed Sediment Supply from these areas to receiving waters.

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* -

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

OR

☐ The project impacts transport pathways of Critical Coarse Sediment from onsite upstream drainages.

(If either of these are the case, the applicant may proceed with the subsequent steps of Section E.3).

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

Identified Channel #3 - Insert narrative description here

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 [Insert Jurisdiction]. 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 City for currently available Alternative Compliance pathways. Coordinate with the Copermittee if electing to participate in Alternative

Compliance and complete the sections below to document implementation of the Flow-Through BMP component of the program.

F.1 Identify Pollutants of Concern

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

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

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

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

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

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

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

Table F-2 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)		General Pollutant Categories									
		Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease	Total Dissolved Solids	Sulfate
☐	Detached Residential Development	P	N	P	P	N	P	P	P	N	N
☐	Attached Residential Development	P	N	P	P	N	P	P	P[(2)]	N	N
☒	Commercial/Industrial Development	P[(3)]	P[(7)]	P[(1)]	P[(1)]	P	P[(1)]	P	P	N	N
☐	Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P	N	N
☐	Restaurants (>5,000 ft^2)	P	N	N	P[(1)]	N	N	P	P	N	N
☐	Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P	N	N
☐	Parking Lots (>5,000 ft^2)	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Streets, Highways, and Freeways	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Retail Gasoline Outlets	N	P[(7)]	N	N	P[(4)]	N	P	P	N	N
Project Priority Pollutant(s) of Concern		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

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

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

[(3)] A potential Pollutant is land use involving animal waste products; otherwise not expected

[(4)] Including petroleum hydrocarbons

[(5)] Including solvents

[(6)] Bacterial indicators are routinely detected in pavement runoff

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

F.2 Treatment Control BMP Selection (Not Required)

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 (Not Required)

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 (Not Required)

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 (Not Applicable)

The City may require full trash capture BMPs to be installed as part of the project. Consult with the City to determine applicability.

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]		
						Trash Capture Design Storm Intensity (in)	*Trash Capture Design Flow Rate (cubic feet or 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
[G] = 43,560

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

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

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

Table G-3 Trash Capture BMPs

BMP Name / ID	DMA No(s)	BMP Type / Description	Required Trash Capture Flowrate (cfs)	Provided Trash Capture Flowrate (cfs)

Section H: Source Control BMPs

Source Control BMPs include permanent, structural features that may be required in your Project plans, such as roofs over and berms around trash and recycling areas, and Operational BMPs, such as regular sweeping and "housekeeping," that must be implemented by the site's occupant or user. The Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational Source Control BMPs cannot be substituted for a feasible and effective Structural Source Control BMP. Complete checklist below to determine applicable Source Control BMPs for your site.

Project-Specific WQMP Source Control BMP Checklist

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

STEP 1: IDENTIFY POLLUTANT SOURCES

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

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

STEP 2: REQUIRED SOURCE CONTROL BMPS

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

Pollutant Source	Structural Source Control BMP	Operational Source Control BMP
Storm Inlets	Storm Drain Stenciling and signage (SD-13)	Education for Property owners, tenants, and occupants (N1) / Common Area Catch Basin Inspection (N14)
Car Wash / Sump Pumps	Storm Drain Stenciling and signage (SD-13)	Education for Property owners, tenants, and occupants (N1)
Pets Control/Herbicide	Efficient irrigation (S-12)	Education for Property owners, tenants, and occupants (N1)
Food Source Area	Wash Water Controls for Food Prep Areas (S-13)	Education for Property owners, tenants, and occupants (N1)
Trash Storage Areas	Covered Enclosure (S-32)	Education for Property owners, tenants, and occupants (N1)
Vehicle Cleaning	Vehicle Wash Areas (SD-33)	Education for Property owners, tenants, and occupants (N1)
Loading Docs	Loading Dock Areas (SD-31)	Housekeeping of Docks (N13/SD-31)
Fire Sprinkler Test/Maintenance	Drainage System Maintenance (SC-74)	Education for Property owners, tenants, and occupants (N1) /(N10)
Plaza Sidewalks and Parking Lots	Street Sweeping Private Streets and Parking Lots (SC-43, SC-70)	(N-15)

Section I: Coordinate Submittal with Other Site Plans

Populate Table I-1 below to assist the plan checker in an expeditious review of your project. During construction and at completion, City 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)
BMP - A and B	Infiltration Basin	

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

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: POA

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. 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 storm water 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 storm water BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of storm water 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 storm water 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 storm water 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 storm water runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.
LID Infiltration BMP	BMPs to reduce storm water 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 Clean Water Act (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 storm water BMPs to control post-construction Pollutants and storm water 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)
☒ 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

Exhibit E

NOAA Atlas 14, Volume 6, Version 2
Location name: Shaver Lake, California, USA*
Latitude: 37.4°, Longitude: -119.2°
Elevation: 7158.39 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.165** (0.142-0.193)	**0.213** (0.184-0.250)	**0.280** (0.240-0.329)	**0.337** (0.287-0.401)	**0.420** (0.342-0.520)	**0.488** (0.387-0.620)	**0.560** (0.432-0.735)	**0.640** (0.476-0.868)	**0.755** (0.534-1.08)	**0.851** (0.577-1.27)
10-min	**0.237** (0.204-0.277)	**0.306** (0.263-0.358)	**0.401** (0.344-0.472)	**0.483** (0.411-0.574)	**0.602** (0.491-0.746)	**0.699** (0.555-0.889)	**0.803** (0.619-1.05)	**0.917** (0.682-1.24)	**1.08** (0.765-1.55)	**1.22** (0.827-1.82)
15-min	**0.286** (0.247-0.335)	**0.370** (0.318-0.433)	**0.485** (0.417-0.571)	**0.584** (0.497-0.695)	**0.728** (0.593-0.902)	**0.845** (0.671-1.08)	**0.971** (0.748-1.27)	**1.11** (0.825-1.51)	**1.31** (0.926-1.87)	**1.48** (1.00-2.20)
30-min	**0.391** (0.337-0.457)	**0.505** (0.435-0.592)	**0.663** (0.569-0.780)	**0.799** (0.679-0.949)	**0.995** (0.811-1.23)	**1.16** (0.917-1.47)	**1.33** (1.02-1.74)	**1.52** (1.13-2.06)	**1.79** (1.26-2.55)	**2.02** (1.37-3.00)
60-min	**0.509** (0.439-0.596)	**0.658** (0.567-0.771)	**0.863** (0.741-1.01)	**1.04** (0.884-1.24)	**1.30** (1.06-1.61)	**1.50** (1.19-1.91)	**1.73** (1.33-2.27)	**1.97** (1.47-2.68)	**2.33** (1.65-3.33)	**2.63** (1.78-3.91)
2-hr	**0.757** (0.653-0.886)	**0.960** (0.827-1.13)	**1.24** (1.07-1.46)	**1.49** (1.26-1.77)	**1.84** (1.50-2.28)	**2.13** (1.69-2.71)	**2.45** (1.89-3.21)	**2.79** (2.08-3.79)	**3.29** (2.33-4.70)	**3.71** (2.52-5.53)
3-hr	**0.948** (0.818-1.11)	**1.19** (1.03-1.40)	**1.53** (1.32-1.80)	**1.83** (1.55-2.17)	**2.25** (1.84-2.79)	**2.60** (2.07-3.31)	**2.98** (2.30-3.91)	**3.39** (2.52-4.60)	**3.99** (2.82-5.70)	**4.49** (3.05-6.69)
6-hr	**1.41** (1.22-1.65)	**1.76** (1.52-2.06)	**2.24** (1.93-2.64)	**2.66** (2.26-3.16)	**3.26** (2.66-4.05)	**3.76** (2.98-4.78)	**4.29** (3.30-5.62)	**4.87** (3.62-6.60)	**5.70** (4.03-8.14)	**6.40** (4.34-9.52)
12-hr	**2.09** (1.80-2.44)	**2.65** (2.29-3.11)	**3.42** (2.94-4.03)	**4.08** (3.47-4.85)	**5.02** (4.09-6.22)	**5.78** (4.59-7.35)	**6.58** (5.07-8.63)	**7.44** (5.54-10.1)	**8.68** (6.14-12.4)	**9.69** (6.57-14.4)
24-hr	**2.89** (2.57-3.33)	**3.79** (3.36-4.36)	**4.99** (4.42-5.76)	**6.01** (5.28-6.98)	**7.44** (6.36-8.87)	**8.58** (7.22-10.4)	**9.78** (8.06-12.1)	**11.1** (8.91-14.0)	**12.9** (10.0-16.9)	**14.4** (10.9-19.4)
2-day	**3.85** (3.41-4.42)	**5.13** (4.55-5.91)	**6.87** (6.07-7.92)	**8.32** (7.31-9.66)	**10.4** (8.87-12.4)	**12.0** (10.1-14.6)	**13.7** (11.3-17.0)	**15.5** (12.5-19.7)	**18.1** (14.1-23.8)	**20.2** (15.3-27.3)
3-day	**4.42** (3.93-5.09)	**5.97** (5.29-6.87)	**8.04** (7.11-9.27)	**9.78** (8.59-11.4)	**12.2** (10.5-14.6)	**14.2** (11.9-17.2)	**16.2** (13.4-20.1)	**18.4** (14.8-23.3)	**21.5** (16.7-28.1)	**23.9** (18.1-32.3)
4-day	**4.87** (4.32-5.60)	**6.58** (5.83-7.57)	**8.87** (7.85-10.2)	**10.8** (9.49-12.5)	**13.5** (11.5-16.1)	**15.6** (13.1-19.0)	**17.9** (14.7-22.1)	**20.2** (16.3-25.6)	**23.6** (18.4-30.9)	**26.3** (19.9-35.5)
7-day	**5.89** (5.23-6.78)	**7.89** (6.99-9.08)	**10.6** (9.34-12.2)	**12.8** (11.2-14.8)	**15.9** (13.6-19.0)	**18.4** (15.4-22.3)	**20.9** (17.2-25.9)	**23.6** (19.0-29.9)	**27.4** (21.3-35.9)	**30.5** (23.0-41.1)
10-day	**6.67** (5.92-7.68)	**8.89** (7.88-10.2)	**11.8** (10.5-13.6)	**14.3** (12.5-16.6)	**17.7** (15.1-21.1)	**20.3** (17.1-24.7)	**23.1** (19.0-28.6)	**26.0** (20.9-32.9)	**30.1** (23.4-39.4)	**33.3** (25.2-44.9)
20-day	**8.72** (7.74-10.0)	**11.6** (10.3-13.4)	**15.3** (13.6-17.7)	**18.4** (16.2-21.4)	**22.5** (19.3-26.9)	**25.7** (21.6-31.2)	**28.9** (23.9-35.8)	**32.3** (26.0-40.9)	**36.9** (28.7-48.3)	**40.4** (30.6-54.5)
30-day	**10.7** (9.51-12.3)	**14.2** (12.6-16.4)	**18.7** (16.6-21.6)	**22.3** (19.6-25.9)	**27.1** (23.2-32.4)	**30.7** (25.9-37.3)	**34.4** (28.3-42.6)	**38.1** (30.7-48.2)	**43.1** (33.5-56.4)	**46.9** (35.5-63.3)
45-day	**13.4** (11.9-15.4)	**17.7** (15.7-20.3)	**23.0** (20.4-26.6)	**27.3** (24.0-31.7)	**32.8** (28.0-39.1)	**36.8** (31.0-44.7)	**40.9** (33.7-50.6)	**44.9** (36.2-56.9)	**50.2** (39.1-65.8)	**54.2** (41.0-73.1)
60-day	**15.9** (14.1-18.3)	**20.9** (18.5-24.0)	**27.0** (23.9-31.1)	**31.7** (27.9-36.8)	**37.8** (32.3-45.1)	**42.2** (35.5-51.2)	**46.5** (38.3-57.6)	**50.8** (40.9-64.3)	**56.3** (43.8-73.8)	**60.4** (45.7-81.4)

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

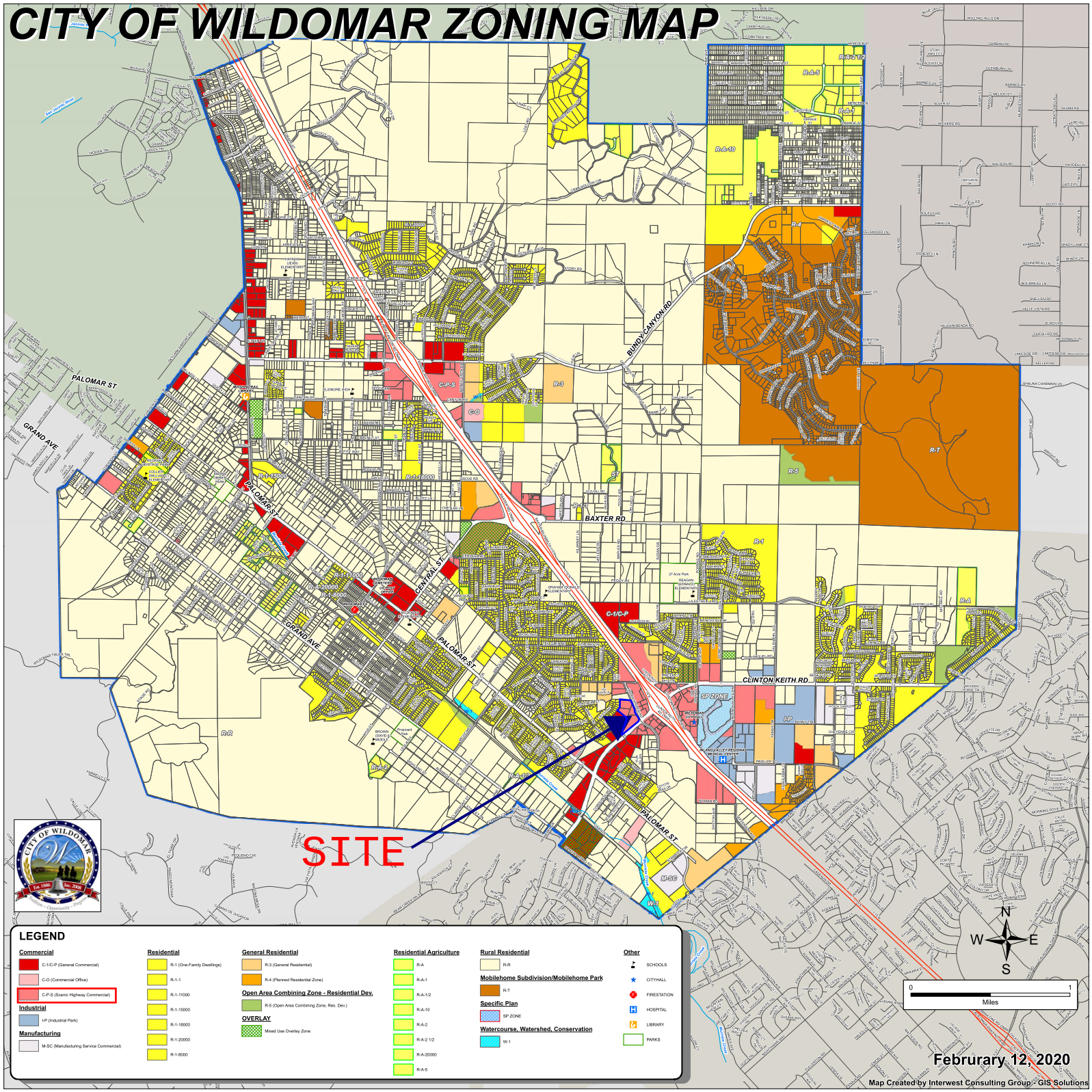
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

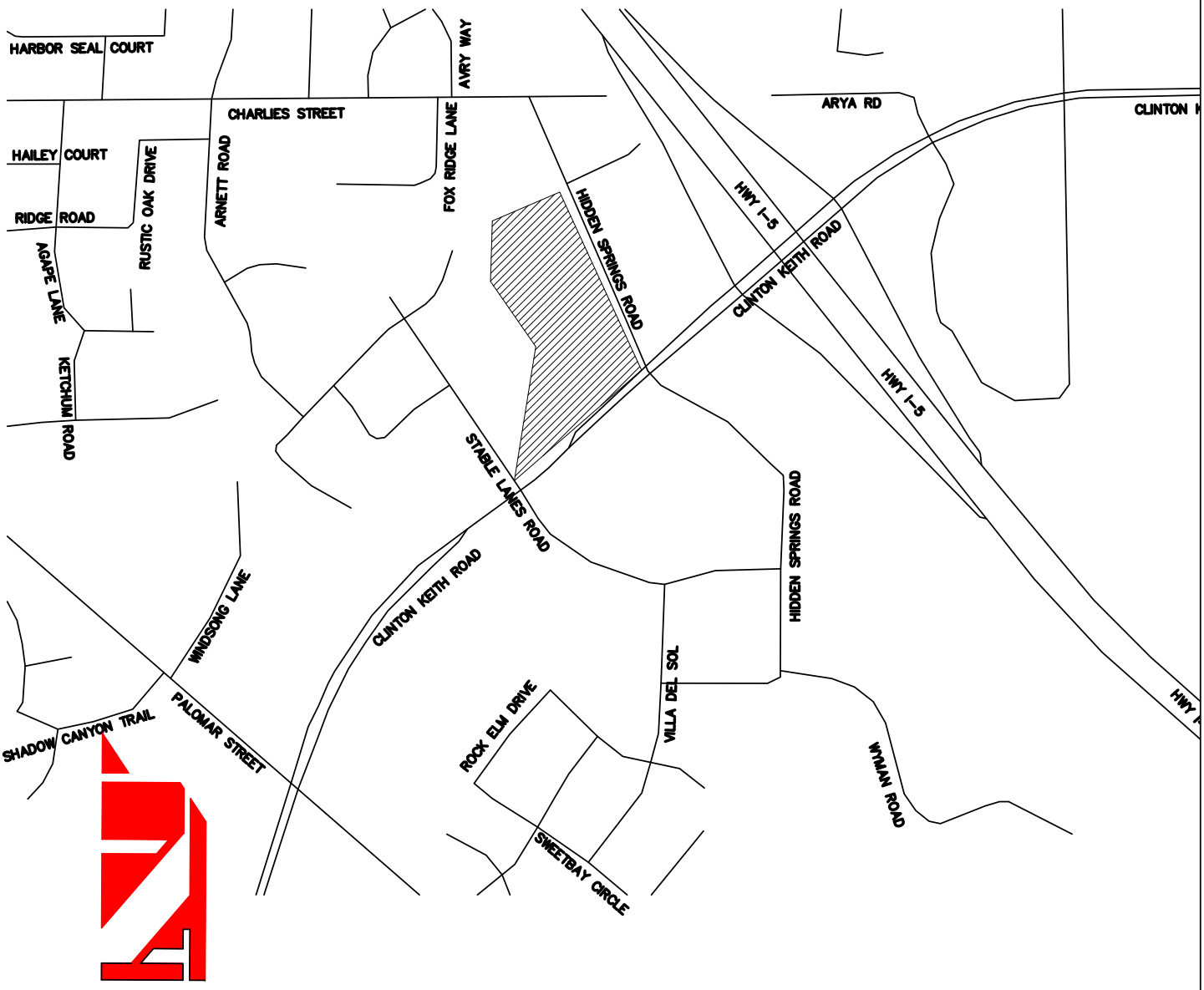
Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Exhibit C


CITY OF WILDOMAR ZONING MAP
SITE
PALOMAR ST
GRAND AVE
BUNDY CANYON RD
BAXTER RD
CENTRAL ST
CLINTON KEITH RD
LEGEND
Commercial
C-1/C-P (General Commercial)
C-O (Commercial Office)
C-P-S (Scenic Highway Commercial)
Industrial
I-P (Industrial Park)
Manufacturing
M-SC (Manufacturing Service Commercial)
Residential
R-1 (One-Family Dwellings)
R-1-1
R-1-11000
R-1-15000
R-1-18000
R-1-20000
R-1-8000
General Residential
R-3 (General Residential)
R-4 (Planned Residential Zone)
Open Area Combining Zone - Residential Dev.
R-5 (Open Area Combining Zone, Res. Dev.)
OVERLAY
Mixed Use Overlay Zone
Residential Agriculture
R-A
R-A-1
R-A-1/2
R-A-10
R-A-2
R-A-2 1/2
R-A-20000
R-A-5
Rural Residential
R-R
Mobilehome Subdivision/Mobilehome Park
R-T
Specific Plan
SP ZONE
Watercourse, Watershed, Conservation
W-1
Other
SCHOOLS
CITYHALL
FIRESTATION
HOSPITAL
LIBRARY
PARKS
N
W
E
S
0
1
Miles
Februrary 12, 2020
Map Created by Interwest Consulting Group - GIS Solutions



VICINITY MAP

DATE:

SCALE:

PROJECT:

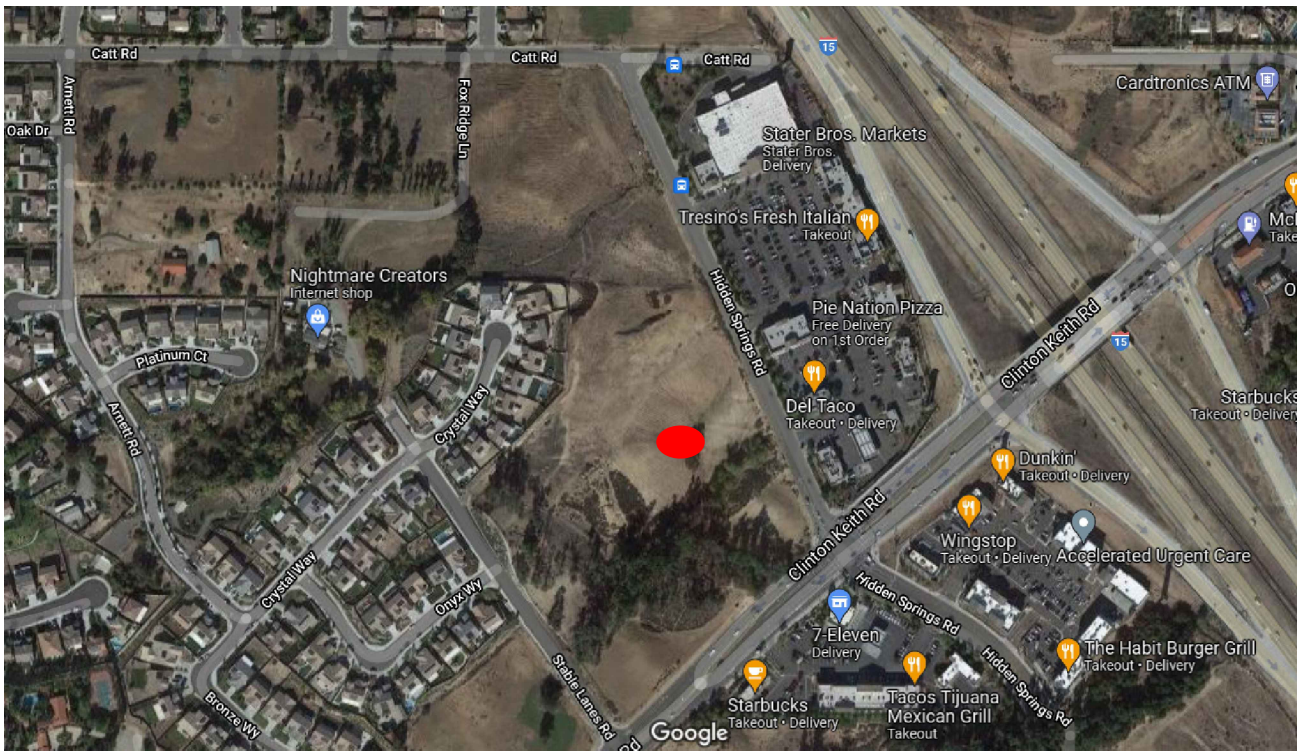
WILDOWMAR
COMMONS

RED BRICK SOLUTION

CONSULTING ENGINEERS
& ARCHITECTS

EXHIBIT A

Latitude	Longitude
33.595075	-117.248298



DATE: SCALE:	LATITUDE-LONGITUDE PROJECT: WILDOWMAR COMMONS	RED BRICK SOLUTION CONSULTING ENGINEERS & ARCHITECTS EXHIBIT B

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

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

0.85 MiraLoma
0.61 RiverseNorth
0.54 RiverseSouth
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
0.90 HurkeyCreek
0.70 ElsinoreNWS
1.11 ElCarisoStation
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

SITE

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

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 2: Construction Plans

Grading and Drainage Plans

Examples of material to provide in Appendix 2 may include but are not limited to the following:

- Site grading plans from the Project's Civil Plan Set,
- Drainage plans showing the exiting condition and proposed drainage system from the project's drainage report,
- Other plan sheets containing elements that impact site grading and drainage.

Refer to Section 4 of the SMR WQMP and Section I of this Template.

SUMMARY OF EARTHWORK QUANTITIES

ITEM	A CUT/CUBIC YDS..	B FILL/CUBIC YDS.
1. LAND DEVELOPMENT PROGRAM FOR PURE VOLUME (RAW)	54,542	90,570
2. SUBSIDENCE LOSS – 0.1'		1,153
3. OVEREXCAVATION – PAD 63,490 x 4 / 27	7,104	7,104
4. OVEREXCAVATION – ROAD 204,773 x 1 / 27	8,537	8,537
5. SUBTOTALS	70,183	107,364
6. SHRINKAGE @ 10%		11,929
7. TOTALS	70,183	119,293
8. IMPORT		49,110

CONSTRUCTION NOTES:

1. CONSTRUCT 4' WIDE RIBBON GUTTER PER DETAIL 'B' ON SHEET C1.02
2. CONSTRUCT 6" PCC CURB PER SPPWC 120-2, A1-6 (150). SEE DETAIL 'A' ON SHEET C1.02
3. CONSTRUCT ADA SIGNAGE AND STRIPING
4. CONSTRUCT 6" PCC CURB AND GUTTER PER SPPWC 120-2, A1-6 (150) SEE DETAIL 'D' ON SHEET C1.02
5. INSTALL 36"X36" JENSEN (OR EQUAL) DROP INLET CATCH BASIN
6. INSTALL ADS UNDERGROUND STORAGE SYSTEM PER MANF. RECOMMENDATION AND DETAILS

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

PROJECT OWNER
SOMAR LAND GROUP, INC
16391 HARWICH CIRCLE
RIVERSIDE, CA. 92503
ATTN: MR. STEVE MACIE
(702) 497-3101

CONSULTANT
Duke Engineering
CIVIL & STRUCTURAL
LANCASTER - CALIFORNIA
44732 YUCCA AVENUE
LANCASTER, CA
661-952-7918

REVISIONS
No. Revisions By Date

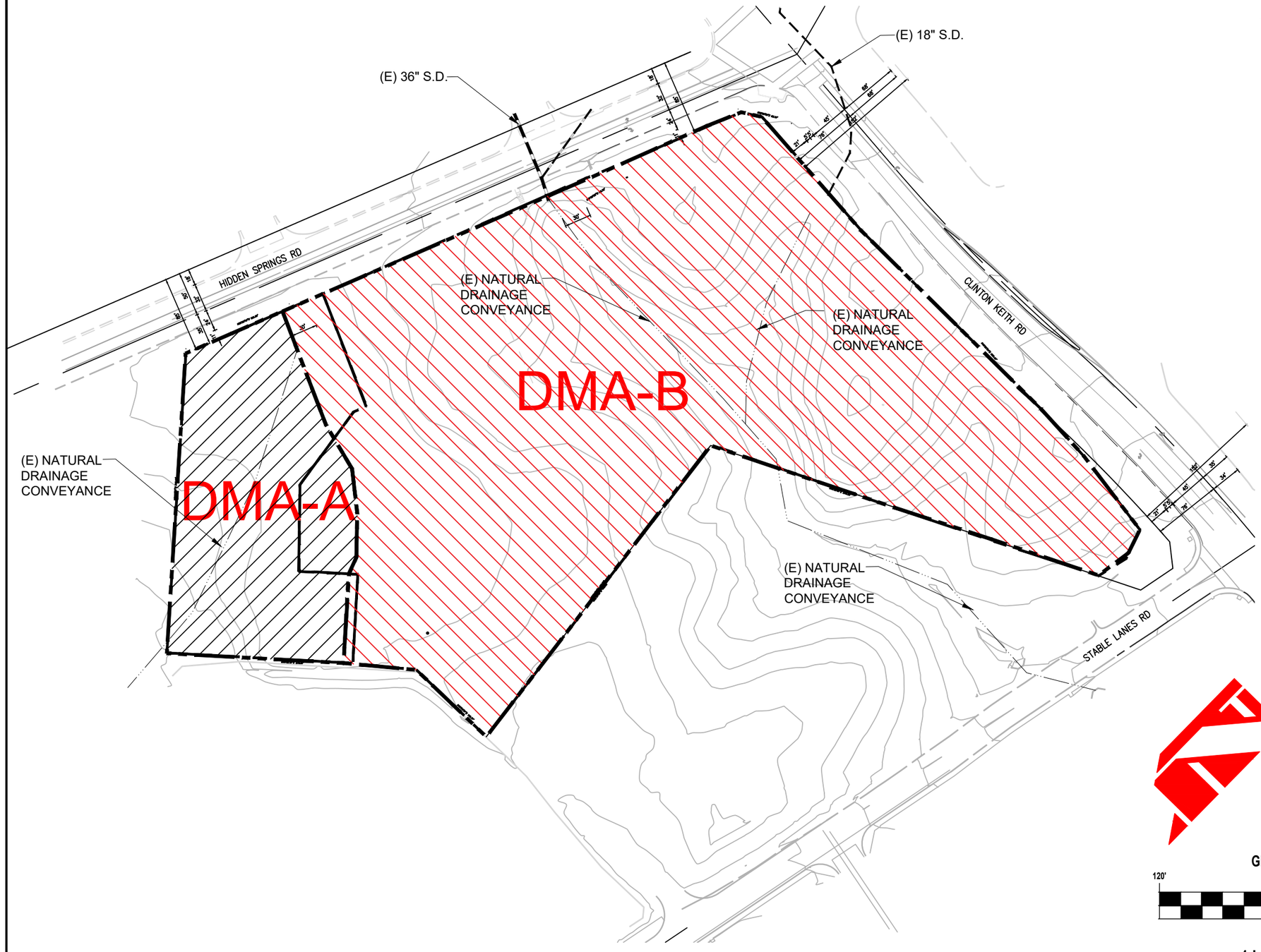
PROJECT
CLINTON KEITH MARKETPLACE
380-110-004,009,010,014,016
WILDOMAR, CA

ENGINEER OF RECORD
RYAN DUKE
No. 77129
Exp. 6-30-22
CIVIL
STATE OF CALIFORNIA

SHEET TITLE
CONCEPTUAL GRADING PLAN

SHEET
C1.00
PROJECT: 19067

SHEET NO.
3
OF 10 SHEETS



LEGEND:

- DMA-A = 0.94 ACRES
- DMA-B = 7.99 ACRES
- FLOWLINE
- (E) STORM DRAIN
- BOUNDARY

GRAPHIC SCALE

120' 0' 60' 120' 240'

(IN FEET)
1 inch = 120 ft.

