Appendix 10.0

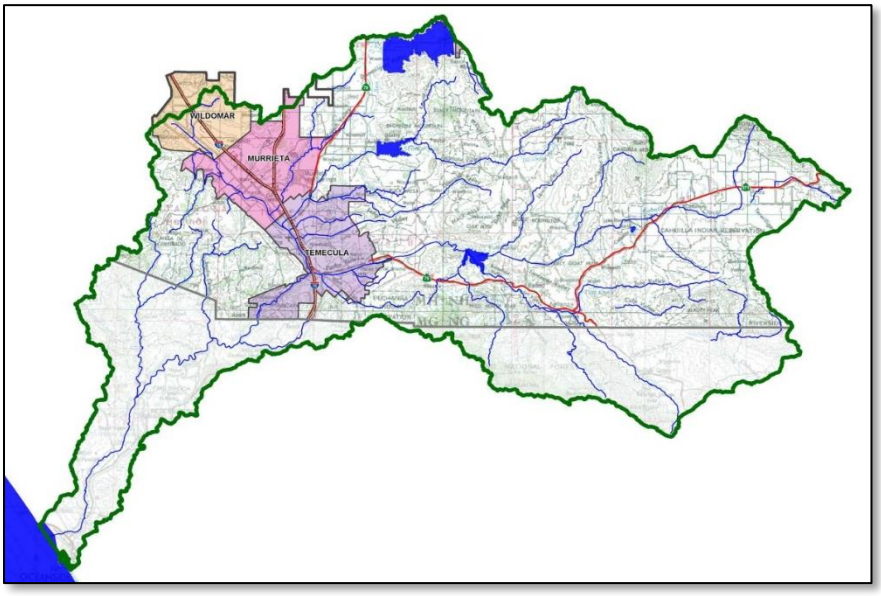
Project Specific Water Quality Management Plan

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:	Won Meditation Center	**Prepared for:**	Won Meditation 19993 Grand Ave/ APN: 382-140-002 & 382-150-001
Development No:	PAR NO. 19-0044	**Prepared by:**	Jirayus Pukkanasut, PE 15038 Clark Ave Hacienda Heights, CA 91745 (714) 723-9703
City Project No:	PAR NO. 19-0044	**WQMP Type:**	☒ **Preliminary (entitlement submittal)** ☐ **Final**



Original Date Prepared: 10/21/19

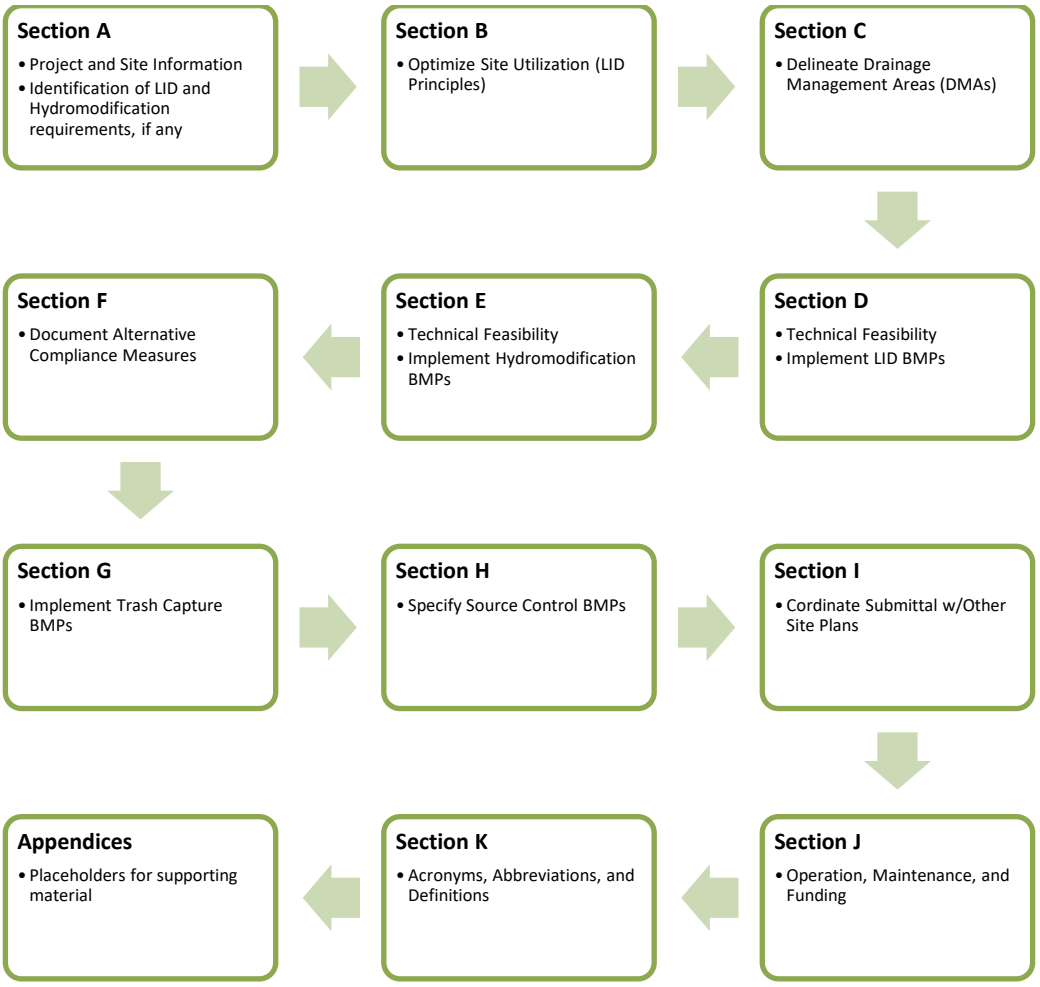
Revision Summary (post WQMP acceptance):