CITY OF WILDOMAR

WQMP

WILDOMAR COMMONS

APN: 0380-110-04, 07, 08, 10,14, &16

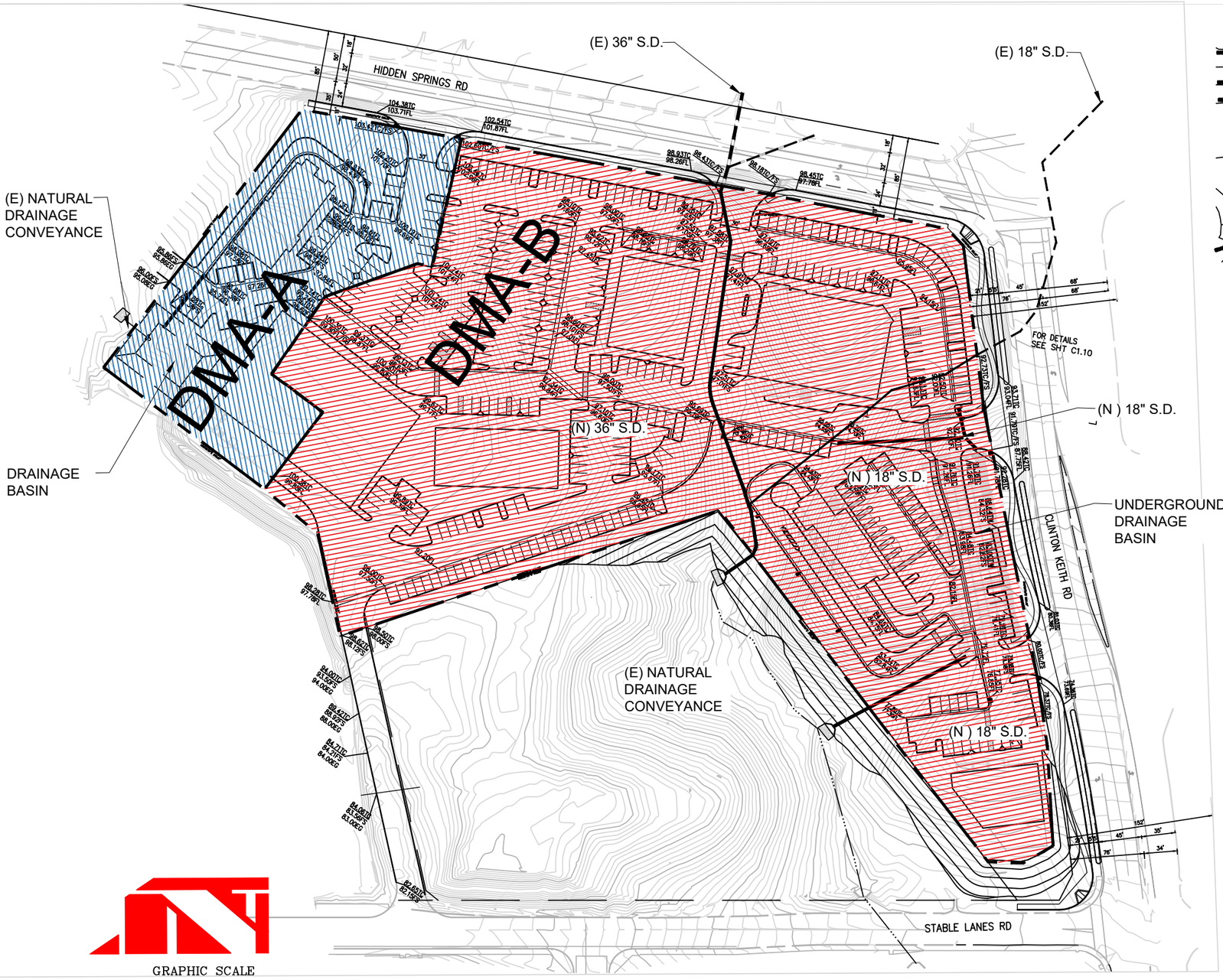
ON-SITE PRE-DEVELOPED

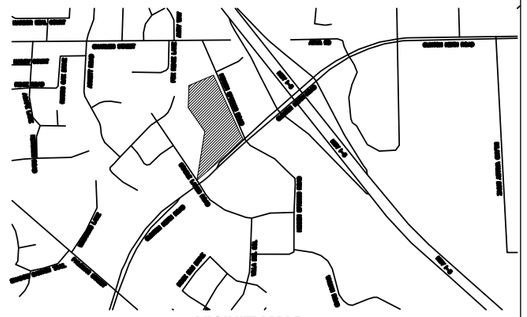
TRIBUTARY DRAINAGE AREAS

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT C1





VICINITY MAP

LEGEND:

DMA-A = 0.94 ACRES

DMA-B = 7.99 ACRES

FLOWLINE

(E) STORM DRAIN

BOUNDARY

GRAPHIC SCALE

120' 0' 60' 120' 240'

(IN FEET)
1 inch =120'ft.

CITY OF WILDOMAR

WATER QUALITY MANGEMENT PLAN

WILDOMAR COMMONS

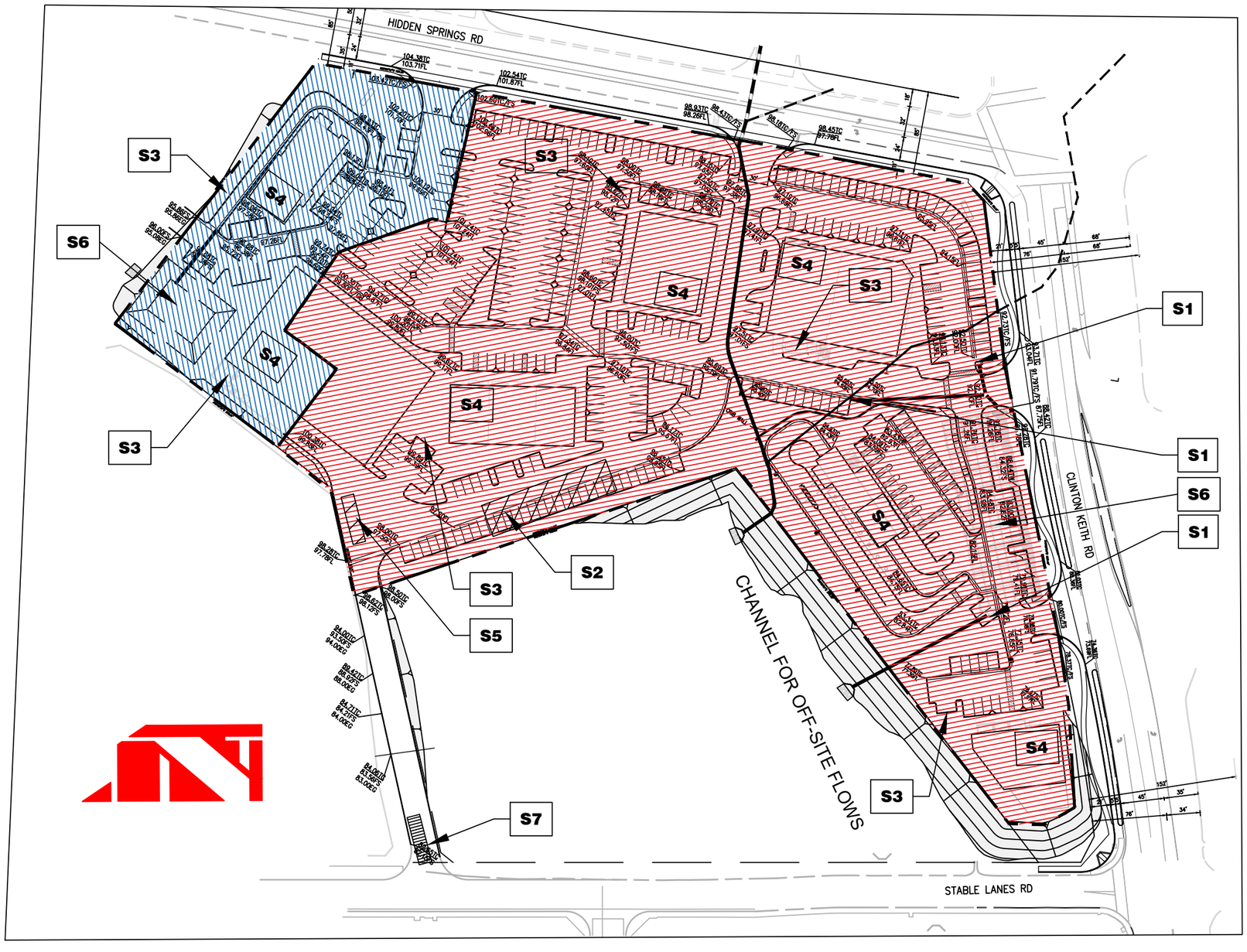
APN: 0411-182-04,07,08,10,14,&16

ON-SITE POST-DEVELOPED TRIBUTARY DRAINAGE AREAS

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT C 2



S#	SOURCE CONTROL SEE BMP'S ATTACHED
S1	CATCH BASIN SIGNAGE SD-13
S2	MATERIAL STORAGE SEE SD-34
S3	TRASH & WASTE STORAGE SEE SD-32
S4	IRRIGATION SMART CONTROLERS
S5	CONCRETE WASHOUT
S6	PROPOSED INFILTRATION BASIN SEE TC-11
S7	CONSTRUCTION ENTRANCE TIRE

CITY OF WILDOMAR
APN: 0411-182-04,07,08,10,14,&16

WATER QUALITY MANGEMENT PLAN (WQMP)

WILDOMAR COMMONS

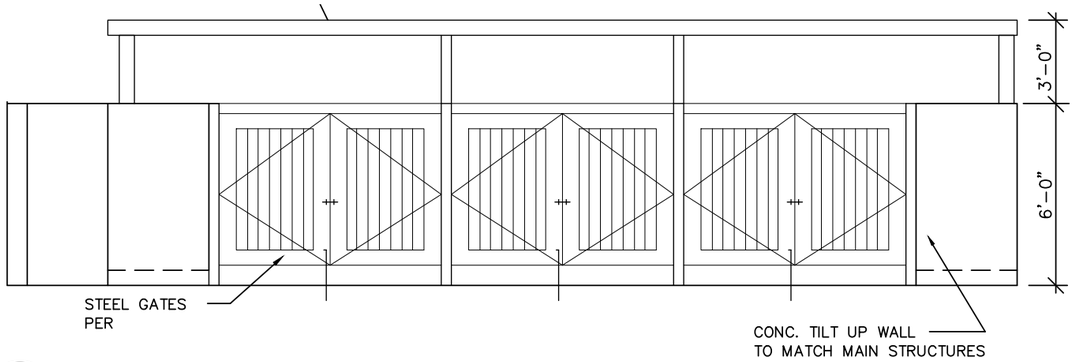
ON-SITE POST-DEVELOPED SWPPP

BEST MANAGEMENT PRACTICES (BMP)

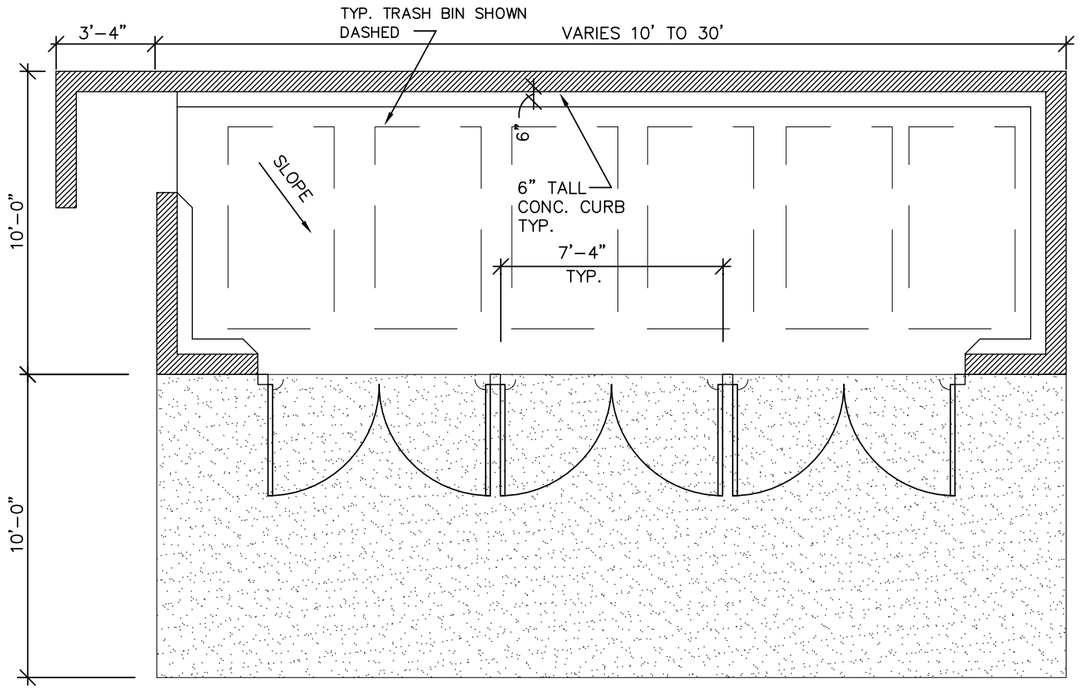
RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT C3

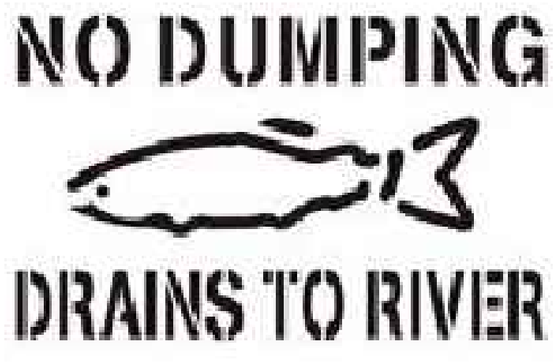


ELEVATION



1 TRASH ENCLOSURE PLAN

SCALE 1"=5'

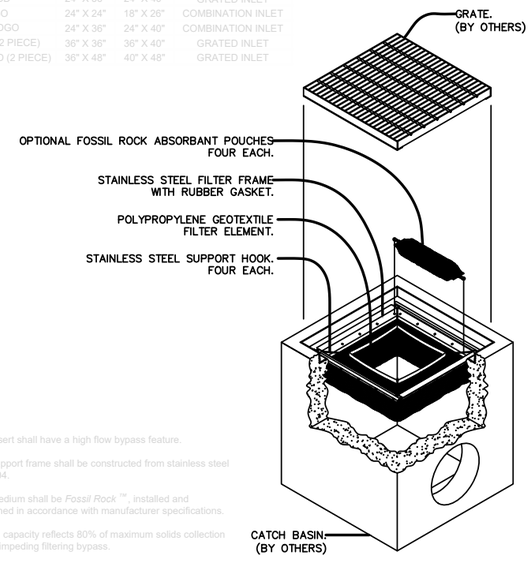


2 CATCH BASIN STENCIL

SCALE NA

FG-0001

MODEL	INLET ID	GRATE OD	COMMENTS
FF-12D	12" X 12"	15" X 15"	GRATED INLET
FF-16D	16" X 16"	18" X 18"	GRATED INLET
FF-18D	18" X 18"	20" X 20"	GRATED INLET
FF-1836SD	18" X 36"	18" X 40"	GRATED INLET
FF-1836DGO	18" X 36"	18" X 40"	COMBINATION INLET
FF-24D	24" X 24"	26" X 26"	GRATED INLET
FF-2436SD	24" X 36"	24" X 40"	GRATED INLET
FF-24DGO	24" X 24"	18" X 26"	COMBINATION INLET
FF-2436DGO	24" X 36"	24" X 40"	COMBINATION INLET
FF-36D (2 PIECE)	36" X 36"	36" X 40"	GRATED INLET
FF-3648D (2 PIECE)	36" X 48"	40" X 48"	GRATED INLET



NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

FloGard®
Catch Basin Insert Filter

Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

3 SDM FILTER

FLO-GAURD MULTI-LEVEL FILTER OR EQUAL

CITY OF WILDOMAR
APN: 0411-182-04,07,08,10,14,&16

WATER QUALITY MANGEMENT PLAN (WQMP)

WILDOMAR COMMONS

BMP DETAILS

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT C4

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.

United States Department of Agriculture

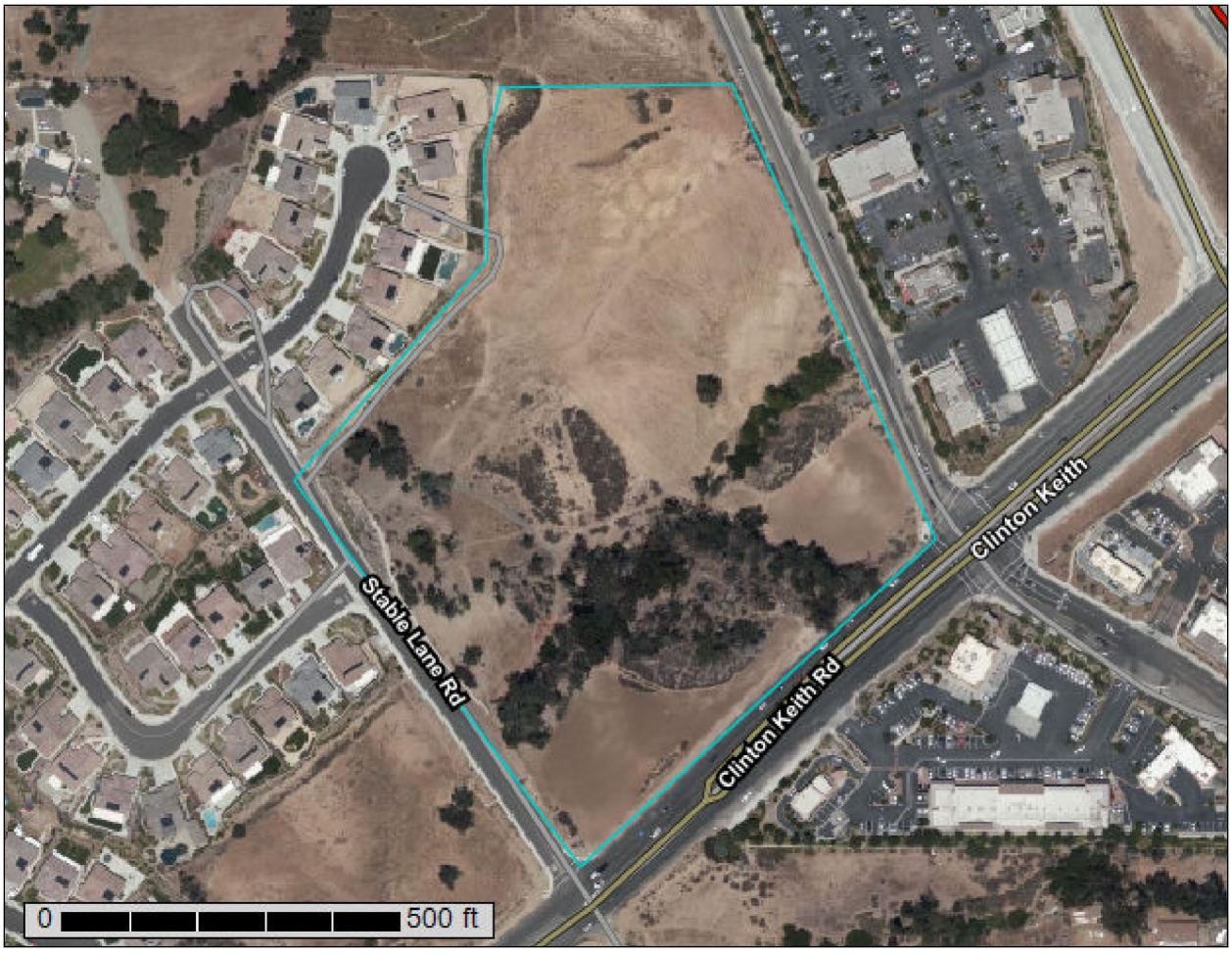
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PlD Soil Class D	Placentia fine sandy loam, 5 to 15 percent slopes	4.3	30.0%
RmE3 Soil Class C	Ramona and Buren sandy loams, 15 to 25 percent slopes, severely eroded	0.3	1.9%
RnE3 Soil Class C	Ramona and Buren loams, 5 to 25 percent slopes, severely eroded	0.9	6.4%
SmE2 Soil Class B	San Timoteo loam, 8 to 25 percent slopes, eroded	8.8	61.7%
Totals for Area of Interest		**14.3**	**100.0%**



Map Scale: 1:2,230 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

November 24, 2020 CTE Job No. 40-3779G

Somar Land Group, Inc.
c/o: Mr. Stephen Macie
302 Hollister Street
San Diego, CA 92154

Subject: Percolation Test Results
Wildomar Commons
NWC of Clinton Keith Road & Hidden Springs Road
Wildomar, California

Dear Mr. Macie:

On November 17 and 18, 2020, a geotechnical representative of Construction Testing & Engineering, South, Inc. (CTE) was on-site to conduct percolation tests for the subject project. The tests were conducted at approximate basin floor elevations in the proposed detention basin areas. The basin locations and elevations were provided by the project civil designer, Challman Engineering, Inc., via email and phone correspondence.

The test holes were excavated using a hollow-stem auger drill rig. The test holes were pre-soaked on day one, followed by the percolation testing on day two. The test locations are shown on the attached figure. The tests were conducted in accordance with the referenced BMP design handbook (RCFCWCD, 2018). The field percolation rates were converted to tested infiltration rates using the "Porchet method." The test results are presented in the table below.

PERCOLATION TEST RESULTS			
Test No.	Test Elevation (feet)	Soil Description	Tested Infiltration Rate (inch/hour)
P-1A	1288	Sandstone	2.1
P-1B	1288	Sandstone	2.0
P-2A	1255	Silty Sand	1.3
P-2B	1255	Silty Clayey Sand	0.8
P-2C	1255	Clayey Sand	0.1

Infiltration Rate Factor of Safety

Infiltration rates can be affected by such factors as build-up of silt, debris, degree of soil saturation, and compaction of soil from grading. Accordingly, an appropriate factor of safety should be applied to accommodate subsurface inconsistencies, potential compaction from grading, and potential silting of the soils.

In accordance with the referenced design handbook, a minimum factor of safety of 3 shall be applied to the tested infiltration rates. We recommend that the safety factor be applied to the slowest (or averaged) tested infiltration rate to provide the design infiltration rate.

Groundwater Evaluation

In the referenced geotechnical investigation report (CTE, 2019), groundwater was encountered in boring B-4 at a depth of 19½ feet below ground surface (bgs). Groundwater levels will fluctuate during periods of high precipitation, and water should be anticipated during these times in the existing natural drainage course area. Based on review of online water data library (DWR) for wells in close proximity to the subject site, historically high groundwater is approximately 15 feet bgs.

If there are questions, please contact the undersigned.

Sincerely,
CONSTRUCTION TESTING & ENGINEERING, SOUTH, INC.

Dharmesh Amin, MS, PE, GE
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
DHARMESH AMIN
2553
GEOTECHNICAL
STATE OF CALIFORNIA

Vincent J. Patula, CEG
Senior Engineering Geologist

Robert L. Ellerbusch
Project Geologist

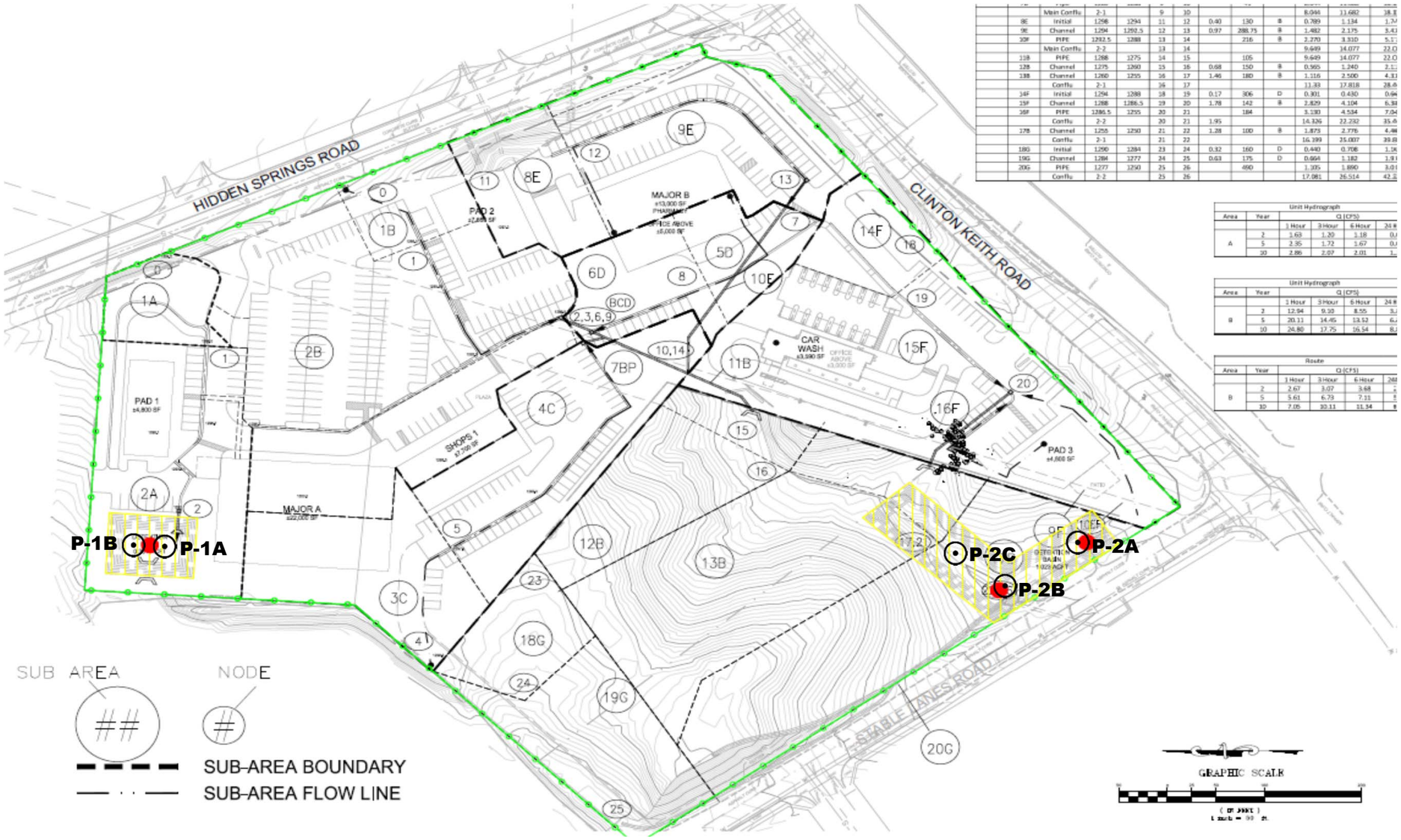
PROFESSIONAL GEOLOGIST
VINCENT J. PATULA
No. 2057
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

REFERENCES

1. California Department of Water Resources (DWR), Water Data Library, http://www.water.ca.gov/waterdatalibrary/.

2. Construction Testing & Engineering, South, Inc., 2019, Report of Geotechnical Investigation, Proposed Commercial Development, The Commons at Hidden Springs, NWC of Clinton Keith Road & Hidden Springs Road, Wildomar, California, November 12.

3. Riverside County Flood Control Water Conservation District (RCFCWCD), 2018, Riverside County Santa Margarita River Watershed Region Design Handbook for Low Impact Development Best Management Practices, revised June.