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 Won Meditation Center by Pacific Geotech, Inc for the Won Meditation Center 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."

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

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices (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**."

Preparer's Signature	10/24/19 Date
Jirayus Pukkanasut Preparer's Printed Name	Civil Engineer Preparer's Title/Position

Preparer's Licensure:

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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:	Non – Profit Organization	
Planning Area:	R-R	
Community Name:	Lake Elsinore	
Development Name:	Won Meditation/Retreat Center	
PROJECT LOCATION		
Latitude & Longitude (DMS):	33°36'47.5"N 117°18'31.0"W	
Project Watershed and Sub-Watershed:	Santa Margarita River Wildomar LaCresta	
24-Hour 85th Percentile Storm Depth (inches):	0.75	
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)	
APN(s):	382-140-002 & 382-150-001	
Map Book and Page No.:	Parcel 1 PM 9608 book 47 page 46	
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)		Meditation Hall
Proposed or Potential SIC Code(s)		N/A
Existing Impervious Area of Project Footprint (SF)		14,941 sf
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement		61,212 sf
Total Project Area (ac)		21.76 ac
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)		C

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, Iron, Manganese, Nitrogen, Phosphorus, Toxicity	AGR, COLD,COM, REC-1, PRO, PROC,MUN, REC-2, RARE	4 miles
Upper SMR	Indicator Bacteria, Iron, Manganese, Nitrogen	AGR, COLD, COM, REC-1, PRO, PROC,MUN, REC-2, RARE	13.5 miles
Lower SMR	Benthic Community Effects, Chlofpyrifos, Nitrogen, Toxicity	AGR, COLD, COM, REC-1, PRO, PROC,MUN, REC-2, RARE	17 miles

A.3 Drainage System Susceptibility to Hydromodification

Using Table A-2 below, list in order of the point of discharge at the project site down to the Santa Margarita River[2], each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, and any exemption (if applicable). Based on the results, summarize the applicable

[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.

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
N/A	N/A	N/A	☐ Y ☒ N
			☐ Y ☐ N
			☐ Y ☐ N
Summary of Performance Standards			
☐ **Hydromodification Exempt** – Select if "Y" is selected in the Hydromodification Exempt column above, project is exempt from hydromodification requirements. ☒ **Not Exempt**-Select if "N" is selected in any row of the Hydromodification Exempt column above. Project is subject to hydrologic control requirements and may be subject to sediment supply requirements.			

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

Table A-3 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☐ Y	☒ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside 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.

☒ 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.

☒ 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.	
☒ 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.	
☒ Yes ☐ No ☐ N/A	**Did you identify and disperse runoff to adjacent pervious areas or small collection areas?** Look for opportunities to direct runoff from impervious areas to adjacent landscaping, other pervious areas, or small collection areas where such runoff may be retained. This is sometimes referred to as reducing Directly Connected Impervious Areas. • Direct roof runoff into landscaped areas such as medians, parking islands, planter boxes, etc., and/or areas of pervious paving. Instead of having landscaped areas raised above the surrounding impervious areas, design them as depressed areas that can receive Runoff from adjacent impervious pavement. For example, a lawn or garden depressed 3"-4" below surrounding walkways or driveways provides a simple but quite functional landscape design element. • Detain and retain runoff throughout the site. On flatter sites, smaller Structural BMPs may be interspersed in landscaped areas among the buildings and paving. • On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and LID BMPs and/or Hydrologic Control BMPs in lower areas. Low retaining walls may also be used to create terraces that can accommodate LID BMPs. Wherever possible, direct drainage from landscaped slopes offsite and not to impervious surfaces like parking lots. • Reduce curb maintenance and provide for allowances for curb cuts. • Design landscaped areas or other pervious areas to receive and infiltrate runoff from nearby impervious areas. • Use Tree Wells to intercept, infiltrate, and evapotranspire precipitation and runoff before it reaches structural BMPs. Tree wells can be used to limit the size of Drainage Management Areas that must be treated by structural BMPs. Guidelines for Tree Wells are included in the Tree Well Fact Sheet in the LID BMP Design Handbook.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.	

Project- Specific WQMP Site Design BMP Checklist	
☒ 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.	
☐ 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. *Not enough demand for reuse. Proposed infiltration.*	
☒ Yes ☐ No ☐ N/A	**Did you keep the runoff from sediment producing pervious area hydrologically separate from developed areas that require treatment?** Pervious area that qualify as self-treating areas or off-site open space should be kept separate from drainage to structural BMPs whenever possible. This helps limit the required size of structural BMPs, helps avoid impacts to sediment supply, and helps reduce clogging risk to BMPs.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.	

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
1-A	Roof Guest House 1 (imp)	3,433	To be Determined in Step 3
1-B	Roof Guest House 2 (imp)	2,878	
1-C	Roof Meditation Hall/ patio (imp)	5,631	
1-D	AC Driveway (imp)	27,875	
1-E	SIDEWALK (imp)	8,911	
1-F	PATIO(imp)	8,764	
BMP-1	DG Parking Area (bmp)	18,245	
1-G	LANDSCAPE(per)	2,970	

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)
N/A			

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] = $[B] + \frac{[B]\cdot[C]}{[A]}$
Not used						

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]
Not Used							

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

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

(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 1	BMP 1

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:		

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

[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.

assessed in Section D.2. Summarize concerns identified in the Geotechnical Report, if any, that resulted in a "YES" response above in the table below.

Table D-2 Geotechnical Concerns for Onsite Infiltration

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

D.2 Biofiltration Applicability- NOT USED

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

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

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

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.

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

	☐ 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)

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 1	☒	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐

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?	
b) When in the entitlement process were other investigations conducted (e.g., groundwater quality, water rights) to	

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

evaluate infiltration feasibility?	
c) What was the scope and results of testing, if conducted, or rationale for why testing was not needed to reach findings?	
d) What public health and safety requirements affected infiltration locations?	
e) What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	
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?	
g) What site design alternatives were considered to achieve infiltration or partial infiltration on site?	
h) What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	
i) What LID Principles (site design BMPs) were included in the project site design?	

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*		
	[A]		[B]	[C]	[A] x [C]			
1-A	3,433	Roofs	1	0.89	3062.2			
1-B	2878	Roofs	1	0.892	2486			
1-C	5631	Roofs	1	0.892	5022.9			
1-D	8764	Concrete or Asphalt	1	0.892	7817.5			
1-E	8911	Concrete or Asphalt	1	0.892	7948.6	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
1-F	27875	Concrete or Asphalt	1	0.892	24864.5			
1-G	2970	Ornamental Landscaping	0.1	0.110458	328.1	*0.75*	*3210*	*6251*
	$A_T = \Sigma[A]$	***60,371***			Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]

[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)
BMP1	DMA1	INFILTRATION	3,210	6,251

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)
BMP 1	DMA1	INFILTRATION	☐	0.0698	0.42	72
			☐			
			☐			
			☐			

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

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential Pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must be selected to address the Project Priority Pollutants of Concern (identified above) and meet the acceptance criteria described in Section 2.3.7 of the SMR WQMP. Documentation of acceptance criteria must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table F-3 Treatment Control BMP Selection

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

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

F.3 Sizing Criteria

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

Table F-4 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
						Design Storm (in)	*Design Flow Rate (cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

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

F.4 Hydrologic Performance Standard – Alternative Compliance Approach

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

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

☐ Offsite Hydrologic Control Management within the same channel system

Insert narrative description here

☐ In-Stream Restoration Project

Insert narrative description here

For Offsite Hydrologic Control BMP Option

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

Table F-5 Offsite Hydrologic Control BMP Sizing

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

For Instream Restoration Option

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

Section G: Implement Trash Capture BMPs

The 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
Pesticide		Maintain landscaping using minimum or no pesticides.
Food Preparation Area	Connect kitchen inlets to grease interseptor	See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.

Trash Storage	Trash bin lid shall be closed at all time. Trash will be pick up once a week State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	Construct roof cover trash enclosure
Plazas, Sidewalks and Parking Lots	Sweeping once a week	Sweeping once a week

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)
Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.
Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.
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Insert text here describing how each included	Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.