		Main Confl'n	2-1			9	10				8.044	11.682
	8E	Initial	1298	1294	11	12	0.40	130	B	0.789	1.134	1.7
	9E	Channel	1294	1292.5	12	13	0.97	288.75	B	1.482	2.175	3.4
	10F	PIPE	1292.5	1288	13	14		216	B	2.270	3.310	5.1
		Main Confl'n	2-2		13	14				9.649	14.077	22.0
	11B	PIPE	1288	1275	14	15		105		9.649	14.077	22.0
	12B	Channel	1275	1260	15	16	0.68	150	B	0.965	1.240	2.1
	13B	Channel	1260	1255	16	17	1.46	180	B	1.116	2.500	4.1
		Confl'n	2-1		16	17				11.33	17.818	28.6
	14F	Initial	1294	1288	18	19	0.17	306	D	0.301	0.430	0.6
	15F	Channel	1288	1286.5	19	20	1.78	142	B	2.829	4.104	6.3
	16F	PIPE	1286.5	1255	20	21		184		3.130	4.534	7.0
		Confl'n	2-2		20	21	1.95			14.326	22.232	35.6
	17B	Channel	1255	1250	21	22	1.28	100	B	1.873	2.776	4.4
		Confl'n	2-1		21	22				16.199	25.007	39.8
	18G	Initial	1290	1284	23	24	0.32	160	D	0.440	0.708	1.1
	19G	Channel	1284	1277	24	25	0.63	175	D	0.664	1.182	1.9
	20G	PIPE	1277	1250	25	26		490		1.105	1.890	3.0
		Confl'n	2-2		25	26				17.081	26.514	42.2

Unit Hydrograph					
Area	Year	Q (CFS)			
		1 Hour	3 Hour	6 Hour	24 H
A	2	1.63	1.20	1.18	0.6
	5	2.36	1.72	1.67	0.9
	10	2.86	2.07	2.01	1.1

Unit Hydrograph					
Area	Year	Q (CFS)			
		1 Hour	3 Hour	6 Hour	24 H
B	2	12.94	9.10	8.55	3.3
	5	20.11	14.45	13.52	6.4
	10	24.80	17.75	16.54	8.1

Route					
Area	Year	Q (CFS)			
		1 Hour	3 Hour	6 Hour	24H
B	2	2.67	3.07	3.68	4
	5	5.61	6.73	7.11	9
	10	7.05	10.11	11.34	13

GEOTECHNICAL LEGEND

⊙ **P-1 Approximate Percolation Test Location**

CTE SOUTH Construction Testing & Engineering, South, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

PERCOLATION TEST LOCATION MAP
WILDOMAR COMMONS
HIDDEN SPRINGS ROAD & CLINTON KEITH ROAD
WILDOMAR, CALIFORNIA

Job No.	Date	Figure
40-3779G	NOV 2020	1

REPORT OF GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
THE COMMONS AT HIDDEN SPRINGS
NWC OF CLINTON KEITH ROAD & HIDDEN SPRINGS ROAD
WILDOMAR, CALIFORNIA
APN 380-110-004, -009, -010, -014, & -016

PREPARED FOR:

SOMAR LAND GROUP
c/o: MR. STEPHEN MACIE
16391 HARWICH CIRCLE
RIVERSIDE, CALIFORNIA 92503

PREPARED BY:

CONSTRUCTION TESTING & ENGINEERING, SOUTH, INC.
14538 MERIDIAN PARKWAY, SUITE A
RIVERSIDE, CA 92518

CTE JOB NO. 40-3779G **NOVEMBER 12, 2019**

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY 1
2.0 INTRODUCTION AND SCOPE OF SERVICES 1
2.1 Introduction 1
2.2 Scope of Services 2
3.0 SITE LOCATION AND DESCRIPTION 2
4.0 FIELD AND LABORATORY INVESTIGATION 3
4.1 Field Investigation 3
4.2 Laboratory Analyses 4
5.0 GEOLOGY 4
5.1 General Physiographic Setting 4
5.2 Site Geologic Conditions 4
5.2.1 Quaternary Younger Alluvium (Qya) 5
5.2.2 Pauba Formation, Sandstone Member (Qpfs) 5
5.2.3 Sandstone of the Wildomar Area (QTsw) 5
5.3 Groundwater Conditions 6
5.4 Geologic Hazards 6
5.4.1 Surface Fault Rupture 6
5.4.2 Local and Regional Faulting 7
5.4.3 Liquefaction Evaluation and Seismic Settlement Evaluation 8
5.4.4 Tsunami and Seiche Evaluation 8
5.4.5 Landsliding 8
5.4.6 Compressible and Expansive Soils 9
5.4.7 Flood Zones 9
6.0 CONCLUSIONS AND RECOMMENDATIONS 9
6.1 General 9
6.2 Site Preparation 9
6.2.1 General 9
6.2.2 Remedial Grading and Excavations 10
6.2.3 Preparation of Areas to Receive Fill 12
6.2.4 Fill Placement and Compaction 12
6.2.5 Filling on Natural Slopes 13
6.2.6 Fill Slopes 13
6.2.7 Utility Trenches 13
6.3 Foundations and Slab Recommendations 14
6.3.1 General 14
6.3.2 Shallow Foundations 14
6.3.3 Settlement of Foundations 15
6.3.4 Concrete Slabs-On-Grade 16
6.3.5 Pipe Bedding and Thrust Blocks 17
6.4 Seismic Design Criteria 17
6.5 Vehicular Pavements 18
6.6 Retaining Walls 20
6.7 Corrosive Soils 22

6.8 Exterior Flatwork 23
6.9 Drainage 24
6.10 Plan Review 24
6.11 On-Site Construction Reviews 25
6.12 Permits 26
7.0 LIMITATIONS 26

REFERENCES

FIGURES

FIGURE 1	SITE LOCATION MAP
FIGURE 2	EXPLORATION LOCATION MAP
FIGURE 3	GEOLOGIC CROSS SECTION A-A’
FIGURE 4	REGIONAL FAULT AND SEISMICITY MAP
FIGURE 5	RETAINING WALL DRAIN DETAIL

APPENDICES

APPENDIX A	FIELD EXPLORATION METHODS AND EXPLORATION LOGS
APPENDIX B	LABORATORY METHODS AND RESULTS
APPENDIX C	STANDARD SPECIFICATIONS FOR GRADING & TRENCH BACKFILL

1.0 EXECUTIVE SUMMARY

Construction Testing & Engineering, South, Inc. (CTE) has performed a geotechnical investigation to provide site-specific geotechnical information for the proposed commercial development in Wildomar, California. The proposed development will consist of six buildings with a total footprint area of approximately 71,500 square feet. The development will include parking lots, hardscapes, utilities, and landscaping. It is anticipated the buildings will be founded on conventional shallow foundations with slabs-on-grade.

Based on our investigation and review of geologic maps, the site is underlain by sandstone of the Pauba formation, and sandstone and siltstone of the unnamed Sandstone of the Wildomar Area formation. Younger alluvium overlies portions of the formational materials in low lying areas of the site. Groundwater was encountered during our investigation at a depth of 19½ feet below the existing ground surface (bgs) in boring B-4.

Based on our investigation, the proposed development at the site is considered feasible from a geotechnical standpoint, provided the recommendations herein are implemented during project design and construction.

2.0 INTRODUCTION AND SCOPE OF SERVICES

2.1 Introduction

CTE has prepared this report for Somar Land Group. Presented herein are the results of the subsurface investigation performed as well as recommendations regarding the geotechnical engineering and dynamic loading criteria for the proposed construction.

2.2 Scope of Services

Our scope of services included:

- Review of readily available geologic and geotechnical literature pertinent to the site.
- Explorations to determine subsurface soil, rock and groundwater conditions to the depths influenced by the proposed development.
- Laboratory testing of representative soil samples to provide data to evaluate the geotechnical design characteristics of the site foundation soils.
- Definition of the general geology and evaluation of potential geologic hazards at the site.
- Preparation of this report detailing the investigation performed and providing conclusions and geotechnical engineering recommendations for design and construction. Included in the report are site geology and hazards, seismic effects and design parameters, earthwork recommendations, foundation design parameters including lateral resistance, retaining wall design parameters, and pavement structure section recommendations.

3.0 SITE AND PROPOSED CONSTRUCTION

The site is currently undeveloped land, consisting of five adjoining parcels, located at the northwest corner of Clinton Keith Road and Hidden Springs Road in the city of Wildomar, California. Figure 1 shows the location of the site. The site topography is predominantly sloping, with elevations ranging from approximately 1275 feet to 1321 feet above mean sea level (msl). A natural drainage course traverses through the site, beginning on the eastern mid portion of the site and draining to the southwest. Water was not present in the drainage course during our site investigation. The ground surface at the site is partially covered by grasses and brush. Vegetation ranges from medium sized shrubs to mature trees. Weed abatement in the form of discing has been conducted in portions of the site.

The proposed development will consist of six buildings with a total footprint area of approximately 71,500 square feet. The development will include parking lots, hardscapes, utilities, and landscaping. It is anticipated the buildings will be founded on conventional shallow foundations with slabs-on-grade.

4.0 FIELD AND LABORATORY INVESTIGATION

4.1 Field Investigation

Our field investigation was performed on September 9 and 10, 2019, and included 8 exploratory borings (identified as B-1 through B-8) and 4 test pits (identified as TP-1 through TP-4). The explorations were conducted at the proposed building and pavement locations. The exploration locations are shown on Figure 2.

The exploratory borings were excavated to investigate and obtain samples of the subsurface soils. The borings were excavated using a truck-mounted, eight-inch diameter, hollow-stem auger drill rig to a maximum explored depth of approximately 51½ feet bgs.

Soils encountered within the explorations were classified in the field in accordance with the Unified Soil Classification System. The field descriptions were later modified (as appropriate) based on the results of our laboratory testing program. In general, soil samples were obtained at 5-foot intervals with standard split spoon (SPT and California Modified) samplers. Specifics of the soils encountered can be found on the Exploration Logs, which are presented in Appendix A.

4.2 Laboratory Analyses

Laboratory tests were conducted on representative soil samples to evaluate their physical properties and engineering characteristics. Specific laboratory tests included: direct shear, maximum dry density and optimum moisture content, in-place moisture and dry density, "R" value, expansion index, gradation, Atterberg limits, and chemical analyses. These tests were conducted to determine the engineering properties and corrosivity of the on-site soils. Test method descriptions and laboratory results are presented in Appendix B and on the Exploration Logs.

5.0 GEOLOGY

5.1 General Physiographic Setting

Geomorphically, the subject site is situated on the western margin of the Perris structural block. The Perris structural block lies within the Peninsular Range Geomorphic Province and is a relatively stable, rectangular area located between the Elsinore and San Jacinto fault zones. These fault zones are major components of the San Andreas Fault system, which consists of a series of *en-echelon* northwest-striking right-lateral faults and pull-apart basins. The Perris block consists of phyllite, schist and gneiss of Mesozoic- to possibly Paleozoic-age metasedimentary rocks intruded by plutonic rocks of the Cretaceous-age Pennisular Range batholith. Tertiary-age sediments, Miocene-age volcanics, and Quaternary-age sediments unconformably cap the older Mesozoic-age rocks in this portion of the Perris block.

5.2 Site Geologic Conditions

Based on our investigation and review of geologic mapping (Kennedy and Morton, 2003), the site is underlain by sandstone of the Pauba formation, and sandstone and siltstone of the

[unnamed] Sandstone of the Wildomar Area formation. Younger alluvium overlies portions of the formational materials in low lying areas of the site. Below is a brief description of the materials encountered during the investigation. More detailed descriptions are provided in the Exploration Logs in Appendix A. A geologic cross section of the site is presented on Figure 3.

5.2.1 Quaternary Younger Alluvium (Qya)

Quaternary younger alluvium was encountered in boring B-6 from the surface to a depth of 10½ feet bgs. The alluvium consisted of loose silty clayey sand.

5.2.2 Pauba Formation, Sandstone Member (Qpfs)

The Pleistocene-age Sandstone Member of the Pauba Formation was encountered in borings B-1 thru B4. The encountered Pauba formational materials consisted of highly to moderately weathered, moderately hard to hard sandstone. The materials, as excavated, classified as silty clayey sand, clayey sand and poorly-graded sand with clay.

5.2.3 Sandstone of the Wildomar Area (QTsw)

Pleistocene to late Pliocene-age unnamed formation, designated as Sandstone of the Wildomar area, was encountered in boring B-4 underlying the Pauba formation, and encountered in borings B-5 thru B-8 from the surface to the maximum explored depths. This formational material consisted of highly to moderately weathered, moderately hard to hard sandstone and siltstone. Calcium carbonate (caliche) was present in some of the

layers. The sandstone and siltstone materials, as excavated, classified as silty sand, silty clayey sand, and sandy silt.

5.3 Groundwater Conditions

Groundwater was encountered in boring B-4 at a depth of 19½ feet below ground surface (bgs). Groundwater levels will fluctuate during periods of high precipitation. During grading and construction, water should be anticipated in the natural drainage course area, and groundwater could be encountered in deeper excavations on other low elevation areas of the site. In addition to groundwater, saturated subgrade conditions during or following periods of wet weather have the potential to impact grading or construction.

5.4 Geologic Hazards

From our investigation, it appears that geologic hazards at the site are limited primarily to those caused by strong shaking from earthquake-generated ground motions. Presented herein are the geologic hazards that are considered for potential impacts to site development.

5.4.1 Surface Fault Rupture

As defined by the California Geological Survey, an active fault is one that has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). This definition is used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Special Studies Zones Act of 1972 and revised in 1994 as the Alquist-Priolo Earthquake Fault Zoning Act. The name Special Studies Zones was changed to Earthquake Fault Zones as a result of a 1993 amendment. Special Publication - 42 was most recently revised in 2007 and is subject to periodic amendments. The intent of this act is to require fault investigations on sites located within Earthquake Fault Zones to

preclude the construction of structures for human occupancy across the trace of an active fault. The site is not located in or adjacent to an Alquist-Priolo Earthquake Fault Zone.

Based on our site reconnaissance and review of the referenced literature, no known active fault traces underlie the site. Based on our investigation, the potential for surface rupture from displacement or fault movement beneath the improvements is considered low.

5.4.2 Local and Regional Faulting

The California Geological Survey broadly groups faults as "Class A" or "Class B" (Cao et al, 2003). Class A faults are identified based upon relatively well-defined paleoseismic activity and a fault slip rate of more than 5 millimeters per year (mm/yr). Class B faults are all other faults that are not defined as Class A faults. The following Table 1 presents the ten nearest active faults to the site and includes magnitude and fault classification.

TABLE 1
NEAR SITE FAULT PARAMETERS

FAULT NAME	APPROXIMATE DISTANCE FROM SITE (mi)	MAXIMUM EARTHQUAKE MAGNITUDE	CLASSIFICATION
Elsinore – Temecula	0.3	6.8	A
Elsinore – Glen Ivy	6.9	6.8	A
Elsinore – Julian	20.3	7.1	A
San Jacinto-San Jacinto Valley	20.8	6.9	A
San Jacinto – Anza	21.6	7.2	A
Chino-Central Ave (Elsinore)	24.7	6.7	B
Newport Inglewood (Offshore)	28.2	7.1	B
Whittier	28.7	6.8	A
San Jacinto – San Bernardino	29.2	6.7	A
Rose Canyon	33.7	7.2	B

A regional fault and seismicity map is presented on Figure 4.

5.4.3 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine sands, silts or low plasticity clays lose their physical strength during earthquake-induced shaking and behave as a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with groundwater level, soil type, material gradation, relative density, and the intensity and duration of ground shaking.

The potential for liquefaction and seismic settlement at the site is considered very low because underlying formational materials are bedrock.

5.4.4 Tsunami and Seiche Evaluation

Due to site elevation and distance from the Pacific Ocean, the site is not considered to be subject to damage from tsunamis. Based on the absence of large bodies of water in the area, seiche (oscillatory waves in standing bodies of water) damage is also not expected.

5.4.5 Landsliding

No features typically associated with landsliding were noted during the site investigation. In the reference review, no evidence of landsliding was found to have occurred within the area of the site. Therefore, the potential for landsliding to affect the site is considered very low.

5.4.6 Compressible and Expansive Soils

Based on our investigation and laboratory testing, site soil and rock materials are not expected to be compressible relative to the post-construction overburden. Based on the results of expansion index and Atterberg limits testing, site soils are anticipated to have very low expansion potential.

5.4.7 Flood Zones

Based on Federal Emergency Management Agency flood zone map (FEMA, 2008), the site is located in Zone X, which is identified as an "area of minimal flood hazard."

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

Based on our investigation, the proposed construction on the site is feasible from a geotechnical standpoint, provided the recommendations in this report are incorporated into design and construction of the project. Preliminary recommendations for the design and construction of the proposed development are included in the subsequent sections of this report. Additional recommendations could be required based on the actual conditions encountered during earthwork and/or improvement construction.

6.2 Site Preparation

6.2.1 General

Prior to grading, the site should be cleared of debris, pavement and deleterious materials. In areas to receive structures or distress-sensitive improvements, surficial eroded,

desiccated, burrowed, or otherwise loose or disturbed soils should be removed to the depth of competent material as recommended below in Section 6.2.2. Organic and other deleterious materials not suitable for use as structural backfill should be disposed of offsite at a legal disposal site.

6.2.2 Remedial Grading and Excavations

In order to provide uniform structural support and reduce potential differential settlement due to the presence of disturbed/loose near-surface material, and to mitigate potential transitional bearing conditions, remedial grading will be required. Based on the conceptual grading plan provided (Pacific West), maximum cuts and fills are on the order of 11 and 30 feet, respectively. Table 2 below presents the maximum cut and fill depths for the proposed building pads, estimated minimum removal depths below existing grade and minimum over-excavation depths of fill areas for each building pad. These estimates may require modification based on the final grading plan.

TABLE 2
BUILDING PAD OVER-EXCAVATION ESTIMATES

Building No.	Existing Grade, ft.	Proposed Pad Elevation, ft.	Approximate Max. Cut, ft.	Approximate Max. Fill, ft.	Min. Over-Excavation for Cut Area, feet below proposed building footings	Min. Removal for Fill Area, feet below existing grade
1	1303-1314	1303.5	11	0.5	3	3
2	1306-1312	1301.5	10.5	0	3	N/A
3	1290-1311	1300.0	11	10	4½	3
4	1284-1298	1295.0	3	11	4½	3
5	1263-1292	1293.0	0	30	N/A	5 to 12
6	1266-1283	1279.0	4	13	5½	3

The over-excavation of cut areas is necessary to mitigate transition pad conditions and to produce uniform bearing conditions. The excavations should extend laterally at least 5-feet beyond the foundation limits. Over-excavations for pavement and hardscape areas may be limited to a depth of one-foot below existing or finish grade, whichever is greater.

The soils exposed at the bottom of the over-excavations should be documented by a geotechnical representative of this office to determine their suitability. If unsuitable materials are encountered at the bottom of the excavation, they should be removed to the depth of competent natural material. Groundwater, if encountered, should be removed from the excavations prior to placing fill.

Temporary, unsurcharged excavations up to three feet deep may be cut vertically. Deeper excavations should be sloped back or shored. Temporary sloped excavations should be cut at a slope of 1:1 (horizontal:vertical) or flatter. Vehicles and storage loads should not be placed within 10 feet of the top of the excavation. Berms are recommended along the tops of slopes to divert runoff water from entering the excavation and eroding the slope faces. Excavations should be stabilized within 30 days of initial excavation. Final slopes should be no steeper than 2:1 (horizontal:vertical). Safety provisions of Cal OSHA and other related statutory agencies should be followed, especially as related to support of adjacent structures.

6.2.3 Preparation of Areas to Receive Fill

Exposed excavation bottoms and subgrade surfaces to receive fill should be scarified to a minimum depth of 8 inches, brought to within +/- 2 percent of optimum moisture content and compacted to at least 90 percent of the maximum dry density as determined by ASTM D 1557.

6.2.4 Fill Placement and Compaction

Structural fill and backfill should be compacted to at least 95 percent of the maximum dry density (as determined by ASTM D 1557) at moisture content within +/- 2 percent of optimum. The top 12-inches of pavement subgrade should be compacted to at least 95 percent. Compaction equipment should be appropriate for the materials being compacted. The optimum lift thickness for fill soils will be dependent on the type of compaction equipment being utilized. Fill should be placed in uniform horizontal lifts not exceeding 8 inches in loose thickness. Placement and compaction of fill should be performed in general conformance with geotechnical recommendations and local ordinances.

Granular soils generated from on-site excavations are anticipated to be suitable for use as structural fill, provided they are free from pavement, debris and deleterious material and are dried to moisture content near optimum. Rocks or other soil fragments greater than four inches in size should not be used in the fills. Proposed import material should be evaluated by the project geotechnical engineer prior to being placed at the site. Import

materials should consist of non-corrosive, granular material with an expansion index less than 20.

6.2.5 Filling on Natural Slopes

Benches are required for fill placement on natural slopes of 5:1 (horizontal:vertical) or steeper. Each bench should be a minimum of one equipment width with a vertical height of approximately 4-feet. The bench should be excavated into competent natural materials. Fills should be compacted as recommended above (Sec. 6.2.4).

6.2.6 Fill Slopes

Fill slopes should be constructed at an inclination of no steeper than 2:1 (horizontal:vertical). A fill key should be excavated to a minimum depth of 2-feet into competent natural material and a minimum of 15-feet wide at the base of all fill slopes. Prior to placing fill material, the exposed base of the key should be scarified and compacted as described in Section 6.2.3. The key should be tipped approximately 2% front to back and this angle should be maintained throughout the fill slope construction. Fill should be compacted as recommended above (Sec. 6.2.4). Fill slopes should be overbuilt and then trimmed back to grade, exposing the compacted inner core.

6.2.7 Utility Trenches

Utility trenches should be excavated in accordance with the recommendations presented in Section 6.2.2. Backfill should be placed in loose lifts no greater than eight inches and

mechanically compacted to a relative compaction of at least 90 percent of the maximum dry density (per ASTM D 1557) at moisture content within +/- 2 percent of optimum.

6.3 Foundations and Slab Recommendations

6.3.1 General

Foundations and slabs for the proposed structures should be designed in accordance with structural considerations and the following minimum preliminary geotechnical recommendations. Foundations are expected to be supported in properly compacted fill. These recommendations assume that the foundation soils will have low potential for expansion, as anticipated.

6.3.2 Shallow Foundations

It is our opinion that the use of isolated and continuous footings will be geotechnically suitable for this project. We recommend that continuous footings be constructed a minimum of 15 inches wide and be founded at least 18 inches below the lowest adjacent rough grade elevation. Dimensions for isolated footings should be a minimum of 24 inches square and founded at least 18 inches below top of slab elevation.

Foundation dimensions should be based on an allowable bearing pressure of 1,500 pounds per square foot (psf) for minimum footing dimensions of one foot in width and one foot in depth. The values may be increased by 20 percent for each additional foot of width or depth to a maximum value of 3,000 psf. The allowable bearing value may be increased by one-third for short-duration loading which includes the effects of wind or seismic forces.

Footing reinforcement within continuous footings should consist of a minimum of four number 4 bars, two located at the top of the footing and two located at the bottom. This minimum reinforcement is due to geotechnical conditions and is not to be used in lieu of that needed for structural considerations. Reinforcement for isolated footings should be determined by the structural engineer.

Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure within the natural soils or compacted fill. An allowable coefficient of friction of 0.35 may be used with the dead load forces.

For spread footings in compacted or natural soils the allowable passive earth pressure may be computed as an equivalent fluid having a density of 150 pounds per cubic foot with a maximum earth pressure of 1,500 pounds per square foot. When combining the passive and friction values for calculating the lateral resistance, the passive component shall be reduced by one third.

6.3.3 Settlement of Foundations

We have analyzed settlement potential during construction and for long-term performance. Construction settlement is expected to occur as loads are applied and structures are brought to their operational weight. Long-term settlement is expected to occur over time as a result of compression of wetted or partially saturated soil.

It is anticipated that shallow foundations designed and constructed as recommended will experience total settlement of less than 1 inch and differential static settlement of less than 1/2 inch over a distance of 30 feet or more.

6.3.4 Concrete Slabs-On-Grade

Concrete slabs-on-grade should be designed for the anticipated loading. Lightly-loaded concrete slabs should measure a minimum of 5 inches thick and be reinforced with a minimum of number 3 reinforcing bars placed on 18-inch centers, each way at mid-slab height. Floor slabs should be underlain by 4 inches of coarse clean sand or crushed stone. An uncorrected modulus of subgrade reaction of 100 pci may be used for elastic design. Concrete slabs subjected to heavier loads may require thicker slab sections and/or increased reinforcement as per the project structural engineer. The correct placement of the reinforcement in the slab is vital for satisfactory performance under normal conditions.

In areas to receive moisture-sensitive floor coverings or used to store moisture-sensitive materials, a polyethylene or visqueen moisture vapor retarder (15-mil or thicker) should be placed beneath the slab. A two-inch layer of coarse clean sand or crushed stone should underlie the moisture vapor retarder.

It is recommended that a water-cement ratio of 0.5 or less be used for concrete, and that the slab be moist-cured for at least five days in accordance with methods recommended

by the American Concrete Institute. On-site quality control should be used to confirm the design conditions.

6.3.5 Pipe Bedding and Thrust Blocks

We recommend that pipes be supported on a minimum of 6 inches of sand, gravel, or crushed rock. The pipe bedding material should be placed around the pipe, without voids, and to an elevation of at least 12 inches above the top of the pipe. The pipe bedding material should be compacted in accordance with the recommendations in the earthwork section of this report.

Thrust forces may be resisted by thrust blocks and the adjacent soil. Thrust blocks may be designed using a passive resistance in engineered fill equal to the pressure developed by a fluid with a density of 250 pounds per cubic foot (pcf). A friction value of 0.25 may be used between the pipe and adjacent soil.

6.4 Seismic Design Criteria

The seismic ground motion values listed in Table 3 below were derived in accordance with the ASCE 7-10 Standard that is incorporated into the California Building Code, 2016 (effective January 1, 2017). This was accomplished by establishing the Site Class based on the soil properties at the site, and then calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application for the 2016 CBC values. These values are intended for the design of structures to resist the effects of earthquake ground motions. The site coordinates used in the application were 33.59478°N and 117.24824°W. Site Class C was used for the analysis.

TABLE 3
SEISMIC GROUND MOTION VALUES

PARAMETER	VALUE
Site Class	C
Mapped Spectral Response Acceleration Parameter, S_S	2.300g
Mapped Spectral Response Acceleration Parameter, S_1	0.933g
Seismic Coefficient, F_a	1.000
Seismic Coefficient, F_v	1.300
MCE Spectral Response Acceleration Parameter, S_{MS}	2.300g
MCE Spectral Response Acceleration Parameter, S_{M1}	1.213g
Design Spectral Response Acceleration Parameter, S_{DS}	1.533g
Design Spectral Response Acceleration Parameter, S_{D1}	0.809g
Mapped MCE Geometric Peak Ground Acceleration, PGA_m	0.920g
Seismic Design Category	E

6.5 Vehicular Pavements

Pavement sections were evaluated using a design 'R' value of 15, correlating to a modulus of subgrade reaction of approximately 100 pci for site subgrade soil. The laboratory determined 'R' values for site soil were 15 and 39. The pavement section recommendations are based on the assumption that the subgrade soil (the top 12-inches minimum) will be compacted to a minimum of 95 percent of the maximum dry density (per ASTM D 1557).

If concrete pavement is used, it should have a minimum modulus of rupture (flexural strength) of 600 psi. We estimate that a 4,500 psi 28-day compressive strength concrete would generally

provide the minimum required flexural strength; however, other mix designs could also meet the requirements. As such, we recommend that the contractor submit the proposed mix design with necessary documentation to offer a proper level of confidence in the proposed concrete materials. Recommended concrete pavement sections are presented below in Table 4.

TABLE 4

PORTLAND CEMENT CONCRETE (PCC) PAVEMENT SECTION

Traffic Area	Assumed Traffic Index	Design Modulus of Subgrade Reaction (pci)	PCC Thickness (inches)
Auto Parking Areas	5.0	100	6.0
Truck Drive Lanes	6.0	100	7.0

An unreinforced pavement with the minimum thickness indicated above should generally be constructed with maximum joint spacing of 24 times the pavement thickness, in both directions, and in nearly square patterns. As an alternative, the concrete pavement could be constructed with typical minimal reinforcement consisting of #4 bars at 18 inches, on-center, both ways, at or above mid-slab height and with proper concrete cover.

Recommended asphalt concrete pavement sections are presented below in Table 5.

TABLE 5

PRELIMINARY ASPHALT CONCRETE (AC) PAVEMENT SECTIONS

Traffic Area	Assumed Traffic Index	Design 'R' Value	AC Thickness (inches)	Aggregate Base Thickness* (inches)
Auto Parking Areas	5.0	15	3.0	9.0
Truck Drive Lanes	6.0	15	3.5	11.0

* Minimum R Value of 78.

In addition, it is recommended that pavement areas conform to the following criteria:

- Placement and construction of the recommended pavement section should be performed in accordance with the Standard Specifications for Public Works Construction (Greenbook, latest edition).

- Aggregate base should conform to the specification for Caltrans Class 2 Aggregate Base (Caltrans, 2015) or Greenbook Crushed Aggregate Base.

Pavement sections are prepared assuming that periodic maintenance will be done, including sealing of cracks and other measures.

6.6 Retaining Walls

For the design of walls where the surface of the backfill is level, it may be assumed that the on-site soils will exert an active lateral pressure equal to that developed by a fluid with a density of 40 pounds per cubic foot (pcf). The active pressure should be used for walls free to yield at the top at least 0.2 percent of the wall height. For walls restrained at the top so that such movement is not permitted, a pressure corresponding to an equivalent fluid density of 60 pcf should be used,

based on at-rest soil conditions. These pressures should be increased by 20 pcf for walls retaining soils inclined at 2:1 (horizontal:vertical).

Retaining walls over six feet high should be designed for earthquake forces. Lateral pressures on cantilever retaining walls (yielding walls) due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral thrust against a properly drained and backfilled cantilever retaining wall above the groundwater level can be expressed as:

$$P_{AE} = P_A + \Delta P_{AE}$$

For non-yielding (or "restrained') walls, the total lateral thrust may be similarly calculated based on work by Wood (1973):

$$P_{KE} = P_K + \Delta P_{KE}$$

Where:

P_A = Static Active Thrust

P_K = Static Restrained Wall Thrust

ΔP_{AE} = Dynamic Active Thrust Increment = $(3/8)\ k_h\ \gamma H^2$

ΔP_{KE} = Dynamic Restrained Thrust Increment = $k_h\ \gamma H^2$

k_h = 2/3 Peak Ground Acceleration =2/3 (PGA_M) = 0.61g

H = Total Height of the Wall

γ = Total Unit Weight of Soil ≈ 135 pounds per cubic foot

The increment of dynamic thrust in both cases should be distributed as an inverted triangle, with a resultant located at 0.6H above the bottom of the wall. Recommendations for waterproofing the

walls to reduce moisture infiltration should be provided by the project architect or structural engineer.

We recommend that walls be backfilled with soil having an expansion index of 20 or less with less than 30 percent passing the #200 sieve. The backfill area should include the zone defined by a 1:1 sloping plane, extended back from the base of the wall footing. Wall backfill should be compacted to at least 90 percent relative compaction, based on ASTM D 1557. Backfill should not be placed until walls have achieved adequate structural strength. Heavy compaction equipment, which could cause distress to walls, should not be used. The recommended lateral earth pressures presented herein assume that drainage will be provided behind the walls to prevent the accumulation of hydrostatic pressures. A backdrain system (similar to that shown on Figure 5) should be provided to reduce the potential for the accumulation of hydrostatic pressures.

6.7 Corrosive Soils

Sulfate-containing solutions or soil can have a deleterious effect on the in-service performance of concrete. In order to evaluate the foundation environment, a representative sample of site soil was laboratory tested for pH, resistivity, soluble sulfate and chloride. The results of the tests are summarized in Table 6.

TABLE 6
SUMMARY OF CHEMICAL ANALYSES

Sample Location	pH	Resistivity (ohm-cm)	Sulfate (mg/kg)	Chloride (mg/kg)
B-4 @ 0-5 ft.	6.5	5300	ND	ND
B-8 @ 5-10 ft.	7.1	4400	ND	ND

ND – Not Detected

Based on ACI 318-14 Building Code and Commentary, the onsite soil tested is a sulfate exposure class of S0, which is considered low and injurious sulfate attack is not a concern. We recommend concrete containing Type II cement be used. A three inch concrete cover over reinforcing steel is recommended for concrete in contact with the soil.

Based on the results of the resistivity tests, site soil appears to be *moderately corrosive* to ferrous metals. We recommend plastic pipes be used. CTE does not practice in the field of corrosion engineering. Therefore, a corrosion engineer could be consulted to determine the appropriate protection for metallic improvements in contact with site soils.