Site Design BMP will be implemented.		
Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.	Insert text here describing how each included Site Design BMP will be implemented.

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: Insert text here describing how each included Site Design BMP will be implemented.

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.

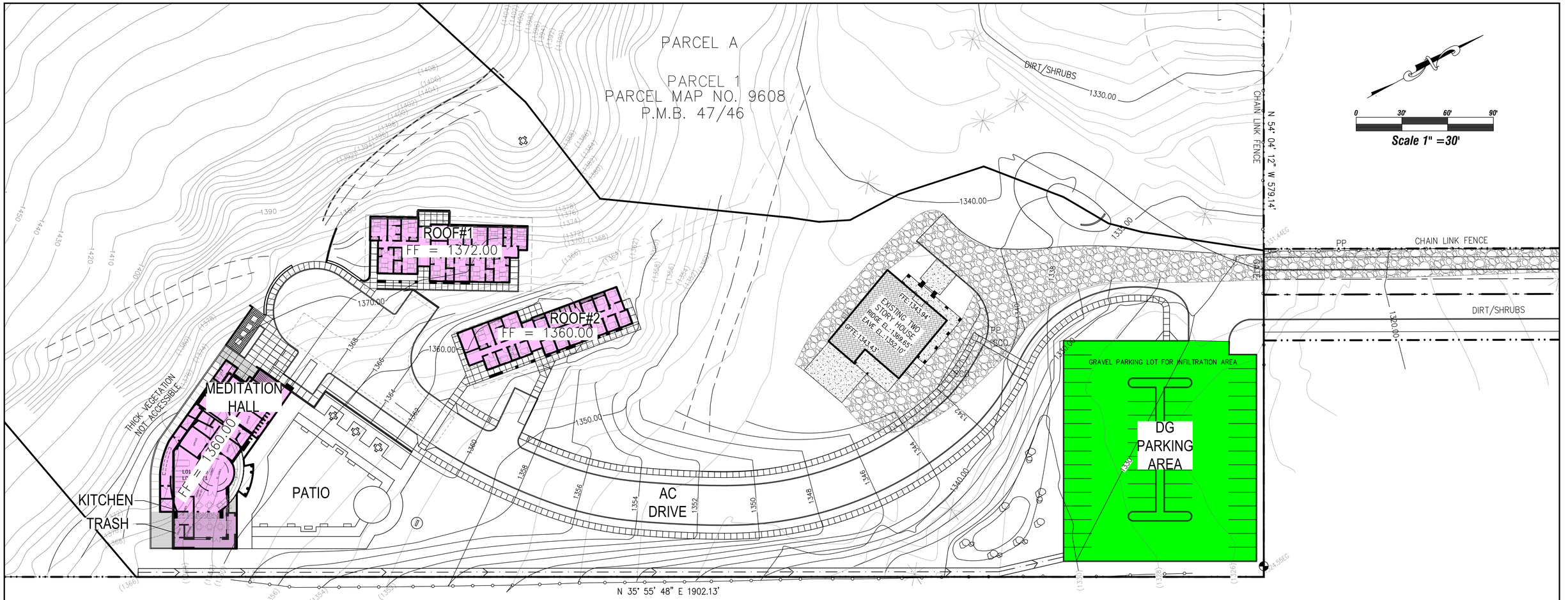
Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Structural 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.

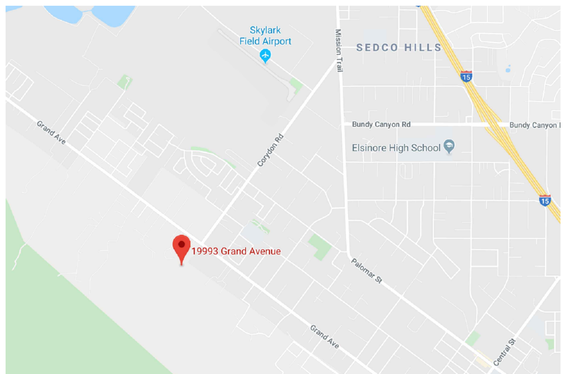
Appendix 1: Maps and Site Plans

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





VICINITY MAP

POST DEVELOPMENT DMA

DESCRIPTION	PERVIOUS (SF)	IMPERVIOUS (SF)	
EX. BLDG		3,720	
ROOF #1		3,433	
ROOF #2		2,878	
MEDITATION HALL		5,631	
PATIO		8,764	
SIDEWALK		8,911	
AC DRIVE		27,875	
DG PARKING AREA	18,245		
LANDSCAPE	2,970		
TOTAL DISTURBED AREA	**21,215**	**61,212**	**82,427**
EX. GROUND TO REMAIN	865,311		
TOTAL	**886,526**	**61,212**	**947,738**
AC	**20.35**	**1.41**	**21.76**
%	**0.94**	**0.06**	