6.8 Exterior Flatwork

Exterior concrete flatwork should have a minimum thickness of four inches (unless otherwise specified by the project architect) and be underlain by four inches of compacted aggregate base. To reduce the potential for distress to exterior flatwork caused by minor settlement of foundation soils, we recommend that such flatwork be installed with crack-control joints at appropriate spacing as recommended by the structural engineer. Flatwork, such as sidewalks, and

architectural features, should be installed with crack control joints. The upper six inches of subgrade should be prepared in accordance with the earthwork recommendations provided herein. Positive drainage should be established and maintained adjacent to flatwork as per the recommendations of the project civil engineer of record.

6.9 Drainage

Positive drainage at a slope of 2 percent or more should be established for a minimum distance of five feet away from structures and improvements, and as recommended by the project civil engineer of record. To facilitate this, the proper use of construction elements such as roof drains, downspouts, earthen and/or concrete swales, sloped external slabs-on-grade, and subdrains may be employed. The project civil engineer should thoroughly evaluate the on-site drainage and make provisions as necessary to keep surface water from entering structural areas.

Slabs and planted areas immediately adjacent to the appurtenant structures should slope away from the structures to mitigate pooling of water and should drain to a safe point of collection. Planter boxes adjacent to buildings should have concrete bottoms and drainage away from the buildings. Joints in slabs and swales should be maintained sealed with an appropriate joint compound. Drainage devices shall be provided as specified by the Building Code and grading ordinances.

6.10 Plan Review

CTE should be authorized to review project grading and foundation plans and the project specifications before the start of earthwork to identify potential conflicts with the recommendations contained in this report.

6.11 On-Site Construction Reviews

On-site construction reviews of grading, drainage and foundation work should be performed by a field representative of this office to ascertain compliance with the recommendations of this report. Final grading and/or construction should be observed and a written observation form or report issued by this office stating that the work meets the recommendations of this report. As a minimum, on-site construction reviews are to be performed at the following stages of work:

1. Observation of exposed temporary cut slope surface before excavation is more than five feet deep, and again after final excavation before workman enter or placement of any steel.

2. Observation of footing excavations prior to placement of form boards or reinforcing steel.

3. As called for in the Grading Section/Appendix C herein, for on-site construction reviews and testing of grading work and of compacted earth backfilling behind retaining walls.

4. During proof rolling of subgrade before placement of base material or reinforcing steel, and again following the placement of base material prior to placing reinforcing steel.

5. Observation following installation of sub-drain perforated pipes before covering with gravel or filter material, and again after placing the filter material over perforated pipes before covering with backfill.

6. Following installation of drainage structures and completion of all work.

This office should be given a minimum 48 hours prior notice for any required on-site observations.

6.12 Permits

Design and construction should be carried out under applicable conditions and permits of the City of Wildomar/Riverside County, California Building Code, and other concerned statutory authorities.

7.0 LIMITATIONS

The recommendations provided in this report are based on the anticipated construction and the subsurface conditions found in our explorations. The interpolated subsurface conditions should be checked in the field during construction to document that conditions are as anticipated.

Recommendations provided in this report are based on the understanding and assumption that CTE will provide the observation and testing services for the project. Earthwork should be observed and tested to document that grading activity has been performed according to the recommendations contained within this report. The project geotechnical engineer should evaluate footing excavations prior to placement of reinforcing steel.

The field evaluation, laboratory testing and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction.

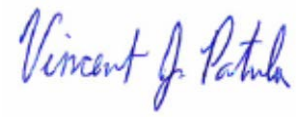
This report is applicable to the site for a period of three years after the issue date provided the project remains as described herein. Modifications to the standard of practice and regulatory requirements may necessitate an update to this report prior to the three years from issue.

Our conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if required, will be provided upon request. CTE should review project specifications for earthwork, foundation, and shoring-related activities prior to the solicitation of construction bids.

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

Respectfully submitted,
CONSTRUCTION TESTING & ENGINEERING, SOUTH, INC.

Dharmesh Amin, MS, PE, GE
Principal Engineer



Vincent J. Patula, CEG
Senior Engineering Geologist

Robert L. Ellerbusch
Project Geologist

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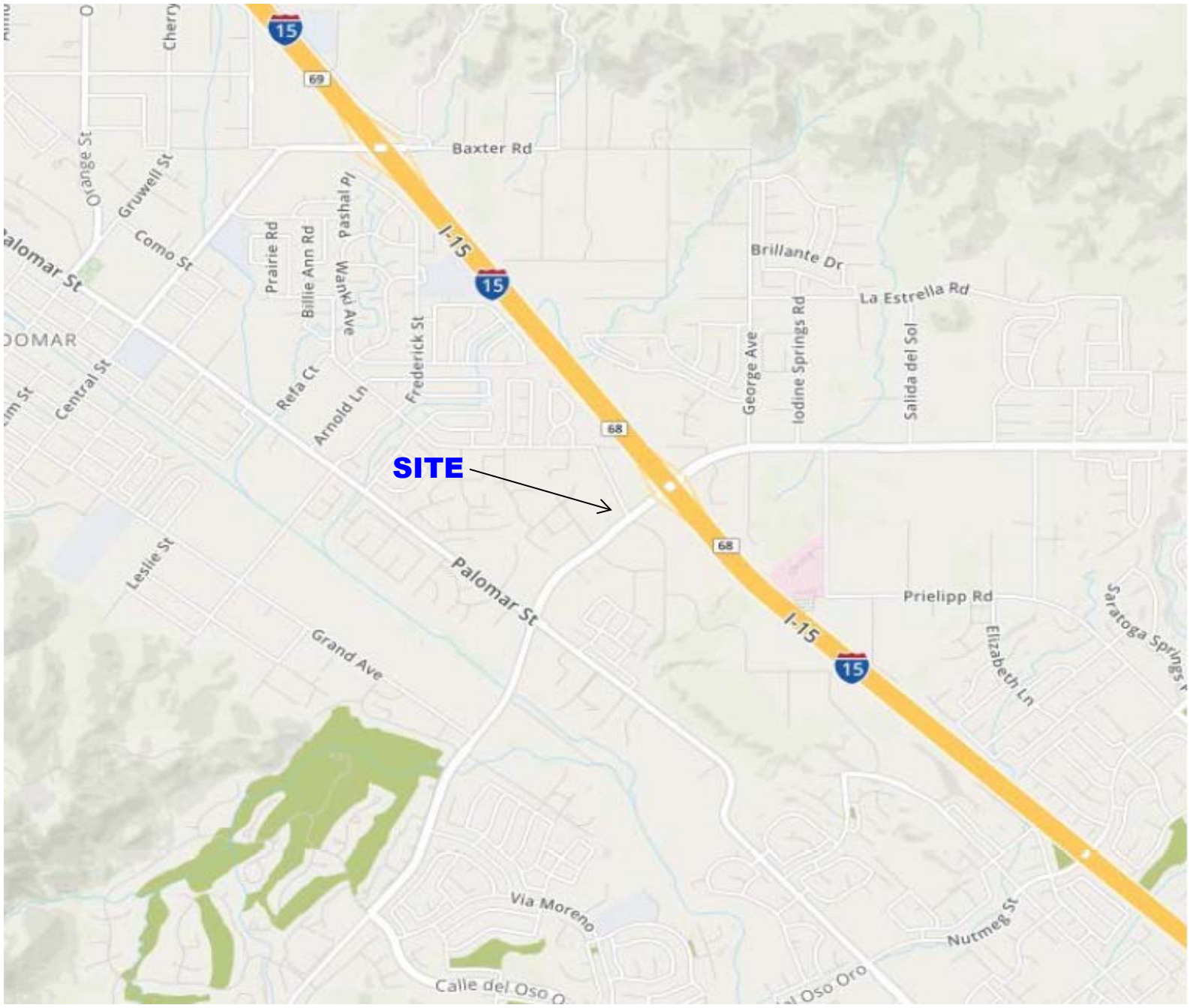

NORTH

NO SCALE

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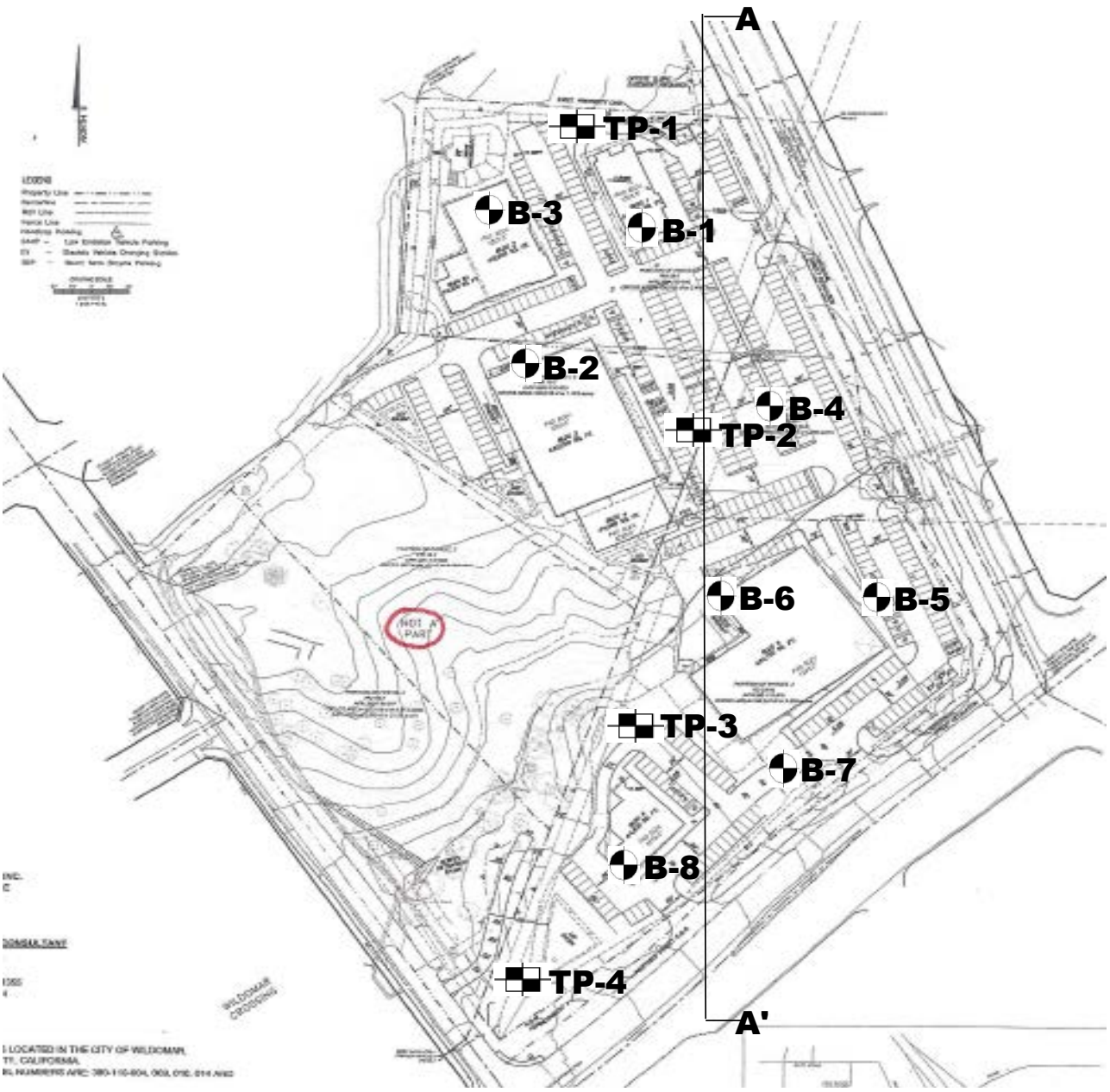
SITE LOCATION MAP

THE COMMONS AT HIDDEN SPRINGS

CLINTON KEITH ROAD & HIDDEN SPRINGS ROAD

WILDOMAR, CALIFORNIA

Job No.	Date	Figure
40-3779G	OCT 2019	1



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LEGEND

B-1 Approximate Boring Location

TP-1 Approximate Test Pit Location

A___A' Geologic Cross Section

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EXPLORATION LOCATION MAP

THE COMMONS AT HIDDEN SPRINGS

CLINTON KEITH ROAD & HIDDEN SPRINGS ROAD

WILDOMAR, CALIFORNIA

Job No.	Date	Figure
40-3779G	OCT 2019	2

EXPLANATION

B-1 APPROXIMATE BORING LOCATION

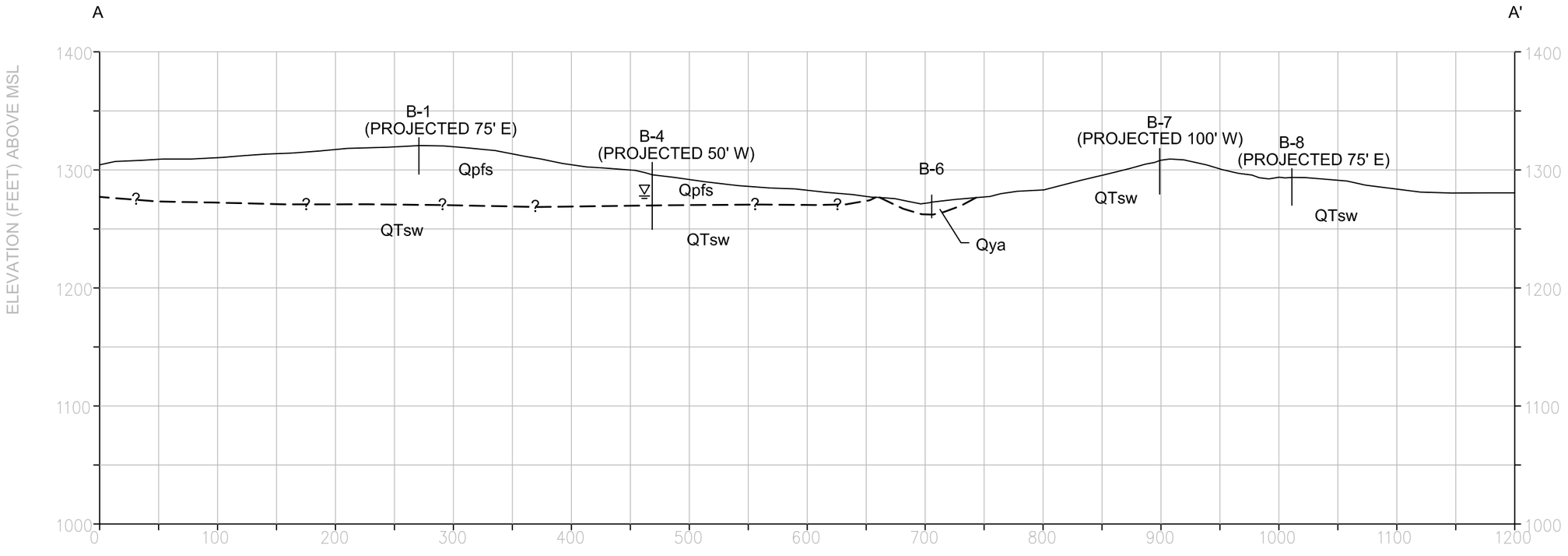
▽ ENCOUNTERED GROUNDWATER ELEVATION

APPROXIMATE GEOLOGIC CONTACT QUERIED WHERE UNCERTAIN

Qya QUATERNARY YOUNGER ALLUVIUM

Qpfs PAUBA FORMATION- SANDSTONE MEMBER

QTsw SANDSTONE OF THE WILDOMAR AREA



100' 0 50' 100'

1 inch = 100ft.

\\ESC_SERVER\Projects\(40-0000) Riverside Office Projects\40-3779G\Fig 3.dwg

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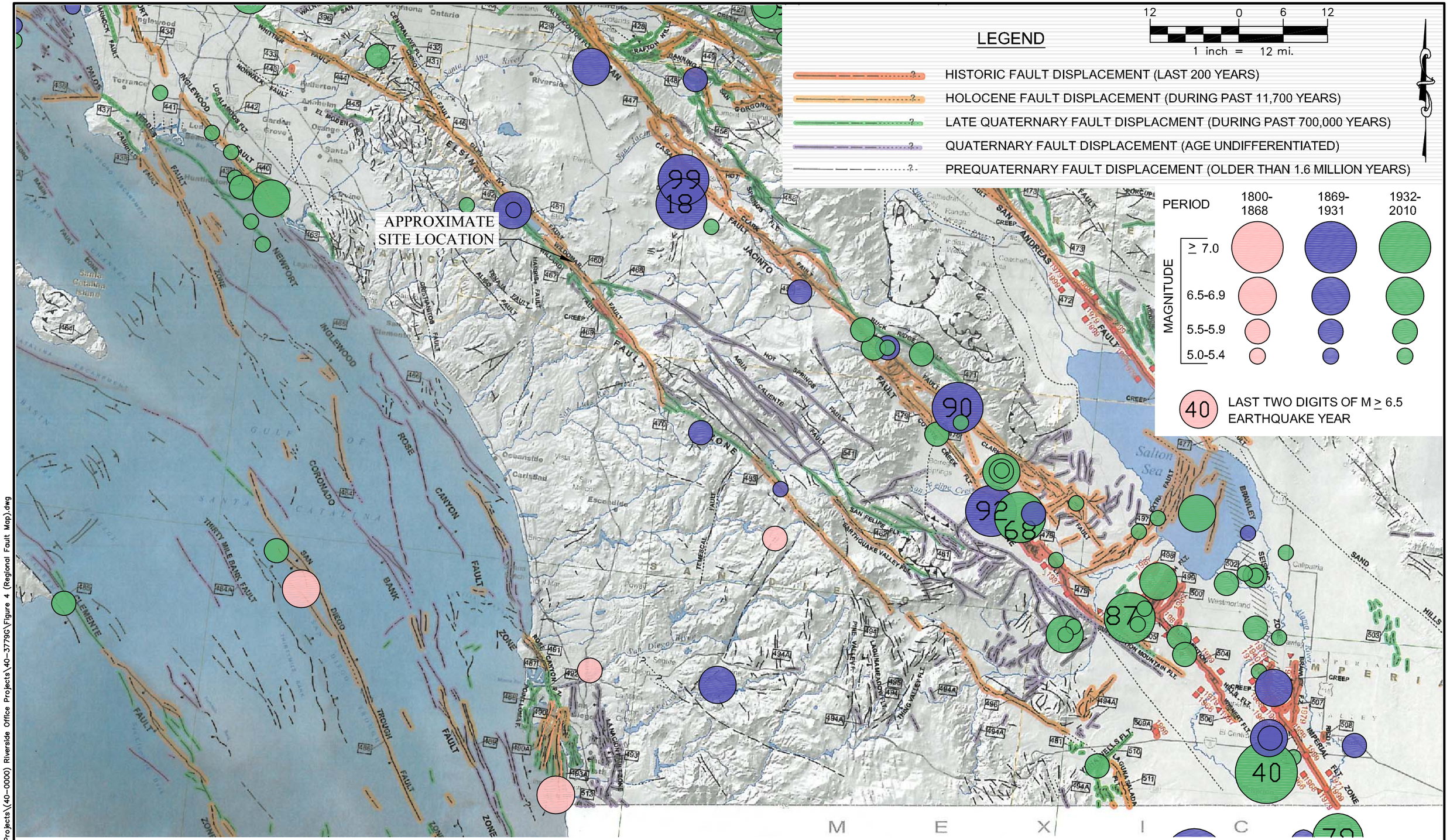
GEOLOGIC CROSS SECTION A–A'

THE COMMONS AT HIDDEN SPRINGS
CLINTON KEITH ROAD & HIDDEN SPRINGS ROAD
WILDOMAR, CALIFORNIA

CTE JOB NO:	40-3779G
SCALE:	1" = 100'
DATE:	10/19
FIGURE:	3



NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800–1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

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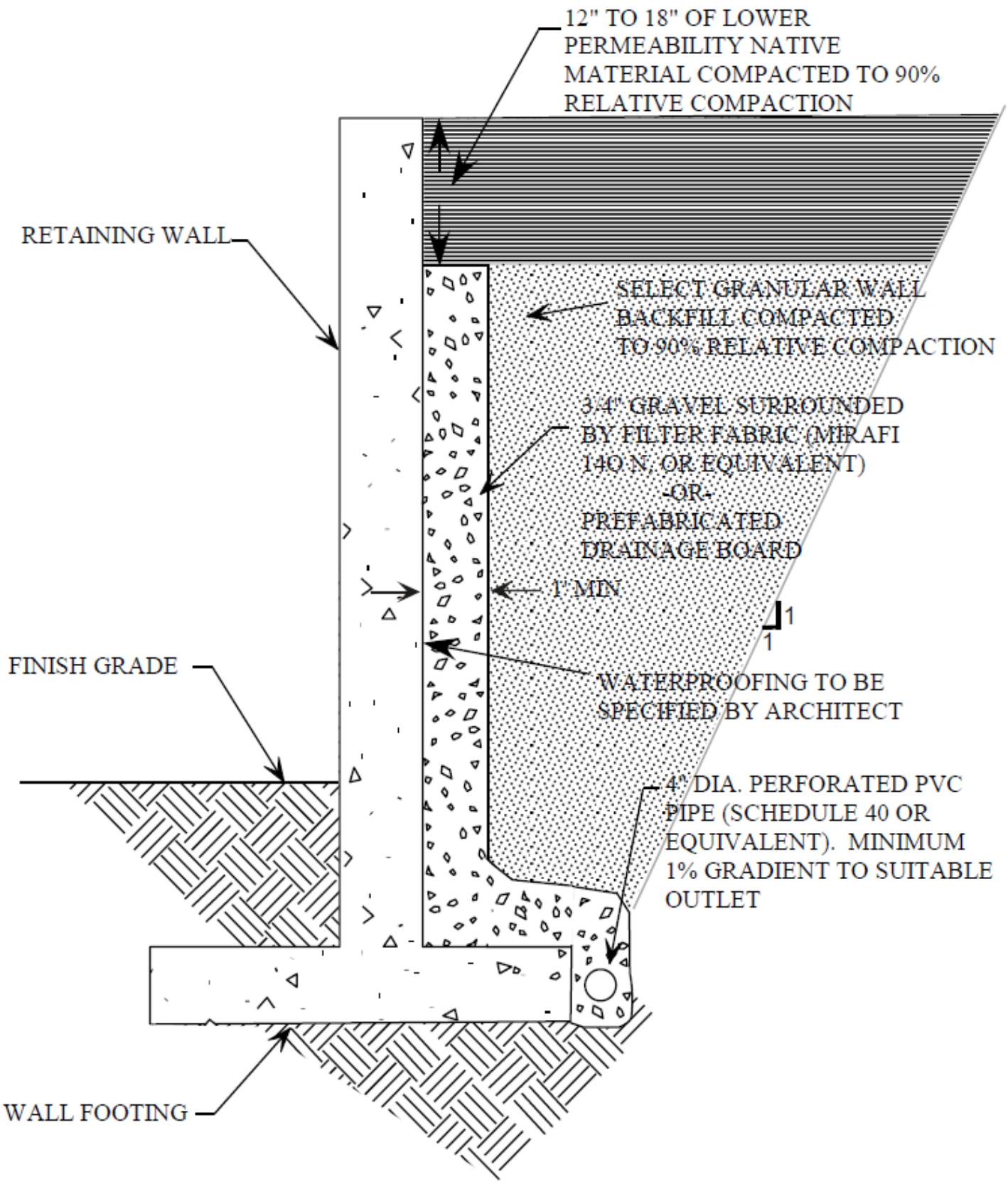
REGIONAL FAULT AND SEISMICITY MAP

THE COMMONS AT HIDDEN SPRINGS
CLINTON KEITH ROAD & HIDDEN SPRINGS ROAD
WILDOMAR, CALIFORNIA

CTE JOB NO: 40-3779G
SCALE: 1 inch = 12 miles
DATE: 10/19
FIGURE: 4

\\ESC_SERVER\Projects\(40-0000) Riverside Office Projects\40-3779G\Figure 4 (Regional Fault Map).dwg



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RETAINING WALL DRAIN DETAIL

THE COMMONS AT HIDDEN SPRINGS
WILDOMAR, CALIFORNIA

Job No.	Date	Figure
40-3779G	OCT 2019	5

APPENDIX A

FIELD EXPLORATION METHODS AND EXPLORATION LOGS

APPENDIX A

FIELD EXPLORATION METHODS AND EXPLORATION LOGS

Soil Boring Methods

Relatively "Undisturbed" Soil Samples

Relatively "undisturbed" soil samples were collected using a modified California-drive sampler (2.4-inch inside diameter, 3-inch outside diameter) lined with sample rings. Drive sampling was conducted in general accordance with ASTM D-3550. The steel sampler was driven into the bottom of the borehole with successive drops of a 140-pound weight falling 30-inches. Blow counts (N) required for sampler penetration are shown on the boring logs in the column "Blows/Foot." The soil was retained in brass rings (2.4 inches in diameter, 1.0 inch in height) and sealed in waterproof plastic containers for shipment to the CTE, South, Inc. geotechnical laboratory.

Disturbed Soil Sampling

Bulk soil samples were collected for laboratory analysis using two methods. Standard Penetration Tests (SPT) were performed according to ASTM D-1586 at selected depths in the borings using a standard (1.4-inches inside diameter, 2-inches outside diameter) split-barrel sampler. The steel sampler was driven into the bottom of the borehole with successive drops of a 140-pound weight falling 30-inches. Blow counts (N) required for sampler penetration are shown on the boring logs in the column "Blows/Foot." Samples collected in this manner were placed in sealed plastic bags. Bulk soil samples of the drill cuttings were also collected in large plastic bags. The disturbed soil samples were returned to the CTE, South, Inc. geotechnical laboratory for analysis.

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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 < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS 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 < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, 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, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, 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 SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed
PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded
PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

FIGURE: BL1

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PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log

BORING LEGEND

DESCRIPTION

Laboratory Tests

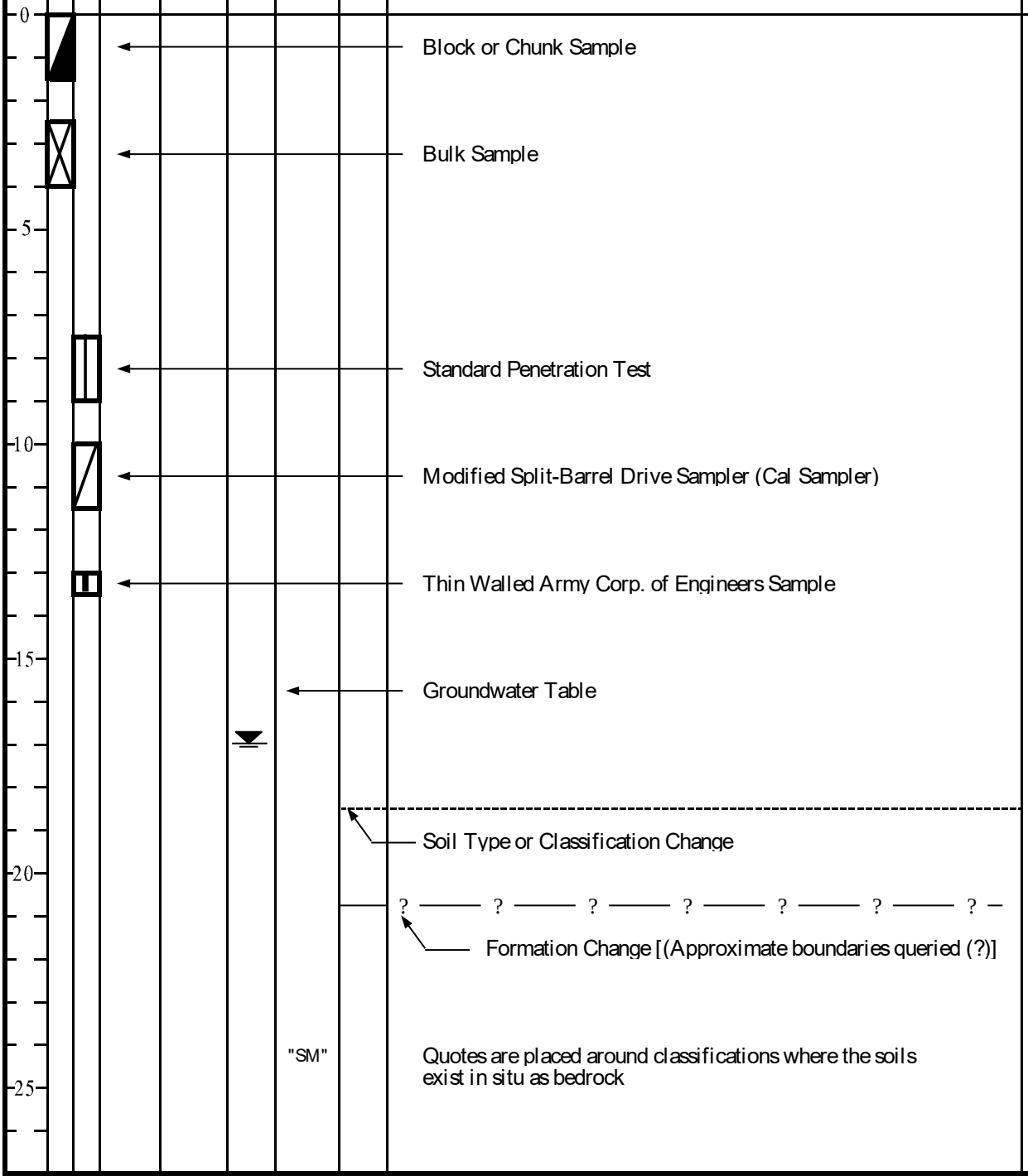

FIGURE: BL2

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1314' msl

BORING: B-1

Depth (Feet)	Sample: Bulk	Sample: Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								**Pauba Formation - Sandstone Member (Qpfs)** scattered cobbles on surface SANDSTONE, moist, light brown. (excavates as silty clayey sand)	
10			29 43 50/3"	118.0	8.2			SANDSTONE, moderately hard, moderately weathered, moist, light yellowish brown. (excavates as poorly graded sand with clay)	WA (7% fines) MD
15			20 29 36		7.3			SANDSTONE, moderately hard, moderately weathered, moist, light yellowish brown. (excavates as poorly graded sand with clay)	M
20			31 50/4"	122.3	9.0			SANDSTONE, hard, moderately weathered, moist, light brown, iron-oxide staining. (excavates as silty clayey sand)	MD
25									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	2 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1314' msl

BORING: B-1 Cont'd.