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MARK	BY	DATE	REVISIONS	APPR.	DATE

ENGINEER | CITY

CITY OF WILDOMAR
ACCEPTED BY:
Date:
DANIEL A. YORK, RCE NO. 43212
CITY ENGINEER
ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

SEAL-ENGINEER:

PREPARED BY: JIRAYUS PUKKANASUT, P.E.
R.C.E. No. 73728 EXP. 06/30/21

BENCHMARK:
Elevation = 1265.04
Datum = NGVD29
BENCHMARK # EL-5-80

THIS SURVEY WAS PERFORMED BY CHRISTENSEN SURVEYING & MAPPING, INC. ON 2-22-2011, UPDATED BY SAM A. SOLIVEN, PLS ON 7/8/2019 & 7/29/2019
SMH RIM ON CORIDON RD & GRAND AVE ELEV: 1302.01 WAS USED AS COMMON BASIS OF ELEVATION

SCALE:
H: As Noted V: As Noted

(PAR 19-0044) (GP19-xxxx)

CITY OF WILDOMAR
WON MEDITATION CENTER
PRELIMINARY WQMP
19993 GRAND AVENUE

SHEET No. 1
OF 2 SHT

10/25/19

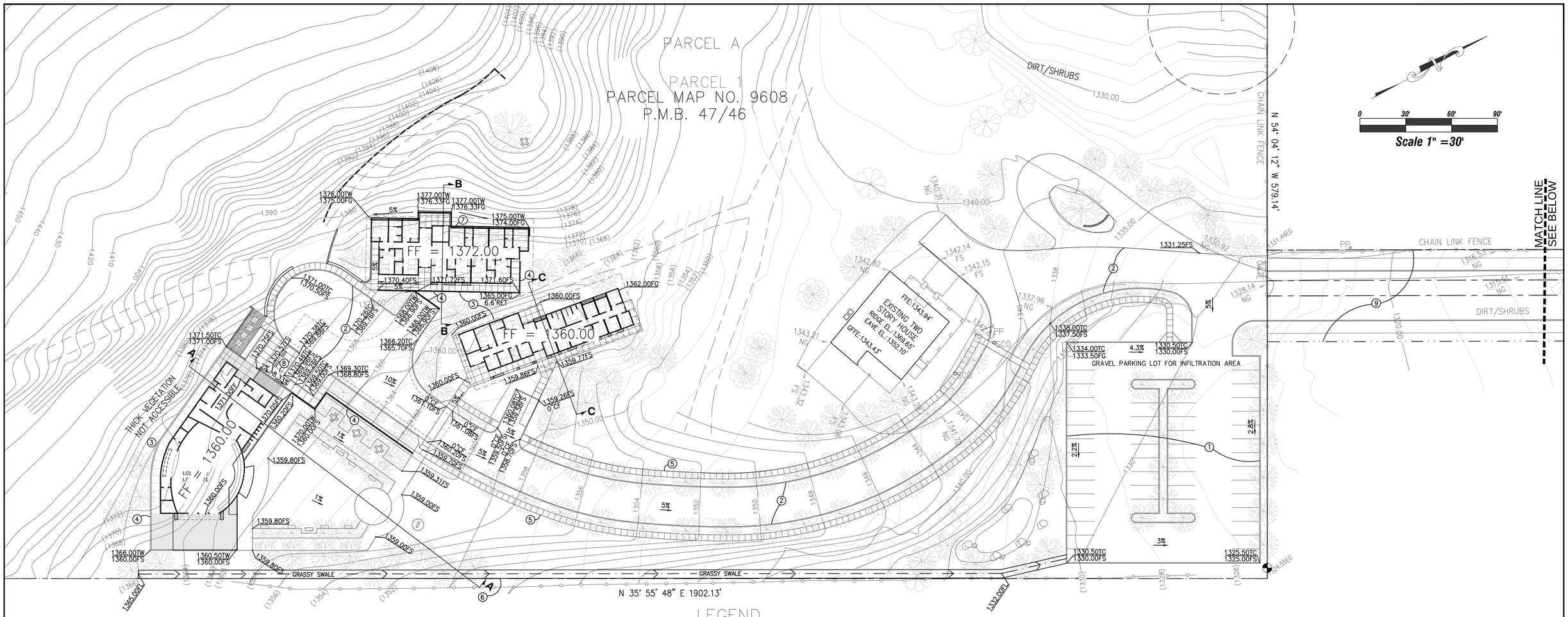
Appendix 2: Construction Plans

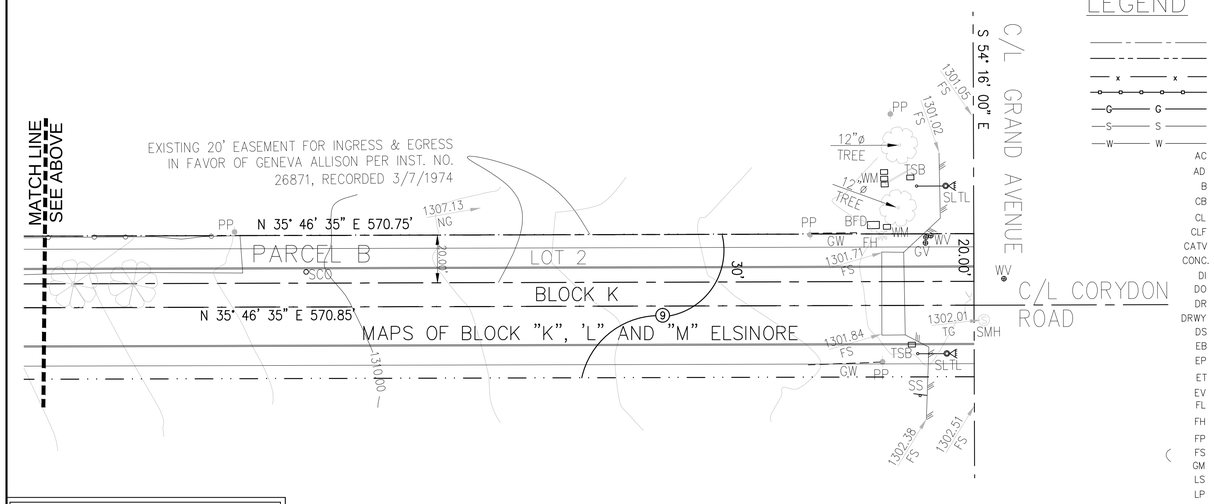
Grading and Drainage Plans

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.





LEGEND

	CENTER LINE	MH	MANHOLE
	PROPERTY LINE	MB	MAIL BOX
x x	WROUGHT IRON FENCE	PL	PROPERTY LINE
	WOODEN FENCE	PP	POWER POLE
G G	GAS LINE	PB	PULL BOX
	SEWER LINE	SMH	SANITARY SEWAGE MANHOLE
W W	WATER LINE	SS	STREET SIGN/STOP SIGN