Depth (Feet)	Sample Bulk	Sample Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25			17 22 28		9.4			SANDSTONE, hard, moderately weathered, moist, light brown, iron-oxide staining. (excavates as silty clayey sand)	M
								Total Depth 26.5 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	
30									
35									
40									
45									
50									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1310' msl

BORING: B-2

Depth (Feet)	Sample: Bulk	Sample: Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								**Pauba Formation - Sandstone Member (Qpfs)**	
								scattered cobbles on surface	
								SANDSTONE, moist, olive brown. (excavates as clayey sand)	
5									
10			40 50/3"	106.7	7.9			SANDSTONE, moderately hard, moderately weathered, moist, light yellowish brown, medium to coarse grain. (excavates as clayey sand)	MD GS (30% fines) AL (LL=29, PI=9)
15			12 18 30		7.4			SANDSTONE, moderately hard, moderately weathered, moist, light yellowish brown, fine to medium grain. (excavates as clayey sand)	M
								difficult to drill from 15 to 20 ft.	
20			22 50/5"	119.8	13.2			SANDSTONE, hard, moderately weathered, moist, olive brown, fine grain. (excavates as poorly-graded sand with clay)	MD
								very difficult to drill from 20 to 25 ft.	
25									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	2 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1310' msl

BORING: B-2 Cont'd.

Depth (Feet)	Sample Bulk	Sample Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25			11 19 22		12.9			SANDSTONE, hard, moderately weathered, moist, olive brown, fine grain, mica-rich. (excavates as poorly-graded sand with clay)	M
								Total Depth 26.5 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	
30									
35									
40									
45									
50									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1308' msl

BORING: B-3

Depth (Feet)	Sample: Bulk	Sample: Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								**Pauba Formation - Sandstone Member (Qpfs)** scattered cobbles on surface SANDSTONE, moist, light brown. (excavates as clayey sand)	
10			10 14 16		8.0			SANDSTONE, moderately hard, weathered, moist, light brown, fine to coarse. (excavates as clayey sand)	M
15			50	109.5	5.7			SANDSTONE, moderately hard, moderately weathered, moist, light brown, fine to coarse. (excavates as poorly-graded sand with clay)	MD
20			14 22 26		6.6			SANDSTONE, moderately hard, moderately weathered, moist, light gray. (excavates as poorly-graded sand with clay)	M
25									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	2 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1308' msl

BORING: B-3 Cont'd.

Depth (Feet)	Sample Bulk	Sample Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25		☒	50	111.6	7.9			SANDSTONE, hard, moderately weathered, light gray.	MD
								Total Depth 25.5 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	
30									
35									
40									
45									
50									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 3
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1292' msl

BORING: B-4

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Pauba Formation - Sandstone Member (Qpfs)**	
									SANDSTONE, damp, light brown, scattered angular gravel. (excavates as silty clayey sand)	RV GS (18% fines) CHM
5				50	113.0	4.9			SANDSTONE, hard, moderately weathered, damp, light brown, fine to coarse, faint iron-oxide staining. (excavates as poorly-graded sand with silty clay)	DS, MD
10				16 32 50/5"		5.2			SANDSTONE, hard, moderately weathered, damp, light gray, fine to coarse. (excavates as poorly-graded sand with silty clay)	M
15				50/5"	108.0	6.9			SANDSTONE, hard, moderately weathered, moist, light brown, fine to coarse. (excavates as poorly-graded sand with silty clay)	MD
20				23 33 41		14.4			Groundwater encountered at 19.5 feet bgs. SANDSTONE, hard, moderately weathered, wet, (excavates as poorly-graded sand with silty clay)	M
25										

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	2 of 3
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1292' msl

BORING: B-4 Cont'd.

Depth (Feet)	Sample Bulk	Sample Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25		☒		50/4"	112.0	12.8			SANDSTONE, hard, wet, light gray, medium to coarse, faint iron-oxide staining.	MD
30		☐		13 27 38		16.8			**Sandstone of the Wildomar Area (QTsw)** SILTSTONE, moderately hard, very moist, brown. (excavates as sandy silt)	M WA (67% fines)
35		☒		42 50/3"	127.9	13.6			SILTSTONE, hard, moist, brown. (excavates as sandy silt)	MD
40		☐		14 33 50/4"		14.9			SILTSTONE, hard, moist, brown, laminated. (excavates as sandy silt)	M
45									very hard to drill from 45 to 50 ft.	
50										

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	3 of 3
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1292' msl

BORING: B-4 Cont'd.

Depth (Feet)	Sample Bulk	Sample Driven Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
50			15 31 50/5"		14.2			SILTSTONE, hard, moist, dark gray. (excavates as sandy silt)	M
								Total Depth 51.5 feet bgs. Groundwater encountered at 19.5 feet bgs. Bore hole backfilled with soil cuttings and bentonite plug.	
55									
60									
65									
70									
75									

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 1
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1293' msl

BORING: B-5

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Sandstone of the Wildomar Area (QTsw)**	GS (24% fines)
5				50	122.9	5.0			SANDSTONE, moderately hard, moderately weathered, damp, light brown, fine to medium, with carbonates. (excavates as silty sand)	MD
10				21 32 36		4.8			SANDSTONE, moderately hard, moderately weathered, damp, light brown, fine to coarse, with carbonates. (excavates as silty sand)	M
15				32 50/4"	109.7	9.1			SANDSTONE, moderately hard, moderately weathered, moist, light brown, fine to medium, with carbonates. (excavates as silty sand)	MD
20				25 50		9.3			SANDSTONE, moderately hard, moderately weathered, moist, light brown, fine to medium.	M
25									Total Depth 21 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 1
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1265' msl

BORING: B-6

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0							SM		**Quaternary Younger Alluvium (Qya)** Silty SAND, moist, brown, fine.	
5				6 4 5		11.5	SC-SM		Silty Clayey SAND, loose, moist, dark brown.	M
10				10 21 30		11.7			**Sandstone of the Wildomar Area (QTsw)** SANDSTONE, moderately hard, very moist, light brown.	M
									Total Depth 11.5 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	
15										
20										
25										

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1300' msl

BORING: B-7

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Sandstone of the Wildomar Area (QTsw)**	
									SANDSTONE, damp, light brown, fine. (excavates as silty sand)	
5										
									SANDSTONE, damp, light brown, fine. (excavates as silty sand)	
10										
15				30 50		4.0			SANDSTONE, moderately hard, moderately weathered, damp, light brown, fine to medium, trace sub-angular gravel, with carbonates. (excavates as silty sand)	M WA (14% fines)
20				50/5"	110.5	4.4			SANDSTONE, hard, moderately weathered, damp, light brown, fine to medium, faint iron-oxide staining. (excavates as silty sand)	MD
									hard to drill from 20 to 25 feet	
25										

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	2 of 2
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1300' msl

BORING: B-7 Cont'd.

Depth (Feet)	Sample Bulk	Sample Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
25				17 35 50/4"		8.5			SANDSTONE, hard, moderately weathered, moist, light brown, fine. (excavates as silty sand)	M
									Total Depth 26.5 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	
30										
35										
40										
45										
50										

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PROJECT:	The Commons at Hidden Springs	DRILLER:	2R Drilling CME 75	SHEET:	1 of 1
CTE JOB NO:	40-3779G	DRILL METHOD:	8" Hollow Stem Auger	DRILLING DATE:	9/9/2019
LOGGED BY:	R.E.	SAMPLE METHOD:	140 lb/30" Autohammer	ELEVATION:	~1268' msl

BORING: B-8

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Sandstone of the Wildomar Area (QTsw)**	
									SANDSTONE, damp, light brown, fine to medium.	
5				50/5"	120.2	9.0			SANDSTONE, moderately hard, highly weathered, moist, dark brown, very silty. (excavates as silty clayey sand)	DS, MD RV GS (37% fines) CHM
10				7 13 21		10.1			SILTSTONE, moderately weathered, moist, brown. (excavates as sandy silt)	M
									hard to drill from 10 to 15 feet	
15				13 24 50	120.2	11.6			SILTSTONE, hard, moderately weathered, moist, brown. (excavates as sandy silt)	MD
									very hard to drill from 15 to 20 feet	
20				14 17 25		15.7			SILTSTONE, hard, moderately weathered, moist, brown. (excavates as sandy silt)	M
25									Total Depth 21.5 feet bgs. No Groundwater encountered. Bore hole backfilled with soil cuttings.	

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PROJECT:	The Commons at Hidden Springs	EXCAVATOR:	Chamberlain	SHEET:	1 of 1
CTE JOB NO:	40-3779G	EXCAV. METHOD:	Backhoe	EXCAV. DATE:	9/10/2019
LOGGED BY:	VP/WL	SAMPLE METHOD:	Bulk/grab	ELEVATION:	

TEST PIT: TP-1

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Pauba Formation - Sandstone Member (Qpfs)**	
	☒					3.2			SANDSTONE, highly weathered, damp, grayish brown, slighty porous. (excavates as poorly-graded sand with clay)	M
	☒					4.7			reddish brown	M
5	☒					5.1				M
	☒					6.7			(excavates as silty clayey sand)	M
10	☒					8.1				M
									Total Depth = 11.5 feet bgs. Test pit backfilled with excavated soil. No Groundwater encountered.	
15										
20										
25										

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PROJECT:	The Commons at Hidden Springs	EXCAVATOR:	Chamberlain	SHEET:	1 of 1
CTE JOB NO:	40-3779G	EXCAV. METHOD:	Backhoe	EXCAV. DATE:	9/10/2019
LOGGED BY:	VP/WL	SAMPLE METHOD:	Bulk/grab	ELEVATION:	

TEST PIT: TP-2

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Pauba Formation - Sandstone Member (Qpfs)**	
									SANDSTONE, weathered, damp, light yellowish brown, slightly porous, weathered granitic cobble with iron-oxide staining.	
									(excavates as silty clayey sand)	
	☒					4.7				M
5									Total Depth = 5 feet bgs. Test pit backfilled with excavated soil. No Groundwater encountered.	
10										
15										
20										
25										

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PROJECT:	The Commons at Hidden Springs	EXCAVATOR:	Chamberlain	SHEET:	1 of 1
CTE JOB NO:	40-3779G	EXCAV. METHOD:	Backhoe	EXCAV. DATE:	9/10/2019
LOGGED BY:	VP/WL	SAMPLE METHOD:	Bulk/grab	ELEVATION:	

TEST PIT: TP-3

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0									**Quaternary Younger Alluvium (Qya)** slopewash	
									Pauba Formation - Sandstone Member (Qpfs) SANDSTONE, weathered, moist, reddish brown, iron-oxide staining, blocky. (excavates as clayey sand)	
5	☒					6.6				M
									Total Depth = 6.5 feet bgs. Test pit backfilled with excavated soil. No Groundwater encountered.	
10										
15										
20										
25										

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PROJECT:	The Commons at Hidden Springs	EXCAVATOR:	Chamberlain	SHEET:	1 of 1
CTE JOB NO:	40-3779G	EXCAV. METHOD:	Backhoe	EXCAV. DATE:	9/10/2019
LOGGED BY:	VP/WL	SAMPLE METHOD:	Bulk/grab	ELEVATION:	

TEST PIT: TP-4

Depth (Feet)	Sample: Bulk	Sample: Driven	Type	Blows/6-inches	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0							SC		Clayey SAND, moist, reddish brown, weakly cemented.	
	☒					7.0				AL (LL=31, PI=11)
5									Total Depth = 4.5 feet bgs. Test pit backfilled with excavated soil. No Groundwater encountered.	
10										
15										
20										
25										

APPENDIX B

LABORATORY METHODS AND RESULTS

APPENDIX B
LABORATORY METHODS AND RESULTS

Laboratory tests were performed on selected soil samples to evaluate their engineering properties. Tests were performed following test methods of the American Society for Testing and Materials (ASTM), or other accepted standards. The following presents a brief description of the various test methods used. Laboratory results are presented in the following section of this Appendix.

Atterberg Limits
The liquid limit and plasticity index were determined on a selected soil sample in accordance with ASTM D4318.

Chemical Analysis
Soil materials were collected and tested for Sulfate and Chloride content, pH, and Resistivity in accordance with Caltrans test methods.

Classification
Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D 2487.

Direct Shear
Direct shear tests were performed on relatively undisturbed samples. Direct shear testing was performed in accordance with ASTM D 3080. The samples were inundated during shearing to represent adverse field conditions.

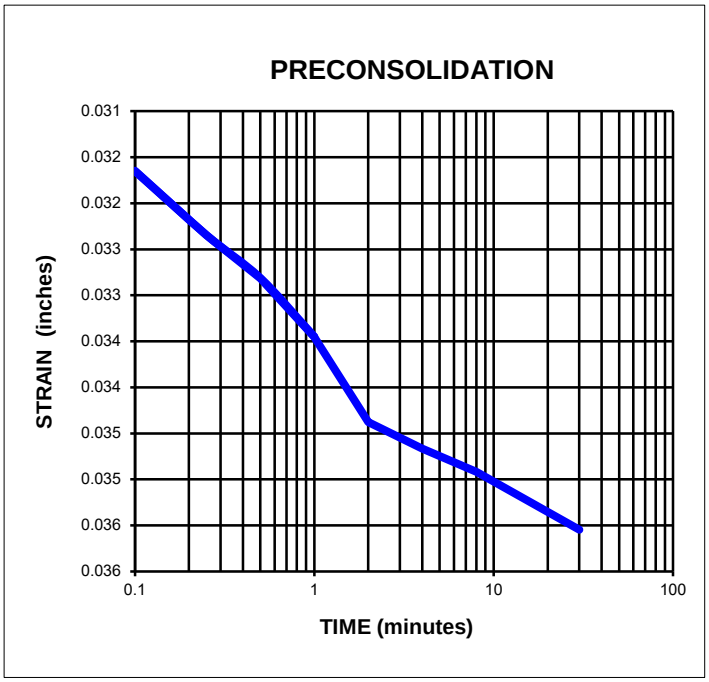
Expansion Index
Expansion Index testing was performed on a selected sample of the on-site soil according to ASTM D 4829.

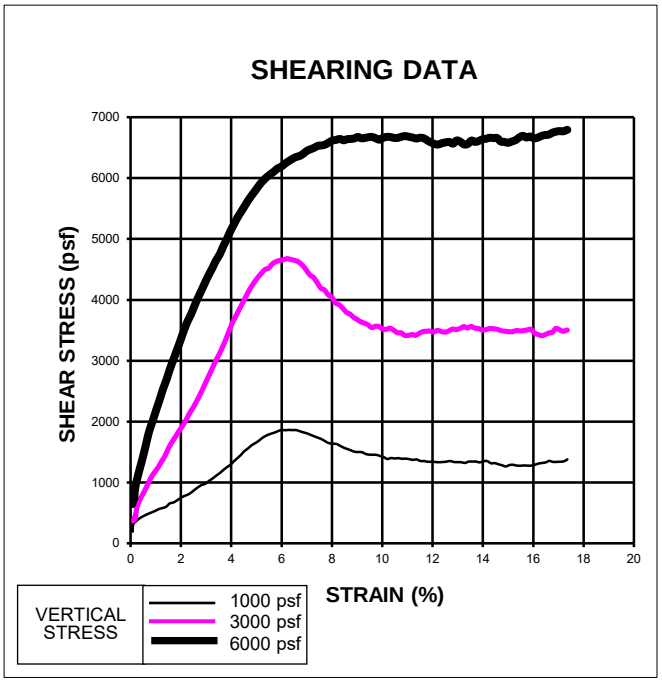
In-Place Moisture/Density
The in-place moisture content and dry unit weight of selected relatively undisturbed samples in accordance with ASTM D 2216 and D 2937, respectively.

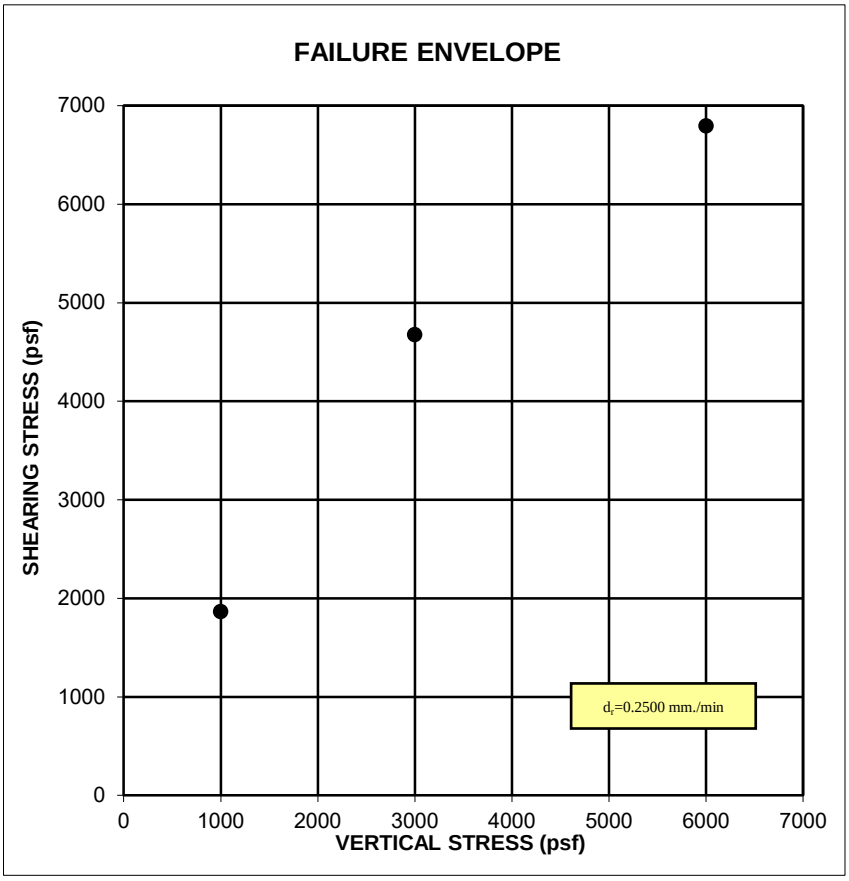
Moisture-Density Relations
Laboratory maximum dry density and optimum moisture content were evaluated according to ASTM D 1557.

Resistance “R” Value
The resistance “R”-value was measured by the CTM 301. The graphically determined “R” value at an exudation pressure of 300 pounds per square inch is the value used for pavement section calculation.

Sieve Analysis (Gradation)
Sieve analyses and 200 washes were performed on selected representative samples according to ASTM C 136 and D 1140 to determine grain-size distribution.

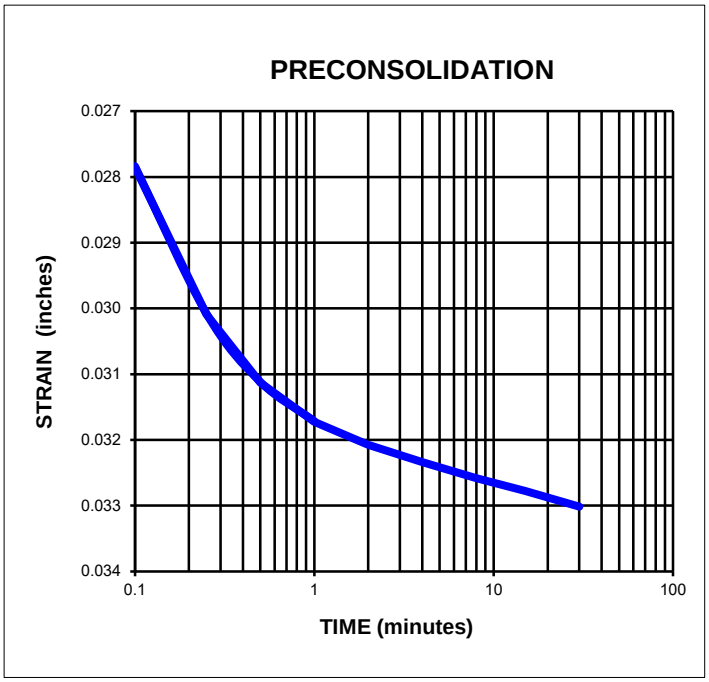


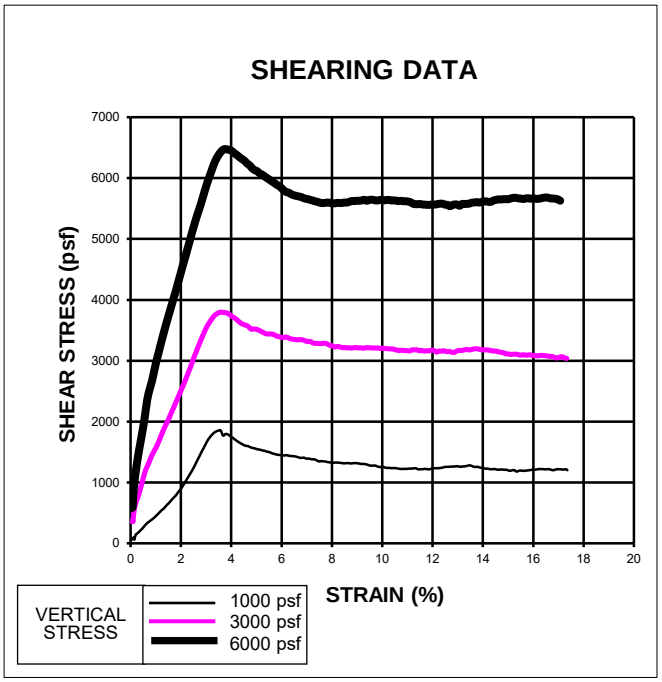


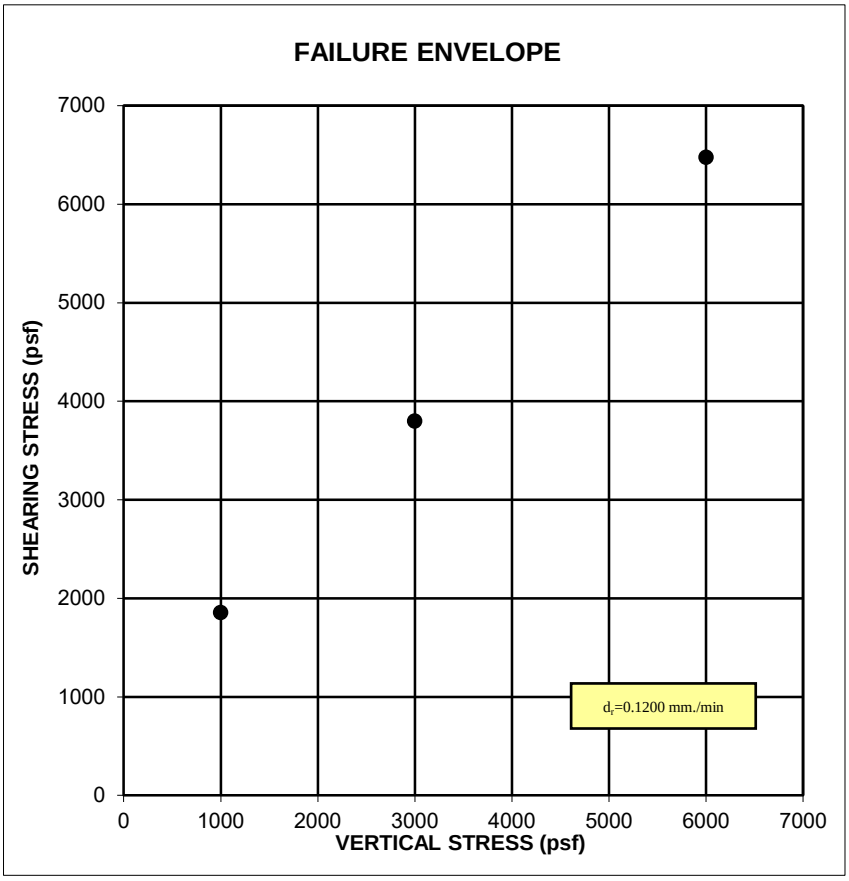


SHEAR STRENGTH TEST - ASTM D3080

Job Name:	The Commons at Hidden Spring			Initial Dry Density (pcf):	113.0
Project Number:	40-3779G	Sample Date:	9/9/2019	Initial Moisture (%):	4.9
Lab Number:	29938	Test Date:	9/13/2019	Final Moisture (%):	16.3
Sample Location:	B-4 @ 5-5.5'	Tested by:	KF	Cohesion:	1230 psf
Sample Description:	Sandstone			Angle Of Friction:	43.9







SHEAR STRENGTH TEST - ASTM D3080

Job Name:	The Commons at Hidden Spring			Initial Dry Density (pcf):	120.2
Project Number:	40-3779G	Sample Date:	9/9/2019	Initial Moisture (%):	9.0
Lab Number:	29938	Test Date:	9/16/2019	Final Moisture (%):	14.9
Sample Location:	B-8 @ 5-5.5'	Tested by:	KF	Cohesion:	960 psf
Sample Description:	Fine-grained Sandstone			Angle Of Friction:	42.7

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REPORT OF RESISTANCE 'R' VALUE-EXPANSION PRESSURE

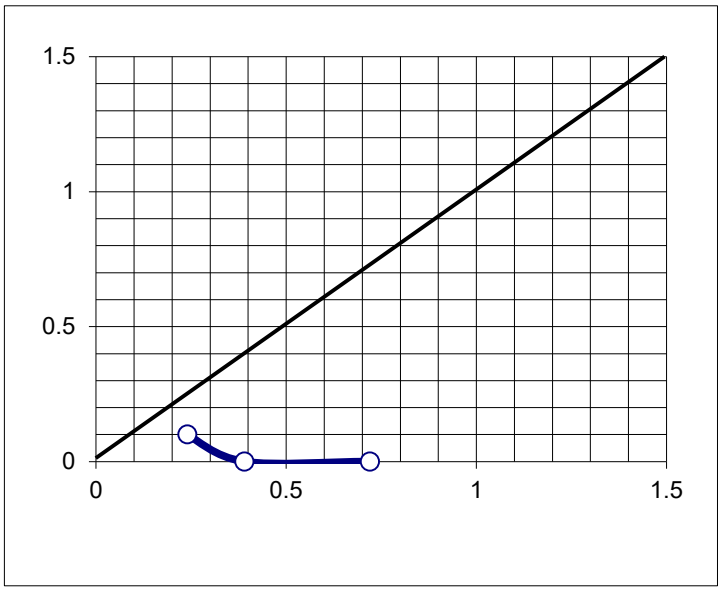
Project Name: The Commons at Hidden Springs
Project No.: 40-3379G
Sample Location: B-4 @ 0-5'
Soil Description: Light Brown SC-SM
Test Procedure: Cal 301

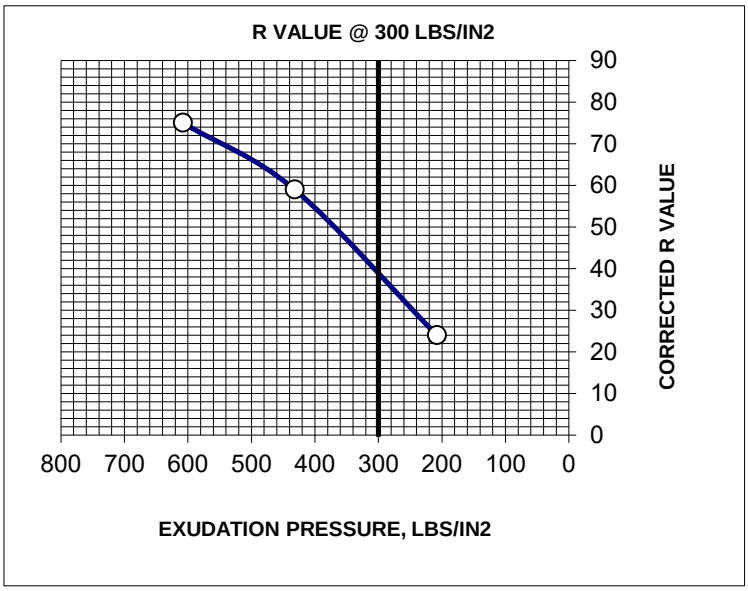
Lab No.: 29938
Sampled By: R.E./W.L. **Date:** 9/9/2019
Submitted By: R.E./W.L. **Date:** 9/9/2019
Tested By: Larry Sachs **Date:** 9/16/2019
Reviewed By: Erik Campbell **Date:** 9/17/2019

Specimen/ Mold No.	3	2	1	
Compactor Air Pressure, ft.lbs.	350	350	350	
Initial Moisture, %	3.0	3.0	3.0	
Wet Weight / Tare (g)	1955.8	1955.8	1955.8	
Dry Weight / Tare (g)	1920.9	1920.9	1920.9	
Tare (g)	755.5	755.5	755.5	
Water Added, ml	75	80	100	
Moisture at Compaction, %	9.4	9.9	11.6	
Wt. Of Briquette and Mold, g	3208	3231	3234	
Wt. Of Mold, g	2095	2096	2110	
Wt. Of Briquitte,g	1113	1135	1124	
Height of Briquette, in	2.44	2.48	2.45	
Dry Density, pcf	126.4	126.3	124.7	
Stabilometer PH @ 1000 lbs	16	26	46	
Stabilometer PH @ 2000 lbs	26	44	98	
Displacement	4.10	4.55	5.00	
R' Value	75	59	24	
Corrected 'R' Value	75	59	24	
Exudation Pressure, lbs	7600	5400	2600	
Exudation Pressure, psi	608	432	208	
Stabilometer Thickness - ft	0.24	0.39	0.72	
Expansion Pressure	0.0003	0.0000	0.0000	
Expansion Press, Thick-ft	0.10	0.00	0.00	

Exudation	39
Expansion	82
R-value	**39**

TI	4.5
Expansion	82





Cover Thickness by Expansion Pressure-Feet

Expansion From Graph:	0.17

Erik Campbell
Laboratory Manager

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REPORT OF RESISTANCE 'R' VALUE-EXPANSION PRESSURE

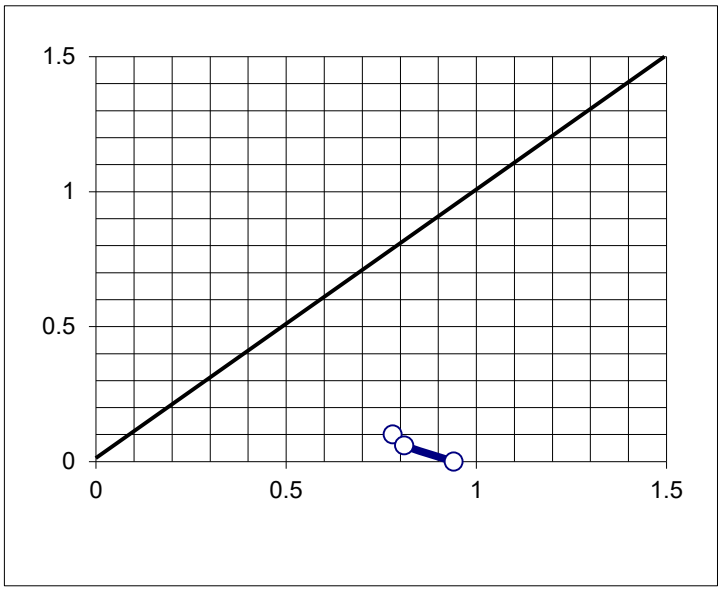
Project Name: The Commons at Hidden Springs
Project No.: 40-3779G
Sample Location: B-8 @ 5-10'
Soil Description: Brown SC
Test Procedure: Cal 301