AC	ASPHALT CONCRETE	SDCB	STORM DRAIN CATCH BASIN
AD	AREA DRAIN	SDMH	STORM DRAIN MAN HOLE
B	BOLLARD	SGN	SIGN
CB	CATCH BASIN	TC	TOP OF CURB
CL	CENTERLINE	TW	TOP OF WALL
CLF	CHAIN LINK FENCE	TG	TOP OF GRATE
CATV	CABLE TV PULL BOX	WH	WATER HEATER
CONC.	CONCRETE	WB	WATER BIB
DI	DRAINAGE INLET	WM	WATER METER
DO	DRAINAGE OUTLET	WV	WATER VALVE
DR	DOOR	(100.00)	RECORD DISTANCE
DRWY	DRIVEWAY	100.00(m)	MEASURED DISTANCE
DS	DOWNSPOUT	100.00(c)	CALCULATED DISTANCE
EB	ELECTRIC BOX		LIGHT STD
EP	EDGE OF PAVEMENT		POWER POLE
ET	ELECTRIC TRANSFORMER		SIGN
EV	ELECTRIC VAULT		CATCH BASIN
FL	FLOW LINE		SSMH (SANITARY SEWER MAN HOLE) OR UTILITY MAN HOLE
FH	FIRE HYDRANT		FIRE HYDRANT
FP	FLAGPOLE		STREET LIGHT
FS	FINISH SURFACE		PINE TREE
GM	GAS METER		
LS	LANDSCAPE		
LP	LIGHT POLE		

CONSTRUCTION NOTE

1. CONSTRUCT GRAVEL PARKING LOT FOR INFILTRATION AREA
2. CONSTRUCT AC/AB DRIVE LANE PER SOIL REPORT
3. GRADE 2:1 MAX
4. CONSTRUCT RETAINING WALL BY SEPARATE PERMIT
5. CONSTRUCT PERVIOUS CONC. WALKWAY FOR INCIDENTAL ONLY
6. CONSTRUCT 6' WIDE AND 1' DEEP GRASSY SWALE
7. BUILDING RETAINING WALL PER BUILDING PERMIT
8. CONSTRUCT ADA RAMP WITH HANDRAIL
9. CONSTRUCT CORYDON ROAD PER COUNTY STD 106

EARTHWORK QUANTITIES

CUT: 3,593 CY
FILL: 5,760 CY

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

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MARK	BY	DATE	REVISIONS	APPR.	DATE

ENGINEER — CITY

CITY OF WILDOMAR
ACCEPTED BY:

Date:

DANIEL A. YORK, RCE NO. 43212
CITY ENGINEER

ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

SEAL-ENGINEER:

PREPARED BY: JIRAYUS PUKKANASUT, P.E.
R.C.E. No. 73728 EXP. 06/30/21

BENCHMARK:
Elevation = 1265.04
Datum = NGVD29
BENCHMARK # EL-5-80

THIS SURVEY WAS PERFORMED BY CHRISTENSEN SURVEYING & MAPPING, INC. ON 2-22-2011

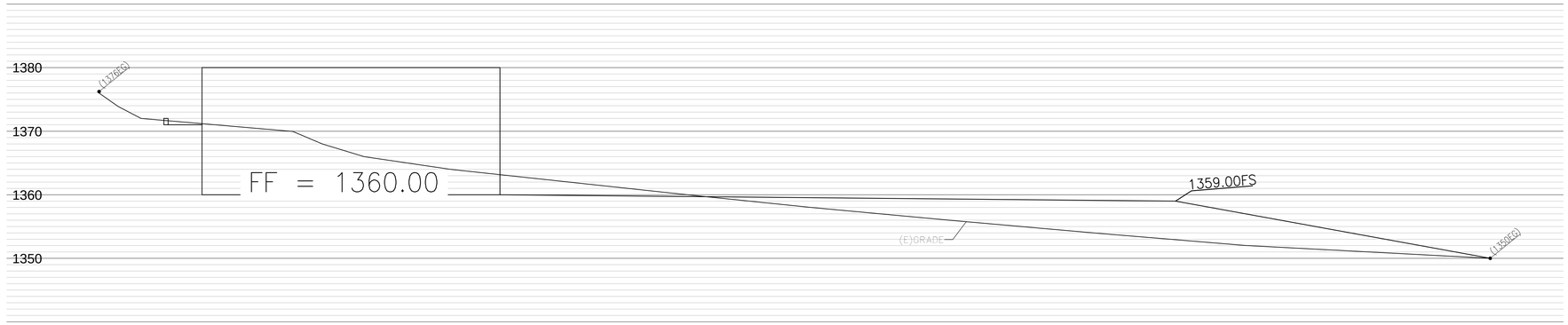
SCALE:
H: As Noted V: As Noted

(PAR 19-0044) (GP19-xxxx)

CITY OF WILDOMAR
WON MEDITATION CENTER
PRELIMINARY GRADING PLAN
19993 GRAND AVENUE

SHEET No. 1 OF 2 SHT

10/17/19



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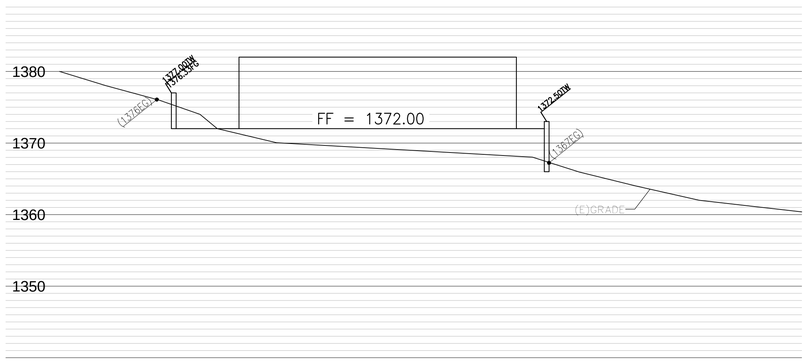

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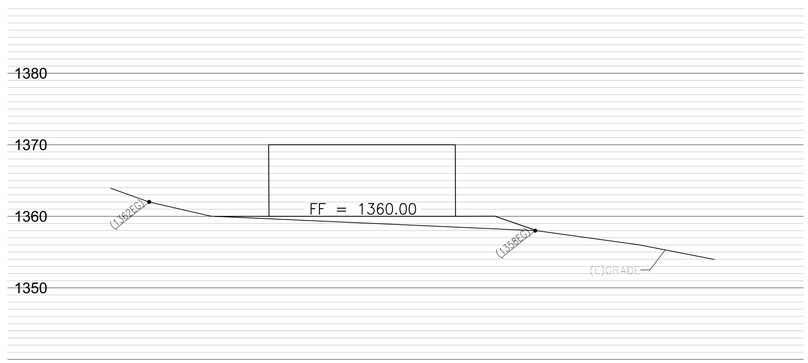