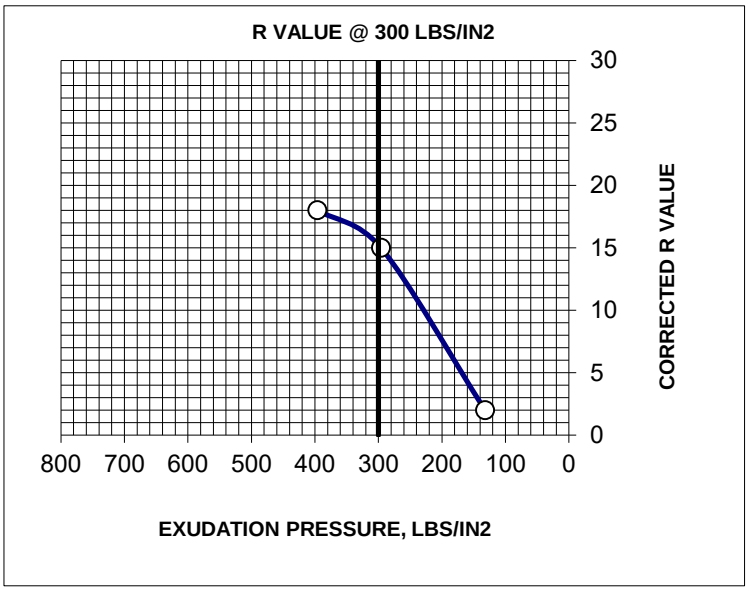
Lab No.: 29938
Sampled By: R.E./W.L. **Date:** 9/9/2019
Submitted By: R.E./W.L. **Date:** 9/9/2019
Tested By: Larry Sachs **Date:** 9/16/2019
Reviewed By: Erik Campbell **Date:** 9/17/2019

Specimen/ Mold No.	9	8	7	
Compactor Air Pressure, ft.lbs.	350	250	100	350
Initial Moisture, %	4.7	4.7	4.7	
Wet Weight / Tare (g)	1902.0	1902.0	1902.0	
Dry Weight / Tare (g)	1848.3	1848.3	1848.3	
Tare (g)	701.4	701.4	701.4	
Water Added, ml	75	80	100	
Moisture at Compaction, %	11.2	11.7	13.4	
Wt. Of Briquette and Mold, g	3226	3239	3247	
Wt. Of Mold, g	2073	2073	2073	
Wt. Of Briquitte,g	1153	1166	1174	
Height of Briquette, in	2.55	2.53	2.59	
Dry Density, pcf	123.2	125.1	121.2	
Stabilometer PH @ 1000 lbs	5	54	70	
Stabilometer PH @ 2000 lbs	116	120	146	
Displacement	4.30	4.57	8.11	
R' Value	18	15	2	
Corrected 'R' Value	18	15	2	
Exudation Pressure, lbs	4950	3700	1650	
Exudation Pressure, psi	396	296	132	
Stabilometer Thickness - ft	0.78	0.81	0.94	
Expansion Pressure	0.0003	0.0002	0.0000	
Expansion Press, Thick-ft	0.10	0.06	0.00	

Exudation	15
Expansion	96
R-value	**15**

TI	4.5
Expansion	96





Cover Thickness by Expansion Pressure-Feet

Expansion From Graph:	0.04

Erik Campbell
Laboratory Manager

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EXPANSION INDEX TEST

ASTM D 4829

CTE Project Number: **40-3779G**

Project Name: **The Commons at Hidden Springs, Wildomar, CA**

Sample ID: B-2 @ 10-15 ft.
Sample Description: Clayey Sand

Test Start Date:	Time:	Initial Reading:
9-13-2019	10:25 am	0.0012

Test Finish Date:	Time:	Final Reading:
9-14-2019	10:25 am	0.0022

Specimen Moisture Content, %: 9.2
Specimen Dry Density, pcf: 112.3
Specimen Saturation, %: 53.3

Expansion (inches): 0.0010

Expansion Index: **1**

Expansion Potential: **Very Low**

LABORATORY COMPACTION OF SOIL (MODIFIED PROCTOR)

ASTM D 1557

Project Name:	Wildomar Commons	**Sampled By:**	RE/WL	**Date:**	9-9-19
CTE Project No.:	40-3779G	**Tested By:**	WL	**Date:**	9-16-19
Lab No.:	9031	**Reviewed By:**	RE	**Date:**	9/16/19
Sample ID:	B-2 @ 10-15				
Sample Description:	Yellowish-brown clayey sand				

TEST NO.	1	2	3	4	
Wt. Comp. Soil + Mold (lbs)	8.899	9.098	9.095	8.925	
Wt. of Mold (lbs)	4.421	4.421	4.421	4.421	
Net Wt. of Soil (lbs)	4.478	4.677	4.674	4.504	
Wet Wt. of Soil + Cont. (g)	1233.7	1325.9	1348.7	1387.5	
Dry Wt. of Soil + Cont. (g)	1187.1	1260.7	1286.1	1290.3	
Wt. of Container (g)	497.7	495.6	655.4	499.5	
Moisture Content (%)	6.8	8.5	9.9	12.3	
Wet Density (pcf)	134.9	140.9	140.8	135.7	
Dry Density (pcf)	126.3	129.8	128.1	120.8	

Preparation Method: Dry [ ] Moist [X]

Mechanical Rammer [ ] **Manual Rammer** [X]

Hammer Weight: 10.0 lb.

Drop: 18 in.

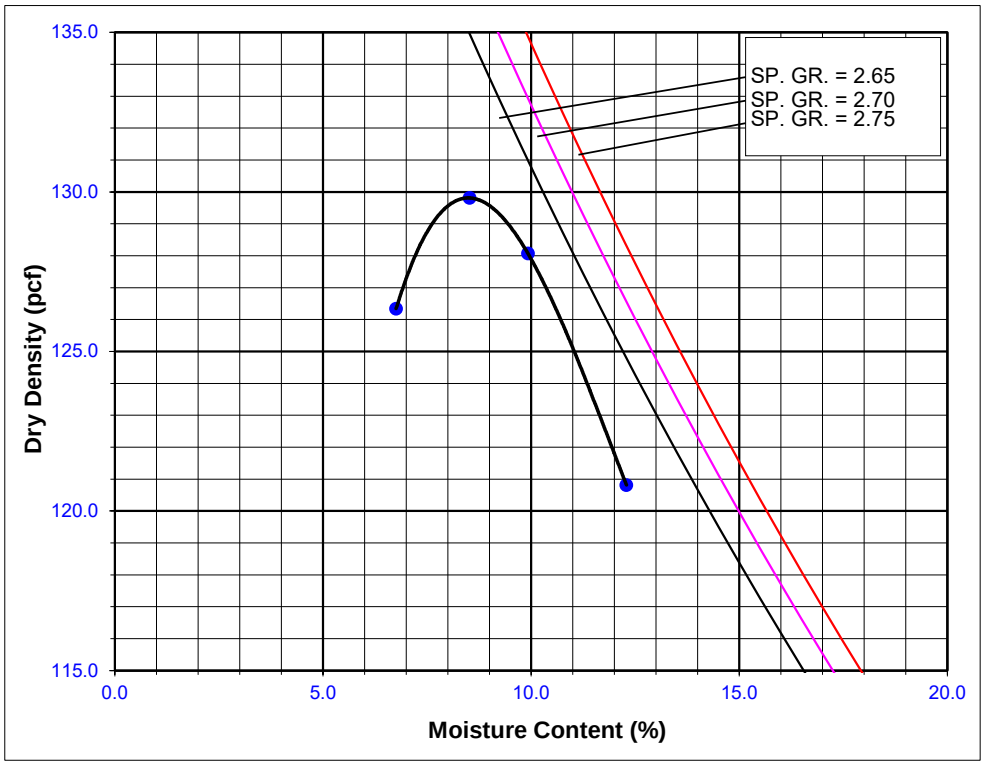
Mold Volume ($ft.^3$): 0.03320

METHOD USED

[ ] **Method A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained =/< 25%

[X] **Method B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if 3/8" retained =/< 25%

[ ] **Method C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
May be used if 3/4" retained =/< 30%



OVERSIZE FRACTION

Total Sample Weight (g): 9756.1

Weight Retained (g)		Percent Retained
	Plus 3/4"	0.0
28.1	Plus 3/8"	0.3
	Plus #4	0.0

Maximum Dry Density (pcf): 129.8

Optimum Moisture Content (%): 8.5

Rock Correction Applied per ASTM D 4718

Maximum Dry Density (pcf):

Optimum Moisture Content (%):

LABORATORY COMPACTION OF SOIL (MODIFIED PROCTOR)

ASTM D 1557

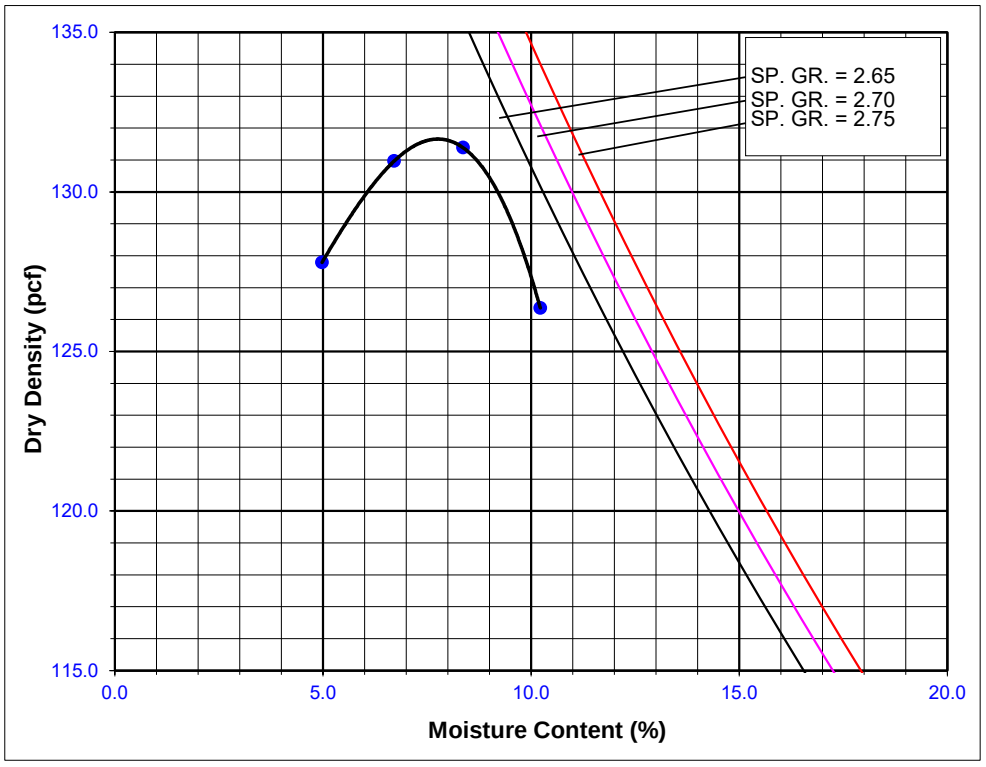
Project Name:	Wildomar Commons	**Sampled By:**		**Date:**	9-9-19
CTE Project No.:	40-3779G	**Tested By:**	WL	**Date:**	9-16-19
Lab No.:	9031	**Reviewed By:**	RE	**Date:**	9-16-19
Sample ID:	B-5 @ 0-5				
Sample Description:	Yellowish-brown silty sand				

TEST NO.	1	2	3	4	
Wt. Comp. Soil + Mold (lbs)	9.061	9.148	9.045	8.875	
Wt. of Mold (lbs)	4.421	4.421	4.421	4.421	
Net Wt. of Soil (lbs)	4.640	4.727	4.624	4.454	
Wet Wt. of Soil + Cont. (g)	1316.1	1316.4	1376.2	1275.4	
Dry Wt. of Soil + Cont. (g)	1280.0	1265.1	1308.9	1238.5	
Wt. of Container (g)	742.2	651.8	650.5	497.5	
Moisture Content (%)	6.7	8.4	10.2	5.0	
Wet Density (pcf)	139.8	142.4	139.3	134.2	
Dry Density (pcf)	131.0	131.4	126.4	127.8	

Preparation Method:	Dry	
	Moist	X
Mechanical Rammer		
Manual Rammer		X
Hammer Weight:	10.0 lb.	
Drop:	18 in.	
Mold Volume (ft.^{3}):	0.03320	

METHOD USED

	Method A	
Soil Passing No. 4 (4.75 mm) Sieve		
Mold : 4 in. (101.6 mm) diameter		
Layers : 5 (Five)		
Blows per layer : 25 (twenty-five)		
May be used if No.4 retained =/< 25%		
X	**Method B**	
Soil Passing 3/8 in. (9.5 mm) Sieve		
Mold : 4 in. (101.6 mm) diameter		
Layers : 5 (Five)		
Blows per layer : 25 (twenty-five)		
May be used if 3/8" retained =/< 25%		
	Method C	
Soil Passing 3/4 in. (19.0 mm) Sieve		
Mold : 6 in. (152.4 mm) diameter		
Layers : 5 (Five)		
Blows per layer : 56 (fifty-six)		
May be used if 3/4" retained =/< 30%		



OVERSIZE FRACTION

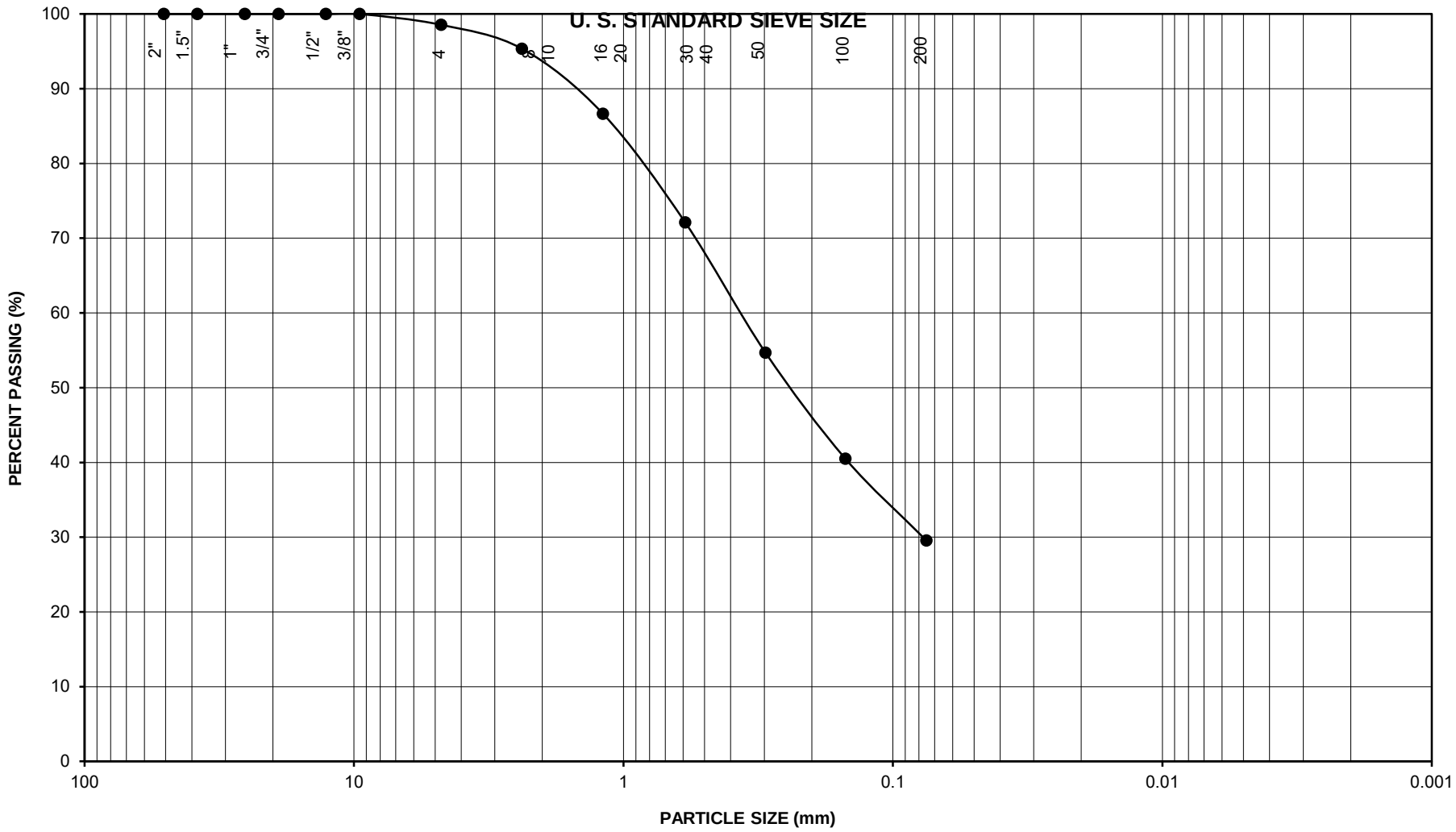
Total Sample Weight (g): 15463.8

Weight Retained (g)		Percent Retained
	Plus 3/4"	0.0
34.4	Plus 3/8"	0.2
	Plus #4	0.0

Maximum Dry Density (pcf)	**131.6**
Optimum Moisture Content (%)	**8.0**

Rock Correction Applied per ASTM D 4718

Maximum Dry Density (pcf)	
Optimum Moisture Content (%)	



PARTICLE SIZE ANALYSIS

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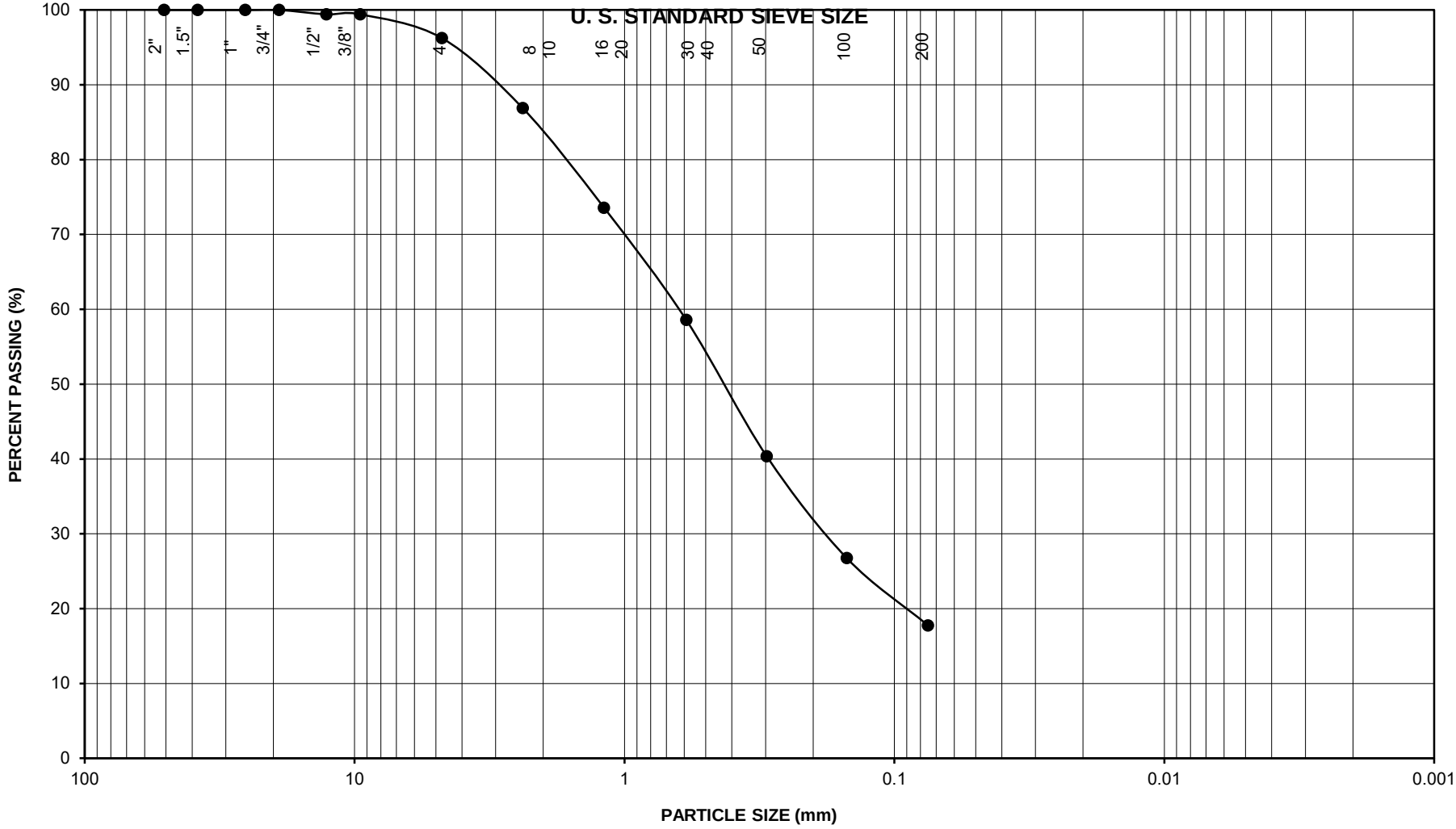
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-2	10-15	●	29	9	SC
		■			

CTE JOB NUMBER: 40-3779G

Wildomar Commons



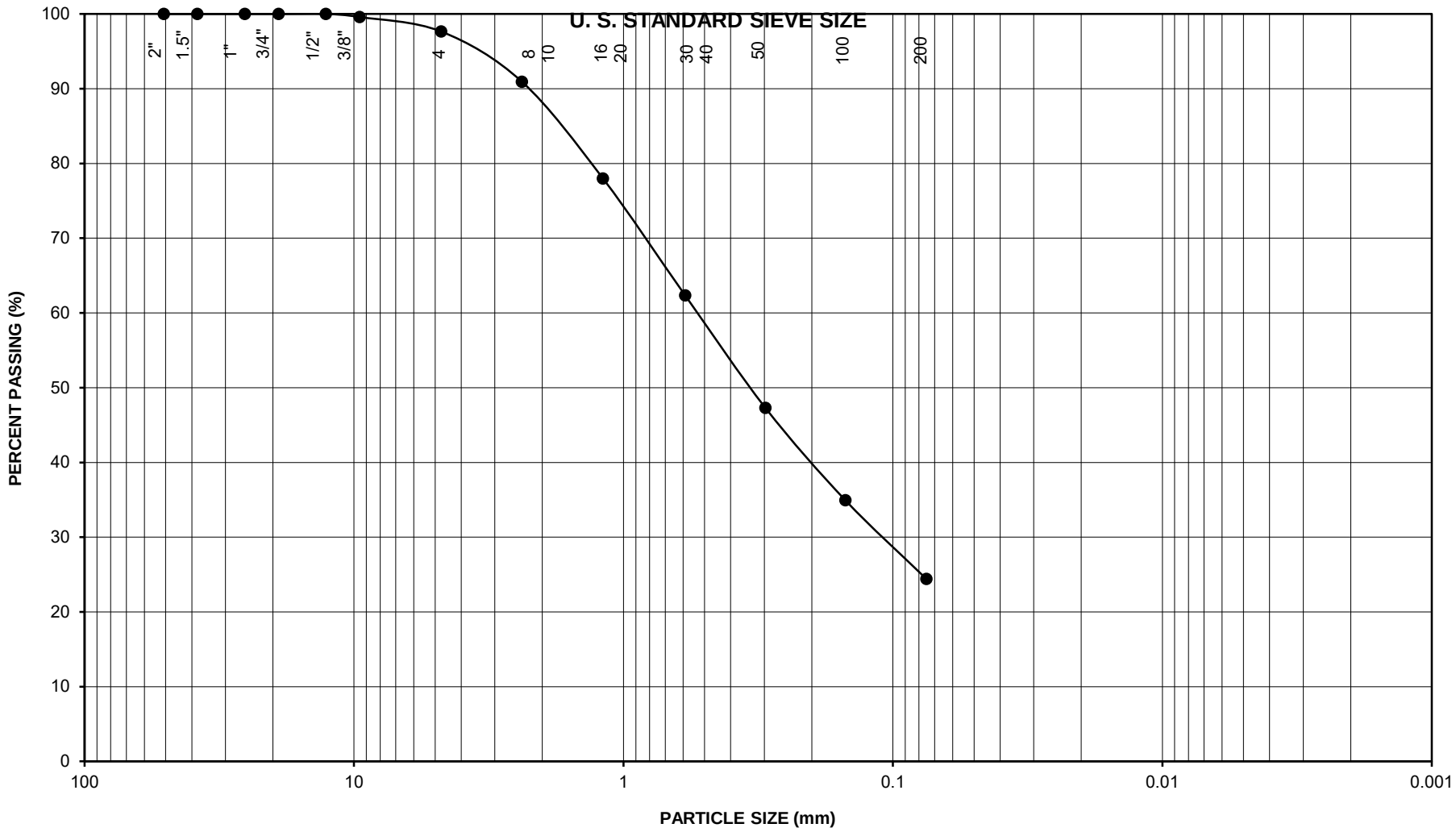
PARTICLE SIZE ANALYSIS

CTE SOUTH Construction Testing & Engineering, South, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-4	0-5	●			SC-SM
		■			

CTE JOB NUMBER: 40-3779G

Wildomar Commons



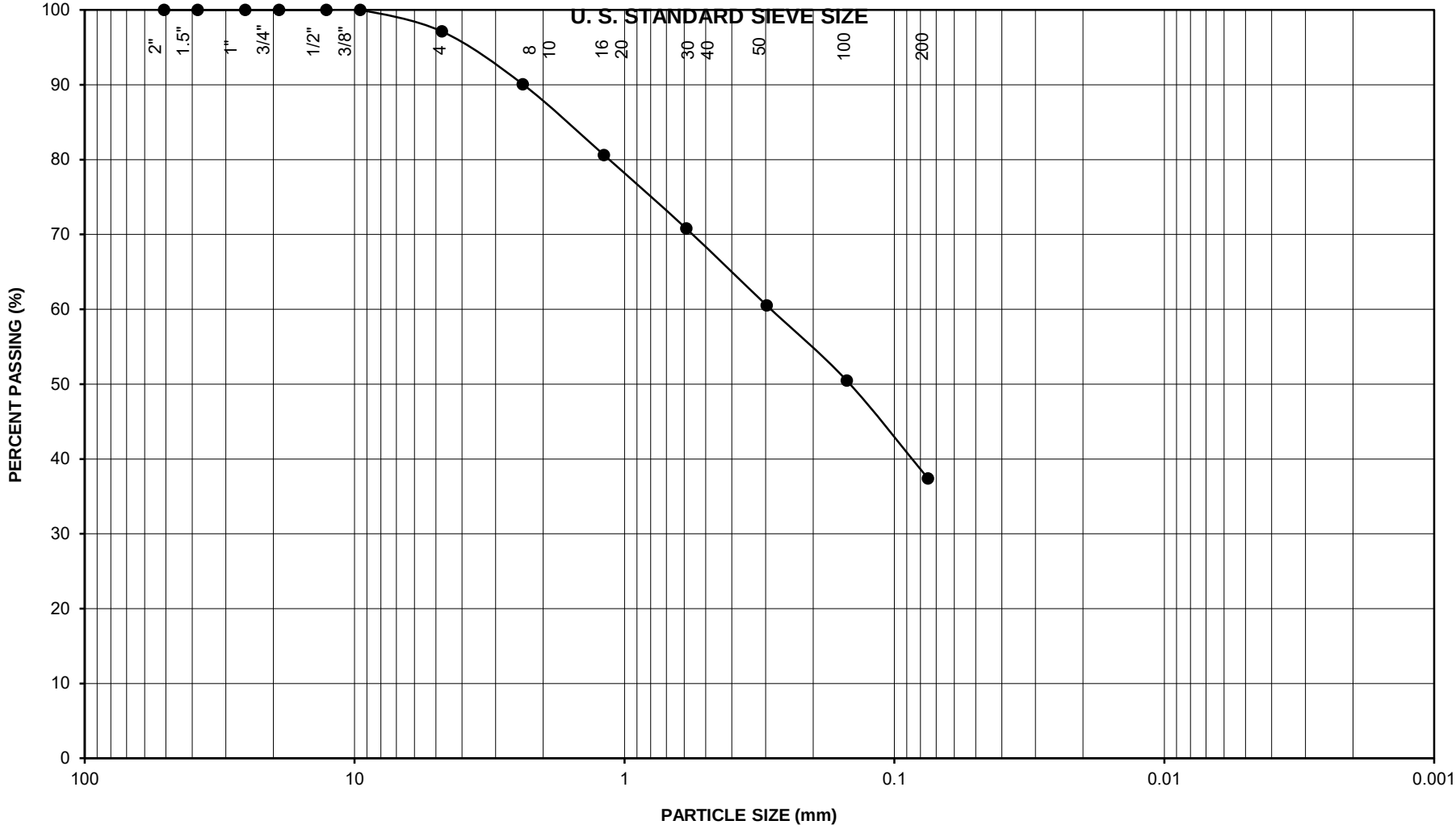
PARTICLE SIZE ANALYSIS

CTE SOUTH Construction Testing & Engineering, South, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-5	0-5	●	NP	NP	SM
		■			

CTE JOB NUMBER: 40-3779G

Wildomar Commons



PARTICLE SIZE ANALYSIS

CTE SOUTH Construction Testing & Engineering, South, Inc.
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-8	5-10	●			
		■			

CTE JOB NUMBER: 40-3779G

Wildomar Commons

BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: Construction Testing & Eng., Inc.
Contact: Robert Ellerbusch
Address: 14538 Meridian Parkway, Suite A
Riverside, CA 92518

Report Date: 16-Sep-2019

Analytical Report: Page 1 of 4
Project Name: Const. Test.-Soils
Project Number: Wildomar Commons

Work Order Number: B9I1692

Received on Ice (Y/N): No Temp: 26 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

Lab Sample #	Client Sample ID	Matrix	Date Sampled	By	Date Submitted	By
B9I1692-01	40-3979 B4 @ 0' - 5'	Soil	09/09/19 12:00	Walter Leung	09/11/19 14:30	Walter Leung
B9I1692-02	40-3979 B8 @ 5' - 10'	Soil	09/09/19 15:00	Walter Leung	09/11/19 14:30	Walter Leung

BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: Construction Testing & Eng., Inc.
Contact: Robert Ellerbusch
Address: 14538 Meridian Parkway, Suite A
Riverside, CA 92518

Report Date: 16-Sep-2019

Project Name: Const. Test.-Soils
Project Number: Wildomar Commons

Work Order Number: B9I1692

Received on Ice (Y/N): No Temp: 26 °C

Laboratory Reference Number
B9I1692-01

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
40-3979 B4 @ 0' - 5'	Soil	09/09/19 12:00	09/11/19 14:30

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Anions							
Chloride	ND	5.0	mg/kg	Cal Trans 422	09/14/19 09:03	KBS	
Sulfate	ND	5.0	mg/kg	Cal Trans 417	09/14/19 09:03	KBS	
Saturated Paste							
pH	6.5	0.1	pH Units	S-1.10 W.S.	09/16/19 13:39	TML	
Minimum Resistivity	5300	10	ohm-cm	Cal Trans 643	09/16/19 13:39	TML	

BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: Construction Testing & Eng., Inc.
Contact: Robert Ellerbusch
Address: 14538 Meridian Parkway, Suite A
Riverside, CA 92518

Report Date: 16-Sep-2019

Project Name: Const. Test.-Soils
Project Number: Wildomar Commons

Work Order Number: B9I1692

Received on Ice (Y/N): No Temp: 26 °C

Laboratory Reference Number
B9I1692-02

Sample Description	Matrix	Sampled Date/Time	Received Date/Time
40-3979 B8 @ 5' - 10'	Soil	09/09/19 15:00	09/11/19 14:30

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Anions							
Chloride	ND	5.0	mg/kg	Cal Trans 422	09/14/19 09:41	KBS	
Sulfate	ND	5.0	mg/kg	Cal Trans 417	09/14/19 09:41	KBS	
Saturated Paste							
pH	7.1	0.1	pH Units	S-1.10 W.S.	09/16/19 13:39	TML	
Minimum Resistivity	4400	10	ohm-cm	Cal Trans 643	09/16/19 13:39	TML	

BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: Construction Testing & Eng., Inc.
Contact: Robert Ellerbusch
Address: 14538 Meridian Parkway, Suite A
Riverside, CA 92518

Report Date: 16-Sep-2019

Project Name: Const. Test.-Soils
Project Number: Wildomar Commons

Work Order Number: B9I1692

Received on Ice (Y/N): No Temp: 26 °C

Notes and Definitions

ND:	Analyte NOT DETECTED at or above the Method Detection Limit **(if MDL is reported)**, otherwise at or above the Reportable Detection Limit (RDL)
NR:	Not Reported
RDL:	Reportable Detection Limit
MDL:	Method Detection Limit
* / '" :	NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

Angela Brown

Angela E. Brown For KayeLani A. Marshall

cc:

e-Short_No Alias.rpt

mailing
P.O Box 432
Riverside, CA 92502-0432

location
6100 Quail Valley Court
Riverside, CA 92507-0704

P 951 653 3351
F 951 653 1662
www.babcocklabs.com

CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119

APPENDIX C

STANDARD SPECIFICATIONS FOR GRADING AND TRENCH BACKFILL

RECOMMENDED EARTHWORK SPECIFICATIONS

The following specifications are recommended to provide a basis for quality control during the placement of compacted fill or backfill as applicable.

1. Areas that are to receive compacted fill shall be observed by Soil/Geotechnical Engineer (GE) or his/her representative prior to the placement of fill.

2. All drainage devices shall be properly installed and observed by GE and/or owner's representative(s) prior to placement of backfill.

3. Fill soils shall consist of imported soils or on-site soils free of organics, cobbles, and deleterious material provided each material is approved by GE. GE shall evaluate and/or test the import material for its conformance with the report recommendations prior to its delivery to the site. The contractor shall notify GE 72 hours prior to importing material to the site

4. Fill shall be placed in controlled layers (lifts), the thickness of which is compatible with the type of compaction equipment used. The fill materials shall be brought to optimum moisture content or above, thoroughly mixed during spreading to obtain a near uniform moisture condition and uniform blend of materials, and then placed in layers with a thickness (loose) not exceeding 8 inches. Each layer shall be compacted to a minimum compaction of 90% relative to the maximum dry density determined per the latest ASTM D1557 test. Density testing shall be performed by GE to verify relative compaction. The contractor shall provide proper access and level areas for testing.

5. Rocks or rock fragments less than eight (8) inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets, except rocks larger than four (4) inches shall not be placed within three (3) feet of finish grade.

6. Rocks greater than eight (8) inches in largest dimension shall be taken offsite, or placed in accordance with the recommendation of the Soils Engineer in areas designated as suitable for rock disposal.

7. Where space limitations do not allow for conventional fill compaction operations, special backfill materials and procedures may be required. Pea gravel or other select fill can be used in areas of limited space. A sand and Portland cement slurry (2 sacks per cubic-yard mix) shall be used in limited space areas for shallow backfill near final pad grade, and pea gravel shall be placed in deeper backfill near drainage systems.

8. GE shall observe the placement of fill and conduct in-place field density tests on the compacted fill to check for adequate moisture content and the required relative compaction. Where less than specified relative compaction is indicated, additional compacting effort shall be applied and the soil moisture conditioned as necessary until adequate relative compaction is attained.

9. The Contractor shall comply with the minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as set forth in the specifications for compacted fill. This may be achieved by either overbuilding the slope and cutting back as necessary, or by direct compaction of the slope face with suitable equipment, or by any other procedure that produces the required result.

10. Any abandoned underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or others not discovered prior to grading are to be removed or treated to the satisfaction of the Soils Engineer and/or the controlling agency for the project.

11. The Contractor shall have suitable and sufficient equipment during a particular operation to handle the volume of fill being placed. When necessary, fill placement equipment shall be shut down temporarily in order to permit proper compaction of fills, correction of deficient areas, or to facilitate required field-testing.

12. The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications.

13. Final reports shall be submitted after completion of earthwork and after the Soils Engineer and Engineering Geologist have finished their observations of the work. No additional excavation or filling shall be performed without prior notification to the Soils Engineer and/or Engineering Geologist.

14. Whenever the words “supervision”, “inspection” or “control” are used, they shall mean observation of the work and/or testing of the compacted fill by GE to assess whether substantial compliance with plans, specifications and design concepts has been achieved, and does not include direction of the actual work of the contractor or the contractor’s workmen.

RECOMMENDED SPECIFICATIONS
FOR PLACEMENT OF TRENCH BACKFILL

1. Trench excavations to receive backfill shall be free of trash, debris or other unsatisfactory materials prior to backfill placement, and shall be observed by project soil/geotechnical engineer (GE) representative.

2. Except as stipulated herein, soils obtained from the excavation may be used as backfill if they are essentially free of organics and deleterious materials.

3. Rocks generated from the trench excavation not exceeding three (3) inches in largest dimension may be used as backfill material. However, such material may not be placed within 12 inches of the top of the pipeline. No more than 30 percent of the backfill volume shall contain particles larger than 1-½ inches in diameter, and rocks shall be well mixed with finer soil.

4. Soils (other than aggregates) with a Sand Equivalent (SE) greater than or equal to 30, as determined by ASTM D 2419 Standard Test Method or at the discretion of the engineer or representative in the field, may be used for bedding and shading material in the pipe zone areas. These soils are considered satisfactory for compaction by jetting procedures.

5. No jetting will be permitted in utility trenches within the top 2 feet of the subgrade of concrete slabs-on-grade.

6. Trench backfill other than bedding and shading shall be compacted by mechanical methods as tamping sheepsfoot, vibrating or pneumatic rollers or other mechanical tampers to achieve the density specified herein. The backfill materials shall be brought to optimum moisture content or above, thoroughly mixed during spreading to obtain a near uniform moisture condition and uniform blend of materials, and then placed in horizontal layers with a thickness (loose) not exceeding 8 inches. Trench backfills shall be compacted to a minimum compaction of 90 percent relative to the maximum dry density determined per the latest ASTM D1557 test.

7. The contractor shall select the equipment and process to be used to achieve the specified density without damage to the pipeline, the adjacent ground, existing improvements or completed work.

8. Observations and field tests shall be carried on during construction by GE to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compaction effort shall be made with adjustment of the moisture content as necessary until the specified compaction is obtained. Field density tests may be omitted at the discretion of the engineer or his representative in the field.

9. Whenever, in the opinion of GE or the Owner's Representative(s), an unstable condition is being created, either by cutting or filling, the work shall not proceed until an investigation has been made and the excavation plan revised, if deemed necessary.

10. Fill material shall not be placed, spread, or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by GE indicate the moisture content and density of the fill are as specified.

11. Whenever the words "supervision", "inspection", or "control" are used, they shall mean observation of the work and/or testing of the compacted fill by GE to assess whether substantial compliance with plans, specifications and design concepts has been achieved.

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.

Infiltration Feasibility

Table D-1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the SMR WQMP in Chapter 2.3.3. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D-1 Infiltration Feasibility

Downstream Impacts (SMR WQMP Section 2.3.3.a)		
Does the project site…	**YES**	**NO**
…have any DMAs where infiltration would negatively impact downstream water rights or other Beneficial Uses[3]?		X
If Yes, list affected DMAs:		
Groundwater Protection (SMR WQMP Section 2.3.3.b)		
Does the project site…	**YES**	**NO**
…have any DMAs with industrial, and other land uses that pose a high threat to water quality, which cannot be treated by Bioretention BMPs? Or have DMAs with active industrial process areas?		X
If Yes, list affected DMAs:		
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet horizontally of a water supply well?		X
If Yes, list affected DMAs:		
…have any DMAs that would restrict BMP locations to within a 2:1 (horizontal: vertical) influence line extending from any septic leach line?		X
If Yes, list affected DMAs:		
…have any DMAs been evaluated by a licensed Geotechnical Engineer, Hydrogeologist, 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?		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 factored infiltration rates of less than 0.8 inches / hour? (Note: on a case-by-case basis, the City may allow a factor of safety as low as 1.0 to support selection of full infiltration BMPs. Therefore, measured infiltration rates could be as low as 0.8 in/hr to support full infiltration. A higher factor of safety would be required for design in accordance with the LID BMP Deign Handbook).		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:		

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

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 BMP Hierarchy			No LID (Alternative Compliance)
	1. Infiltration	2. Biofiltration with Partial Infiltration	3. Biofiltration with No Infiltration	
DMA A	☒	☐	☐	☐
DMA B	☒	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐

Appendix 6: LID BMP Design Details

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

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

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

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

Santa Margarita Watershed

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

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name	Red Brick Solution	Date	1/24/2021
Designed by	David W. Larson	County/City Case No	Riverside/Wildomar
Company Project Number/Name	200030/Wildomar		
Drainage Area Number/Name	1/Wildomar		

Enter the Area Tributary to this Feature A_T = 1.04 acres

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

Site Location

Township T07S

Range R04W

Section 1

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.70

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 1.00

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

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.89

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.62 (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} = 2,341 ft^3

Notes:

Santa Margarita Watershed

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

Legend: Required Entries / Calculated Cells

Company Name	Red Brick Solution	Date	1/24/2021
Designed by	David W. Larson	County/City Case No	Riverside/Wildomar
Company Project Number/Name	200030/Wildomar		
Drainage Area Number/Name	1/Wildomar		

Enter the Area Tributary to this Feature A_T = 1.04 acres

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 1.00

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

Use the following equation based on the WEF/ASCE Method

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

C = 0.89

BMP Design Flow Rate

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

Q_{BMP} = 0.2 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	Red Brick Solution	Date	1/24/2021
Designed by	David W. Larson	County/City Case No	Riverside/Wildomar
Company Project Number/Name	200030/Wildomar		
Drainage Area Number/Name	1/Wildomar		

Enter the Area Tributary to this Feature A_T = 0.25 acres

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

Site Location

Township T07S

Range R04W

Section 1

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.70

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Ornamental Landscaping

Effective Impervious Fraction I_f = 0.10

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 = 0.11

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.08 (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} = 73 ft^3

Notes:

Santa Margarita Watershed

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

Legend: Required Entries / Calculated Cells

Company Name	Red Brick Solution	Date	1/24/2021
Designed by	David W. Larson	County/City Case No	Riverside/Wildomar
Company Project Number/Name	200030/Wildomar		
Drainage Area Number/Name	1/Wildomar		

Enter the Area Tributary to this Feature A_T = 0.25 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Ornamental Landscaping

Effective Impervious Fraction I_f = 0.10

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 = 0.11

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	Red Brick Solution	Date	1/24/2021
Designed by	David W. Larson	County/City Case No	Riverside/Wildomar
Company Project Number/Name	200030/Wildomar		
Drainage Area Number/Name	DMA-A		

Enter the Area Tributary to this Feature A_T = 1.29 acres

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

Site Location

Township T07S

Range R04W

Section 1

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.70

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 1.00

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

Use the following equation based on the WEF/ASCE Method

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

C = 0.89

Determine Design Storage Volume, V_{BMP}

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

V_u = 0.62 (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} = 2,903 ft^3

Notes:

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID: DMA-A	Legend:	Required Entries / Calculated Cells

Company Name: Red Brick Solution — Date: 10/22/2021

Designed by: David W Larson — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	1.29	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,903	ft^3

Maximum Depth

a) Measured infiltration rate	I =	2.05	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	4.1	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		17	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		25	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	6.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	4.1	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	4	:1
b) Proposed basin depth (excluding freeboard)	d_B =	1	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	2903	ft^2
d) Proposed Design Surface Area	A_D =	5092	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	15	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	1	ft
c) Forebay surface area (minimum)	Area =	15	ft^2
d) Full height notch-type weir	Width (W) =	2.0	in

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	Red Brick Solution	Date	10/22/2021
Designed by	David Larson	County/City Case No	Riverside/Wildomar
Company Project Number/Name	200030/Wildomar		
Drainage Area Number/Name	DMA-B		

Enter the Area Tributary to this Feature A_T = 7.99 acres

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

Site Location

Township T07S

Range R04W

Section 1

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.70

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 1.00

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

Use the following equation based on the WEF/ASCE Method

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

C = 0.89

Determine Design Storage Volume, V_{BMP}

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

V_u = 0.62 (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} = 17,982 ft^3

Notes:

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID: DMA-B	Legend:	Required Entries / Calculated Cells

Company Name: Red Brick Solution — Date: 10/22/2021

Designed by: David W Larson — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	7.99	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	17,982	ft^3

Maximum Depth

a) Measured infiltration rate	I =	1.05	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	2.1	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		15	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		21.5	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	4.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	2.1	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	4	:1
b) Proposed basin depth (excluding freeboard)	d_B =	1.2	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	14985	ft^2
d) Proposed Design Surface Area	A_D =	17982	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	90	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	1	ft
c) Forebay surface area (minimum)	Area =	90	ft^2
d) Full height notch-type weir	Width (W) =	2.0	in

Notes:

3.1 INFILTRATION BASIN

Type of BMP	LID – Infiltration
Priority Level	Priority 1 – Full Retention
Treatment Mechanisms	Infiltration, Evapotranspiration (when vegetated), Evaporation, Sedimentation
Infiltration Rate Range	> 0.8 in/hr factored design infiltration rate
Maximum Drainage Area	50 acres

Description

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume, V_{BMP}. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding V_{BMP} must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 – Infiltration Basin

See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements.

Siting Considerations

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the Santa Margarita Region (SMR) Water Quality Management Plan (WQMP) for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

Setbacks

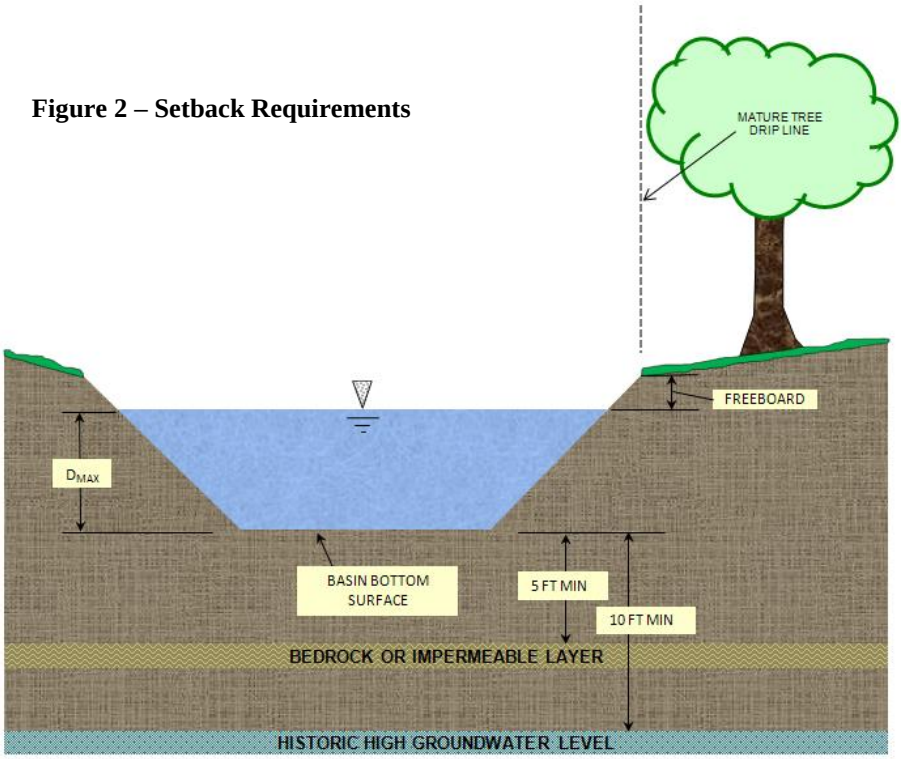
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).

Figure 2 – Setback Requirements



Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

Overflow

Flows exceeding V_{BMP} must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for V_{BMP} and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

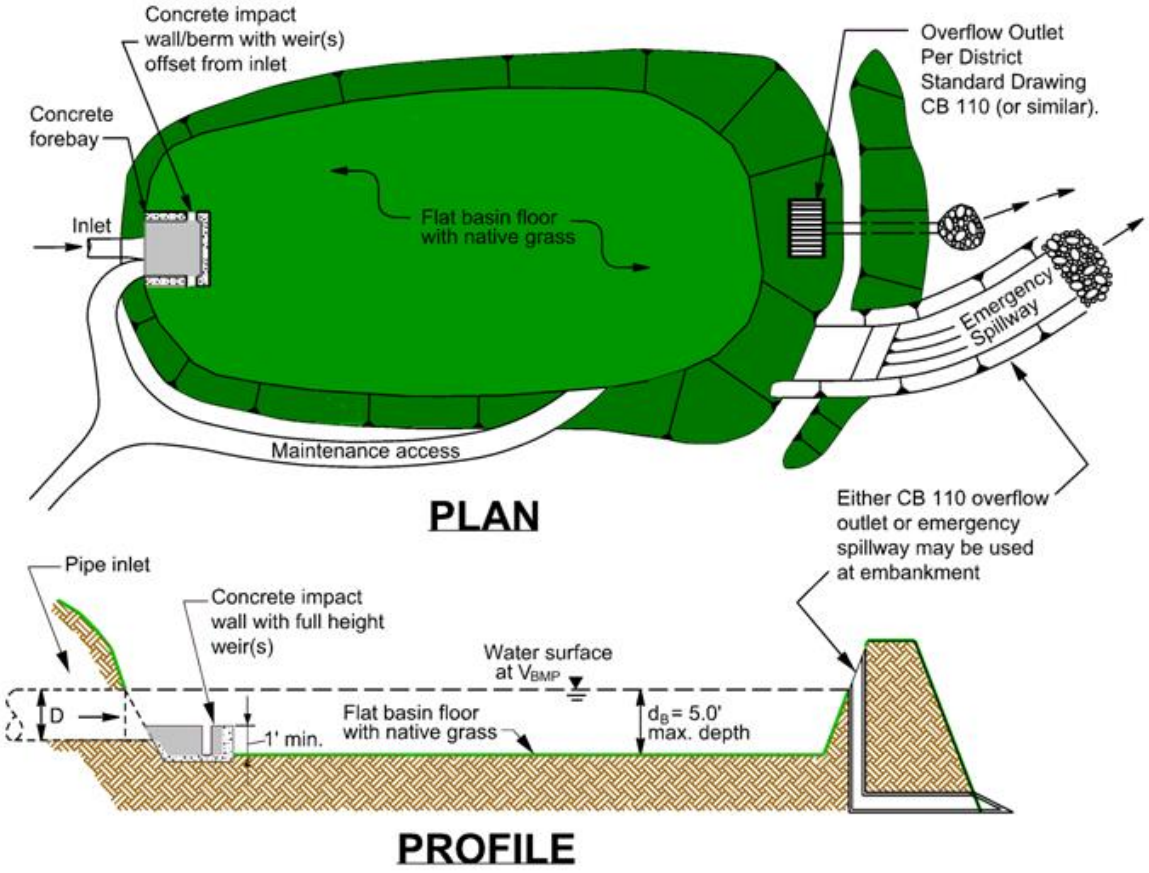


Figure 3 – Infiltration Basin

Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses.

Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District's *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

Maintenance

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District's *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

Table 1 - Inspection and Maintenance

Schedule	Inspection and Maintenance Activity

Ongoing including just before annual storm seasons and following rainfall events.	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used,
	  ○ Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding.
	  ○ Fertilizers should not be applied within 15 days before, after, or during the rain season.
	• Remove debris and litter from the entire basin to minimize clogging and improve aesthetics.
	• Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water.
	• Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed.
	• Revegetate side slopes where needed.

Annually. If possible, schedule these inspections within 72 hours after a significant rainfall.	• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation. • Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis[1]. • No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed.

1. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Table 2 - Design and Sizing Criteria for Infiltration Basins

Design Parameter	Infiltration Basin
Design Volume	V_{BMP}
Forebay Volume	0.5% V_{BMP}
Drawdown time (maximum)	72 hours
Maximum tributary area	50 acres [2]
Minimum infiltration rate	Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The SMR WQMP may include specific requirements for minimum tested infiltration rates.
Maximum Depth	5 feet
Spillway erosion control	Energy dissipators to reduce velocities[1]
Basin Slope	0%
Freeboard (minimum)	1 foot [1]
Historic High Groundwater Setback (max)	10 feet
Bedrock/impermeable layer setback (max)	5 feet
Tree setbacks	Mature tree drip line must not overhang the basin
Set back from wells, tanks or springs	100 feet
Set back from foundations	As recommended in Geotechnical Report

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.

INFILTRATION BASIN SIZING PROCEDURE

1. Find the Design Volume, V_{BMP}.
   a) Enter the Tributary Area, A_T.
   b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
   a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
   b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
   c) The spreadsheet will determine D_1, the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.

$$D_1 = [(t) \times (I)] / 12s$$

Where I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

   d) Enter the depth of freeboard.

e) Enter the depth to the historic high groundwater level measured from the top of the basin.

f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.

g) The spreadsheet will determine D_2, the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.

D_2 = Depth to groundwater – (10 + freeboard) (ft);

or

D_2 = Depth to impermeable layer – (5 + freeboard) (ft)

Whichever is least.

h) The spreadsheet will determine the maximum allowable effective depth of basin, D_{MAX}, based on the smallest value between D_1 and D_2. D_{MAX} is the maximum depth of water only and does not include freeboard. D_{MAX} shall not exceed 5 feet.

3. Basin Geometry

a) Enter the basin side slopes, z (no steeper than 4:1).

b) Enter the proposed basin depth, d_B excluding freeboard.

c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where A_s = minimum area required (ft^2)
V_{BMP} = volume of the infiltration basin (ft^3)
d_B= proposed depth not to exceed maximum allowable depth, D_{MAX} (ft)

d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

4. Forebay

A concrete forebay with a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

a) The spreadsheet will determine the minimum required forebay volume based on 0.5% V_{BMP}.

b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).

c) The spreadsheet will determine the minimum required forebay surface area.

d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.

Appendix 7: Hydromodification

Supporting Detail Relating to compliance with the Hydromodification Performance Standards

Examples of material to provide in Appendix 7 may include but are not limited to the following:

- Hydromodification Exemption Exhibit,
- Potential Critical Coarse Sediment Yield Area Mapping
- Hydromodification BMP sizing calculations,
- SMRHM report files,
- Site-Specific Critical Coarse Sediment Analysis,
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the hydromodification exemption (if applicable) and hydrologic control BMP and Sediment Supply BMP sections of this Template. Refer to Section 2.4 and 3.6 of the SMR WQMP and Sections E of this Template.

EXHIBIT J

User Inputs

Chamber Model:	MC-4500
Outlet Control Structure:	Yes
Project Name:	Wildomar Commons
Engineer:	David Larson
Project Location:	California
Measurement Type:	Imperial
Required Storage Volume:	57565 cubic ft.
Stone Porosity:	40%
Stone Foundation Depth:	9 in.
Stone Above Chambers:	12 in.
Average Cover Over Chambers:	24 in.
Design Constraint Dimensions:	(70 ft. x 230 ft.)

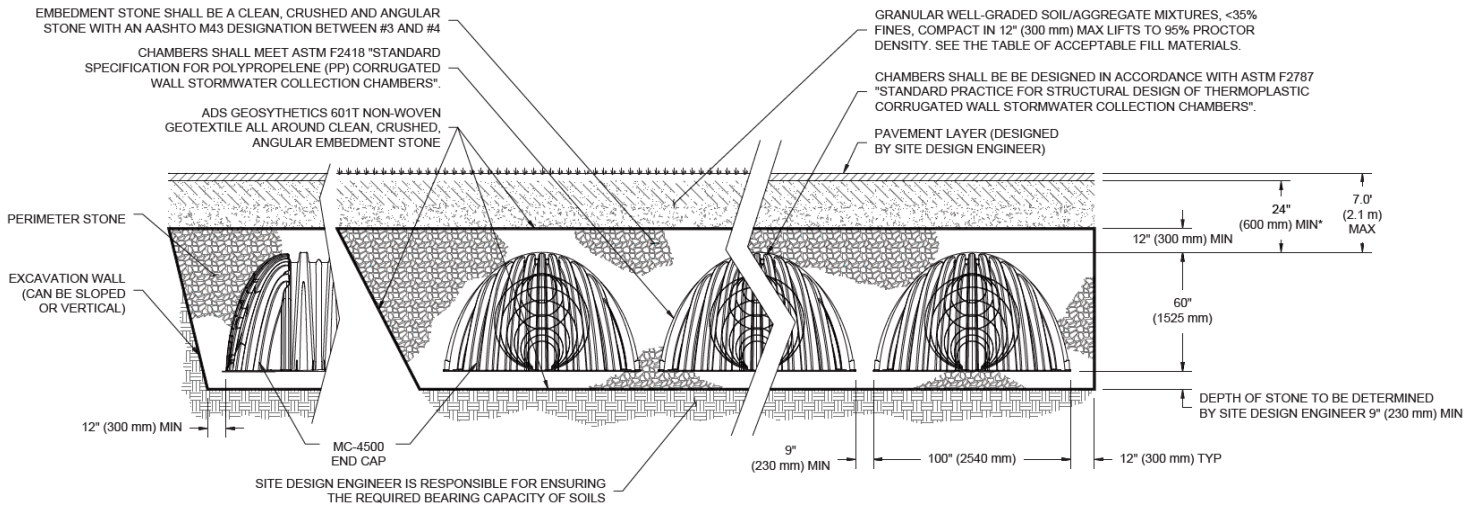
Results

System Volume and Bed Size

Installed Storage Volume:	58094.81 cubic ft.
Storage Volume Per Chamber:	106.50 cubic ft.
Number Of Chambers Required:	336
Number Of End Caps Required:	14
Chamber Rows:	7
Maximum Length:	209.64 ft.
Maximum Width:	65.43 ft.
Approx. Bed Size Required:	13441.71 square ft.

System Components

Amount Of Stone Required:	2014.61 cubic yards
Volume Of Excavation (Not Including Fill):	3360.43 cubic yards



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADVANCED DRAINAGE SYSTEMS, INC.

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WILDOMAR COMMONS

WILDOMAR, CA

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

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

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

PROPOSED LAYOUT

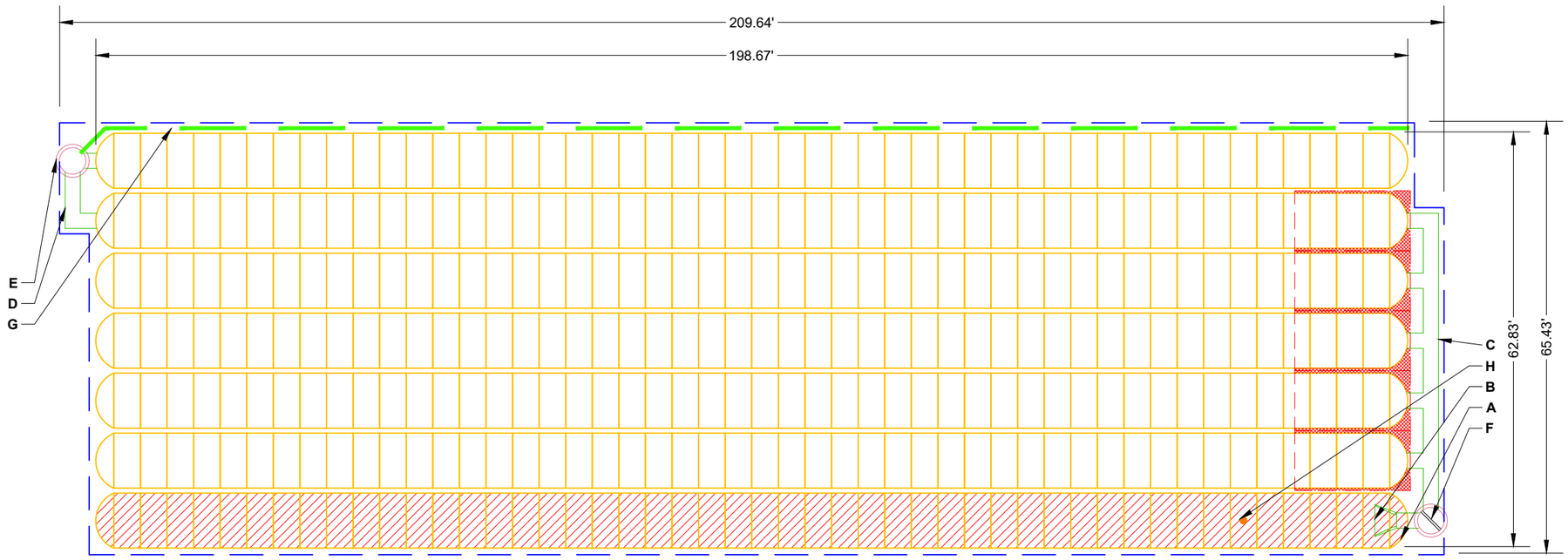
336	STORMTECH MC-4500 CHAMBERS
14	STORMTECH MC-4500 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
58097	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
13442	SYSTEM AREA (SF)
550.2	SYSTEM PERIMETER (ft)

CONCEPTUAL ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
TOP OF STONE:	6.75
TOP OF MC-4500 CHAMBER:	5.75
24" x 24" BOTTOM MANIFOLD INVERT:	0.94
24" x 24" BOTTOM MANIFOLD INVERT:	0.94
24" ISOLATOR ROW PLUS INVERT:	0.94
24" BOTTOM CONNECTION INVERT:	0.94
BOTTOM OF MC-4500 CHAMBER:	0.75
UNDERDRAIN INVERT:	0.00
BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	B	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MC450024RAMP		
MANIFOLD	C	24" x 24" BOTTOM MANIFOLD, ADS N-12	2.26"	
MANIFOLD	D	24" x 24" BOTTOM MANIFOLD, ADS N-12	2.26"	
CONCRETE STRUCTURE	E	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		14.0 CFS OUT
CONCRETE STRUCTURE W/WEIR	F	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		41.5 CFS IN
UNDERDRAIN	G	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		
INSPECTION PORT	H	4" SEE DETAIL		



ISOLATOR ROW PLUS
(SEE DETAIL)

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

BED LIMITS

NOTES

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

WILDOMAR COMMONS
WILDOMAR, CA

DATE: 12/7/2020 | DRAWN: DL | CHECKED: N/A | PROJECT #:

REV	DRW	CHK	DESCRIPTION

StormTech
Detention•Retention•Water Quality
520 CROMWELL AVENUE | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

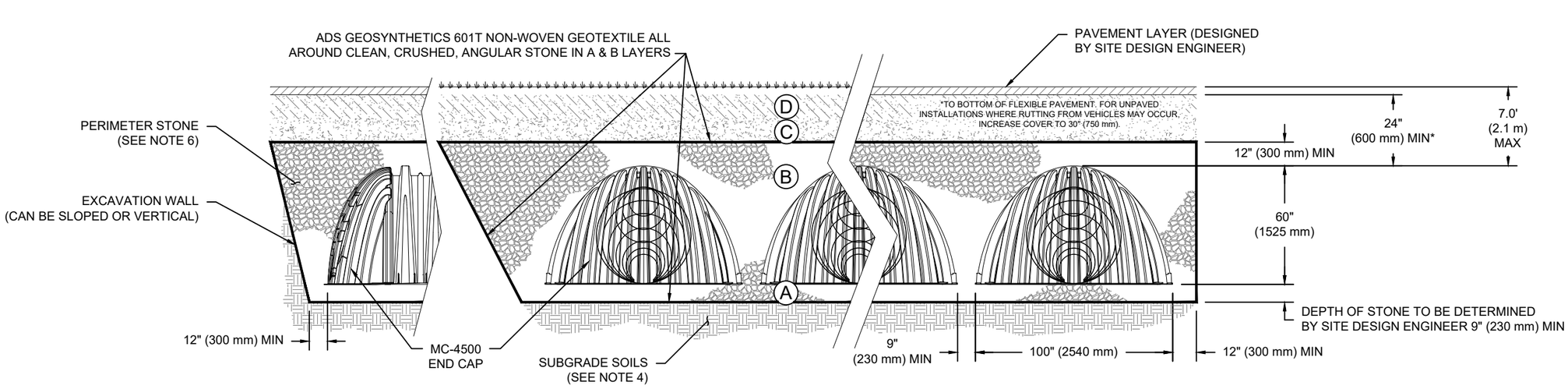
ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 20' 40'

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

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

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



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

WILDOMAR COMMONS
WILDOMAR, CA
DATE: 12/7/2020
DRAWN: DL
PROJECT #:
CHECKED: N/A

REV	DRW	CHK	DESCRIPTION

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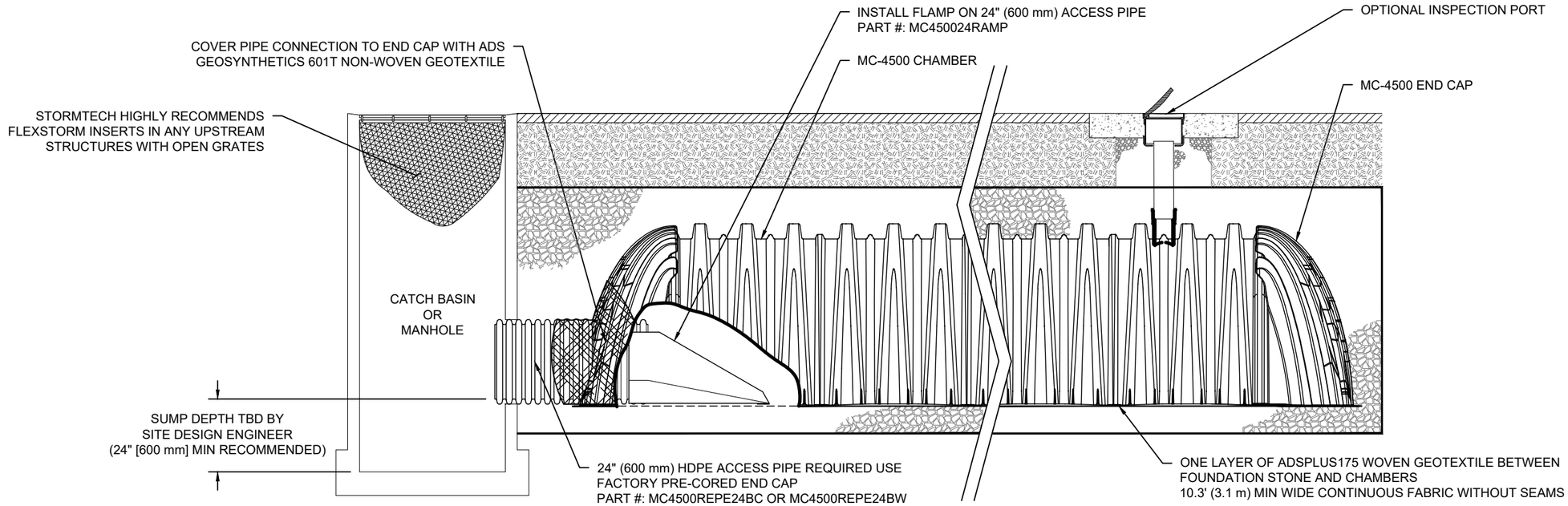


MC-4500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

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

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

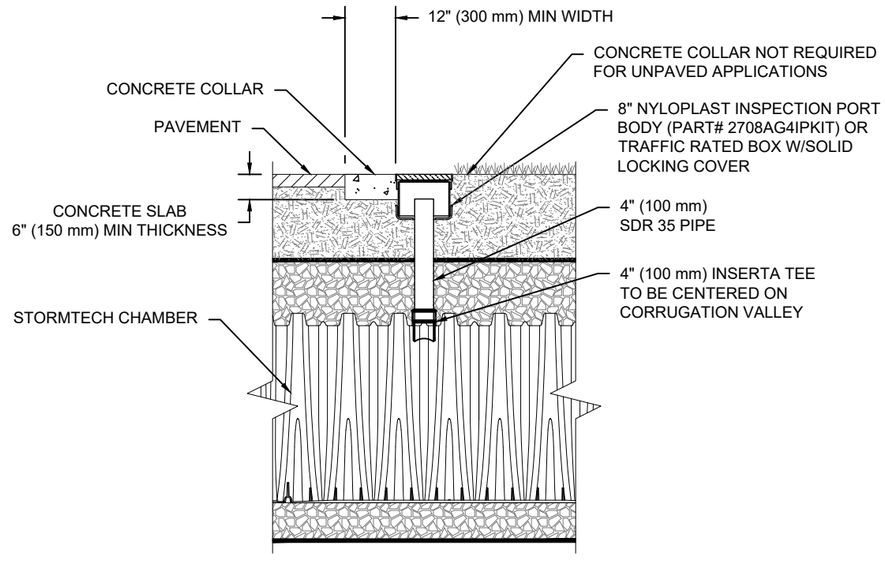
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

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

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



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

4" PVC INSPECTION PORT DETAIL
(MC SERIES CHAMBER)
NTS

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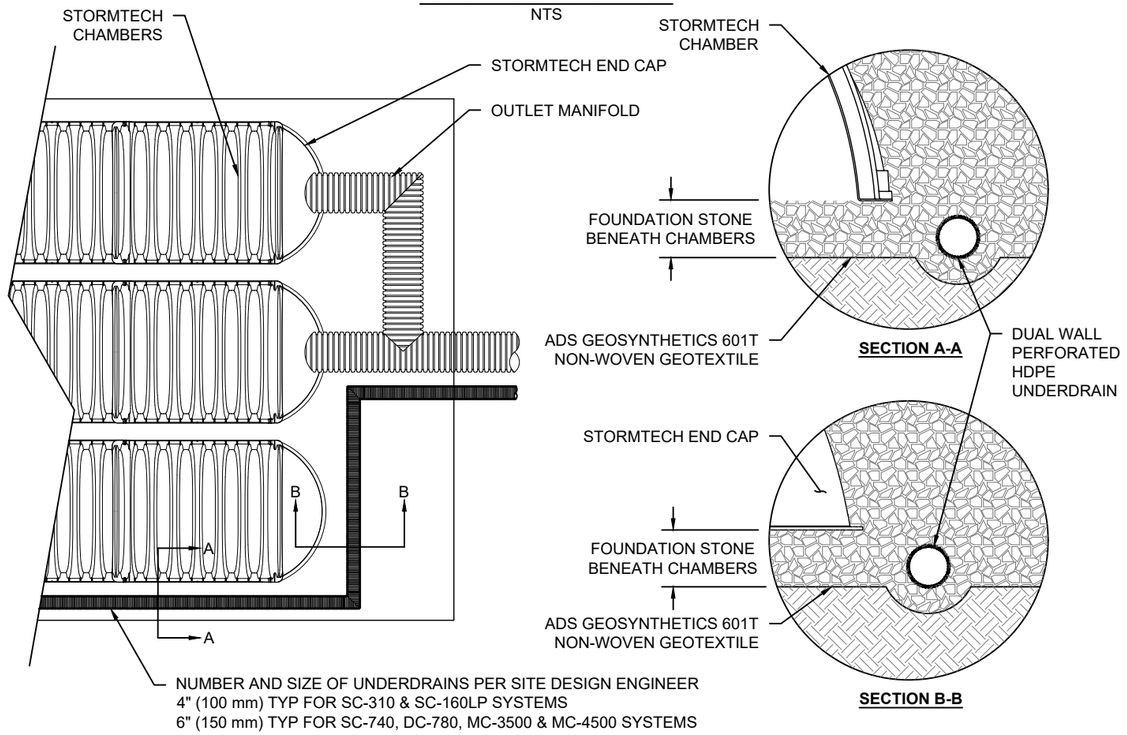
4 OF 5

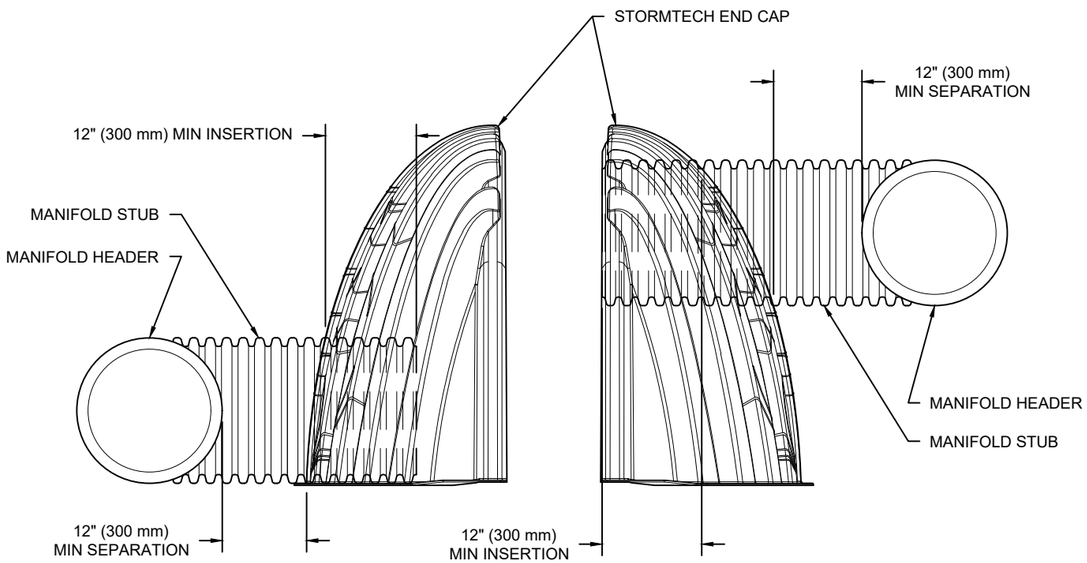
UNDERDRAIN DETAIL

NTS



MC-SERIES END CAP INSERTION DETAIL

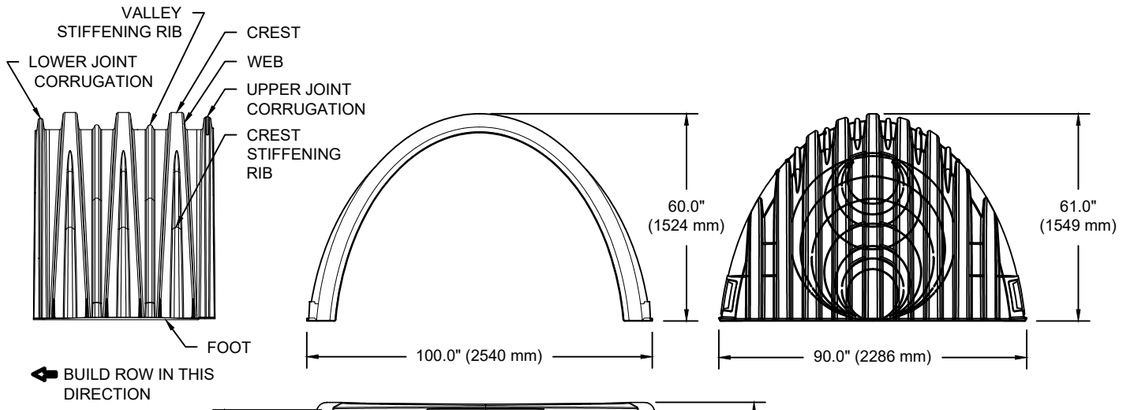
NTS



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

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

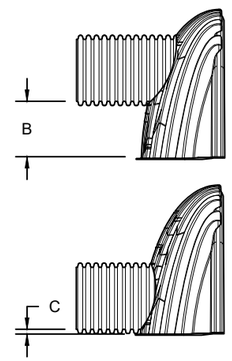
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

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

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

PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW			
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW			
MC4500IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24TW			
MC4500IEPP24B		---	2.26" (57 mm)
MC4500IEPP24BW			
MC4500IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC4500IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

WILDOMAR COMMONS
WILDOMAR, CA

DATE: 12/7/2020 | DRAWN: DL | CHECKED: N/A | PROJECT #:

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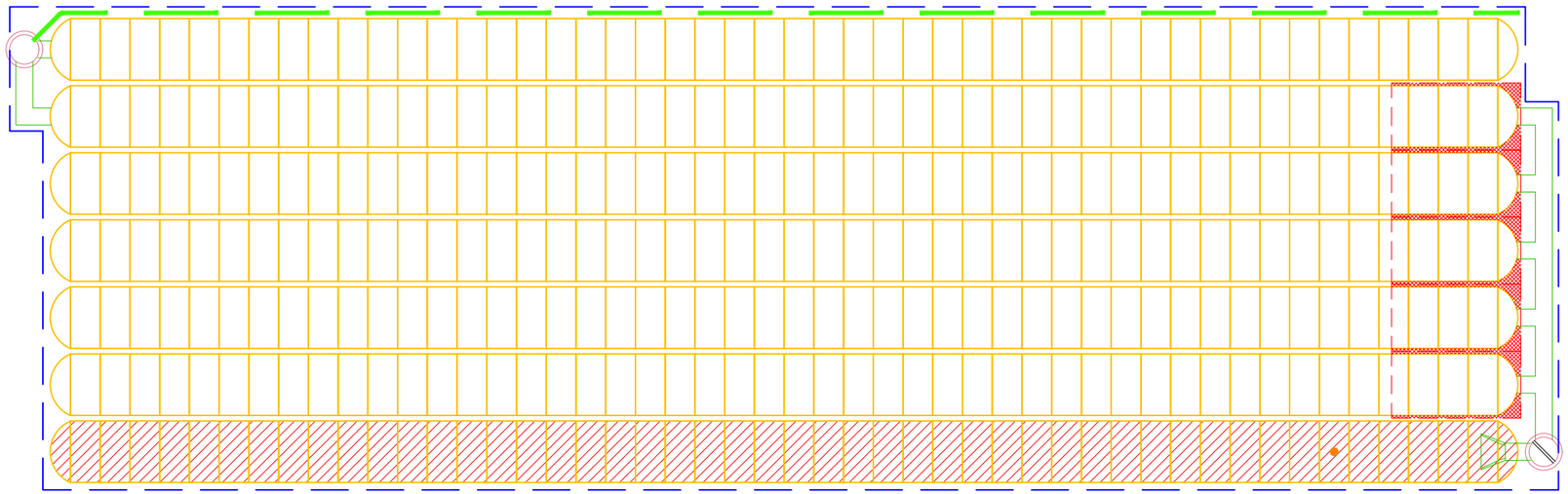
5 OF 5



Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Include a copy of the completed Pollutant Sources/Source Control Checklist used to document Source Control BMPs in Section H of this Template.

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section H of the 2018 SMR WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table H.1 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☑ **A.** On-site storm drain inlets	☑ Locations of inlets.	☑ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	☑ Maintain and periodically repaint or replace inlet markings. ☑ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☑ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☑ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☐ **B.** Interior floor drains and elevator shaft sump pumps		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

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.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features.	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	❑ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at: http://www.rcwatershed.org/about/materials-library/#1450469201433-f5f358c9-6008
❑ **F.** Food service	❑ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ❑ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	❑ Describe the location and features of the designated cleaning area. ❑ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	❑ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 Provide this brochure to new site owners, lessees, and operators.
❑ **G.** Refuse areas	❑ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ❑ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ❑ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	❑ State how site refuse will be handled and provide supporting detail to what is shown on plans. ❑ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	❑ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **H.** Industrial processes.	❑ Show process area.	❑ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	❑ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ❑ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	❑ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ **J.** Vehicle and Equipment Cleaning	☑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	☑ If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ☑ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 ☑ Car dealerships and similar may rinse cars with water only.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **K.** Vehicle/Equipment Repair and Maintenance	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ❑ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ❑ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations; "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

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **L.** Fuel Dispensing Areas	❑ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		❑ The property owner shall dry sweep the fueling area routinely. ❑ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **M.** Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **N.** Fire Sprinkler Test Water		❑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	❑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ❑ Boiler drain lines ❑ Condensate drain lines ❑ Rooftop equipment ❑ Drainage sumps ☑ Roofing, gutters, and trim. ❑ Other sources		❑ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ❑ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ❑ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ❑ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☑ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. ❑ Include controls for other sources as specified by local reviewer.	

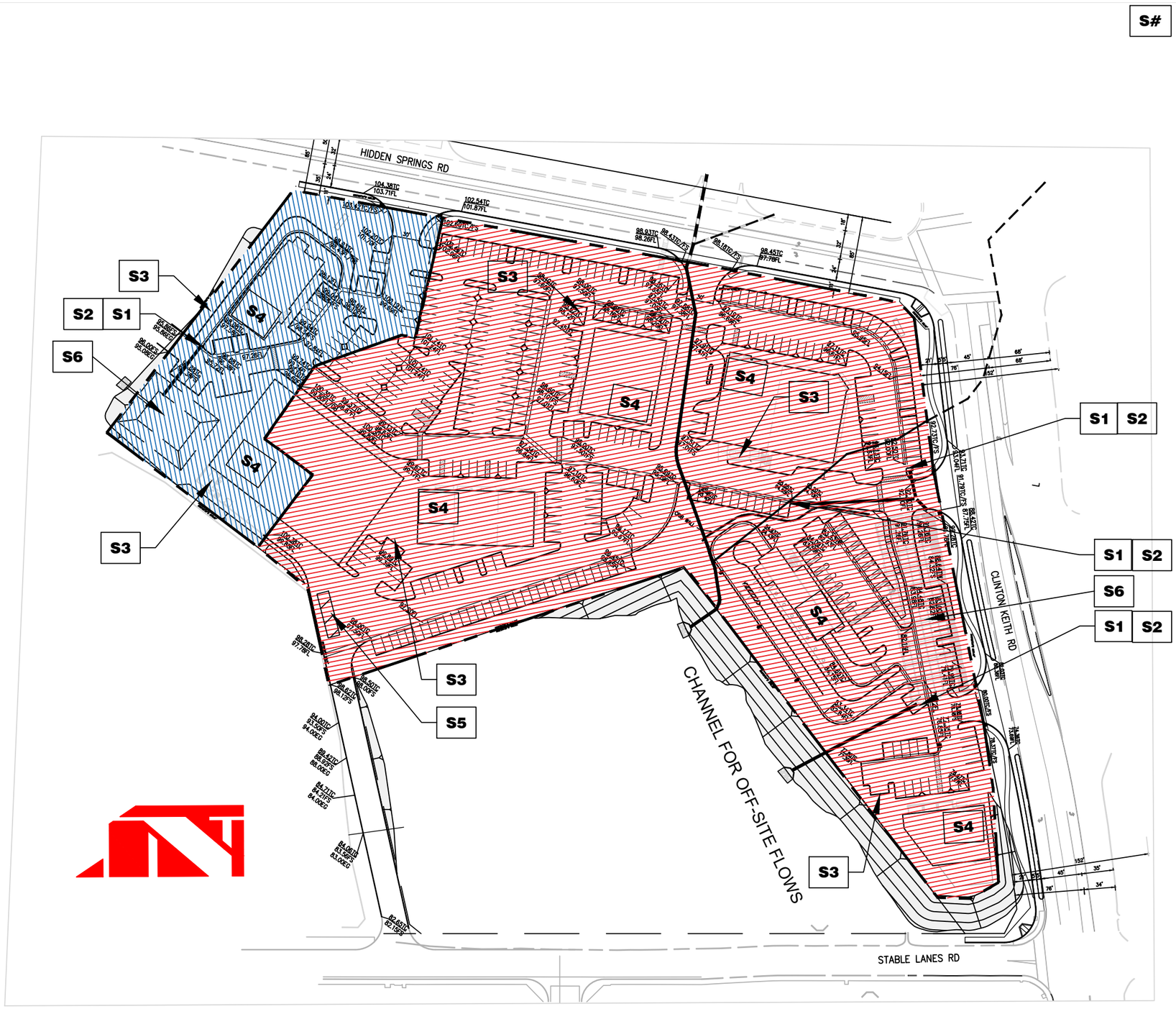
Appendix 8

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**
☑ **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



S#	SOURCE CONTROL SEE BMP'S ATTACHED FOR OPERATION AND MAINTENANCE PROCEDURES
S1	CATCH BASIN SIGNAGE SD-13
S2	BIOFILTER REPLACEMENT
S3	TRASH & WASTE STORAGE SEE SD-32
S4	IRRIGATION SMART CONTROLERS SEE SD-12 NEXT TO EA. BUILDING
S5	LANDSCAPE AREA DEPRESSION
S6	PROPOSED INFILTRATION BASIN SEE TC-11

CITY OF WILDOMAR
APN: 0411-182-04,07,08,10,14,&16

WATER QUALITY MANGEMENT PLAN (WQMP)

WILDOMAR COMMONS

DEVELOPED OPERATIONS & MAINTENANCE PLAN

BMP LOCATION EXHIBIT

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT B

NON-STRUCTURAL "GOOD HOUSEKEEPING" SOURCE CONTROL BMPS REQUIRED				
BMP Name/ Description Type	**Responsible Party(ies)** *or those that will perform tasks*	**BMP Implementation**	**Inspection Frequency & Schedule**	**Inspection Use (Name/date)**
1. BMP Maintenance & Funding	Owner	When BMP replacement(s) is required, the Owner shall order and provide materials to assigned personnel/staff.	Purchasing receipts and invoices are kept within this O&M Program	
2. Property Owner/Operator Awareness	Owner/Site General Manager	Owner will ensure he/she and any designated site operator(s) are familiar with this BMP Inspection Program and all requirements within, including but not limited to: 1) Keeping records of BMP Implementations, 2) Replacing, restoring, reporting damages to treatment BMPs.	Biannually for all employees, and within 2 months for new hires/designated managers.	
3. Employee Training/Education Program	Site appointed General Manager	Within 2 days for new hires and walk-thru of the site where treatment BMPs are located and restrictions. Within 2 months, a signed acknowledgement of site policies and restrictions.	Biannual training of site BMP policies for all employees	
4. Landscape Management	Owner per Contracted Service provider	Owner/site operator(s) shall ensure landscaping/Groundskeeping Service providers do not blow or sweep debris, cutting, leaves, etc., into treatment BMPs and/or City maintained right of ways. All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowing and fertilizer materials off paved areas weekly and dispose of properly.	Ongoing	
5. Litter/Debris Control	Owner per Contracted	Owner to ensure lids are secure, lidded, and consistent with City Ordinances.	Contracted Weekly.	

NON-STRUCTURAL "GOOD HOUSEKEEPING" SOURCE CONTROL BMPS REQUIRED				
BMP Name/ Description Type	**Responsible Party(ies)** *or those that will perform tasks*	**BMP Implementation**	**Inspection Frequency & Schedule**	**Inspection Use (Name/date)**
	Service provider	Contract with Landscaping/Groundskeeping service will include perimeter fencing and wind-blown debris.	Inspections conducted daily as part of site operations.	
Sweeping Private Streets/Parking	Owner per Contracted Service provider	Contract machine sweeping of parking areas and driveways. Sweeper Services shall include bi-annual oil/grease stains found in parking stalls. Removal shall be dry-swept and vacuumed (not chemical/water sprayed) because parking drains to bioretention basin.	Monthly	
Activity Restrictions	Owner		Ongoing	

BMP Inspection and Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities	Inspection Use (Name/date)
Retention Basin	Owner	Clear weeds and vegetation	Annually	
SD-12 (Efficient Irrigation)	Landscape Maintenance	Owner shall inspect or hire landscape maintenance company to inspect irrigation systems and control systems to ensure they are operating efficiently in order to minimize water usage.	Monthly	
SD-13 (Storm Drain Signage)	Owner	Owner shall inspect and maintain the legibility of all stencils, markings and signs.	Bi-annually	
SD-32 (Trash Storage Areas)	Owner	The owner shall inspect and maintain screens, covers, signs for legibility and all trash enclosures and bins for leakage and detioration of underline pavement.	Bi-monthly	
SD-34 (Outdoor Material Storage Areas)	Owner	The owner shall inspect storage areas for trash and spills in order to maintain a clean storage area to ensure that stormflows do not carry debries into the stormwater system.	Bi-monthly	
SD-33 (Vehicle Washing Area)	Owner/ Operator	Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.	Bi-Monthly	

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

BMP OPERATION & MAINTENANCE LOG

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed
SD-10 (Site Design & Landscape Planning)	
SD-12 (Efficient Irrigation)	
SD-13 (Storm Drain Signage)	
SD-32 (Trash Storage Areas)	
SD-33 (Vehicle Washing Area)	
SD-34 (Outdoor Material Storage Areas)	

Note: annual cost to maintain the post construction BMPs shall be determined by the owner.

Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.
- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Vehicle Washing Areas SD-33

Photo Credit: Geoff Brosseau

Design Objectives

- ☑ Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- ☑ Collect and Convey

Description

Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of metals, oil and grease, solvents, phosphates, and suspended solids to wash waters that drain to stormwater conveyance systems.

Approach

Project plans should include appropriately designed area(s) for washing-steam cleaning of vehicles and equipment. Depending on the size and other parameters of the wastewater facility, wash water may be conveyed to a sewer, an infiltration system, recycling system or other alternative. Pretreatment may be required for conveyance to a sanitary sewer.

Suitable Applications

Appropriate applications include commercial developments, restaurants, retail gasoline outlets, automotive repair shops and others.

Design Considerations

Design requirements for vehicle maintenance are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. Design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Areas for washing/steam cleaning should incorporate one of the following features:

- Be self-contained and/or covered with a roof or overhang
- Be equipped with a clarifier or other pretreatment facility
- Have a proper connection to a sanitary sewer

- Include other features which are comparable and equally effective

CAR WASH AREAS - Some jurisdictions' stormwater management plans include vehicle-cleaning area source control design requirements for community car wash racks in complexes with a large number of dwelling units. In these cases, wash water from the areas may be directed to the sanitary sewer, to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

Depending on the jurisdiction, developers may be directed to divert surface water runoff away from the exposed area around the wash pad (parking lot, storage areas), and wash pad itself to alternatives other than the sanitary sewer. Roofing may be required for exposed wash pads.

It is generally advisable to cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area. Sumps or drain lines can be installed to collect wash water, which may be treated for reuse or recycling, or for discharge to the sanitary sewer. Jurisdictions may require some form of pretreatment, such as a trap, for these areas.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment.

Additional Information

Maintenance Considerations

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Outdoor Material Storage Areas SD-34

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutant
- Collect and Convey

Description

Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach

Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design

requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

Designing New Installations

Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.
- The storage area should be paved and sufficiently impervious to contain leaks and spills.
- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.
- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The following protocols are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook).
- Keep accurate maintenance logs to evaluate BMP implementation.

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.

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- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel and dispose of litter in the trash.

Surface cleaning

- Use dry cleaning methods (e.g. sweeping or vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- If water is used follow the procedures below:
  - Block the storm drain or contain runoff.
  - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- When cleaning heavy oily deposits:
  - Use absorbent materials on oily spots prior to sweeping or washing.
  - Dispose of used absorbents appropriately.

Surface Repair

- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff.
- Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc., where applicable. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of the parking facilities and stormwater conveyance systems associated with them on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, nad implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large, construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities on a regular basis to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

SC-43 Parking/Storage Area Maintenance

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Use only as much water as necessary for dust control, to avoid runoff.

References and Resources

http://www.stormwatercenter.net/

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) http://www.basma.org

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Oldcastle Infrastructure™
A CRH COMPANY

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

DRAINAGE PROTECTION SYSTEMS
DPS
A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.