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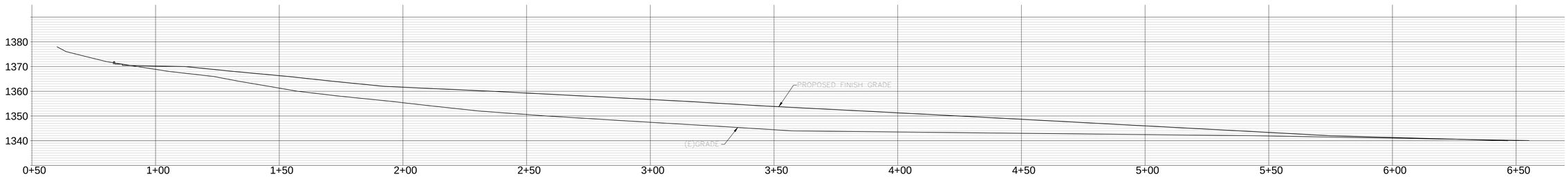

ACCESS DRIVE SECTION
SCALE: 1"=20'

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MARK	BY	DATE	REVISIONS	APPR.	DATE

ENGINEER | CITY

CITY OF WILDOMAR
ACCEPTED BY:
Date:
DANIEL A. YORK, RCE NO. 43212
CITY ENGINEER
ACCEPTANCE AS TO CONFORMANCE WITH APPLICABLE CITY STANDARDS AND PRACTICES

SEAL-ENGINEER:

PREPARED BY: JIRAYUS PUKKANASUT, P.E.
R.C.E. No. 73728 EXP. 06/30/21

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Elevation = 1265.04
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BENCHMARK # EL-5-80

THIS SURVEY WAS PERFORMED BY CHRISTENSEN SURVEYING & MAPPING, INC. ON 2-22-2011

SCALE:
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(PAR 19-0044) (GP19-xxxx)

CITY OF WILDOMAR
WON MEDITATION CENTER
CROSS SECTIONS
19993 GRAND AVENUE

SHEET No. 2
OF 2 SHT

10/17/19

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.

GEOTECHNICAL INVESTIGATION AND PERCOLATION TEST RESULTS

WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

ANDMORE PARTNERS, INC.
LOS ANGELES, CALIFORNIA

OCTOBER 14, 2019
PROJECT NO. T2877-22-02

Project No. T2877-22-02
October 14, 2019

Andmore Partners Inc.
3530 Wilshire Boulevard, Suite 1830
Los Angeles, California 90010

Attention: Mr. Sean Mo

Subject: GEOTECHNICAL INVESTIGATION
AND PERCOLATION TEST RESULTS
WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA

Dear Mr. Mo:

In accordance with your authorization of Proposal No. IE-2456, Geocon West Inc. (Geocon) herein submits the results of our geotechnical investigation and percolation test results for the subject site. The accompanying report presents the results of our study and conclusions and recommendations pertaining to the geotechnical aspects of the proposed project. The site is considered suitable for development provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON WEST, INC.

PROFESSIONAL GEOLOGIST
PAUL D. THERIAULT
No. 2374
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Paul D. Theriault
CEG 2374

Andrew T. Shoashekan
EIT 151871

REGISTERED PROFESSIONAL ENGINEER
JOSEPH J. VETTEL
No. 2401
GEOTECHNICAL
STATE OF CALIFORNIA

Joseph J. Vettel
GE 2401

PDT:AS:LAB:JV:hd

(e-mail) Addressee

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

GEOTECHNICAL INVESTIGATION
AND PERCOLATION TEST RESULTS

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation and percolation testing results for the meditation center proposed at 19993 Grand Avenue, in Lake Elsinore, California (see *Vicinity Map*, Figure 1). The purpose of the geotechnical investigation and percolation testing was to evaluate the surface and subsurface soil conditions and general site geology, and to identify geotechnical constraints that may affect development of the property including faulting, liquefaction and seismic shaking based on the 2016 California Building Code (CBC) seismic design criteria. In addition, we are providing recommendations for remedial grading, shallow foundations, concrete slab-on-grade, concrete flatwork, preliminary pavement sections, lateral loading, and retaining walls. This investigation also includes a review of readily available published and unpublished geologic literature (see *List of References*).

The scope of this investigation included performing a site reconnaissance, field exploration, laboratory testing, engineering analyses, and preparation of this report. We performed our field investigation on September 16 and 17, 2019 by excavating nine backhoe test pits and two percolation holes 2 to 15 feet below the existing ground surface. The *Geologic Map*, Figure 2, presents the approximate locations of the test pits. *Appendix A* provides a detailed discussion of the field investigation including logs of the test pits and percolation test results. Details of the laboratory tests and a summary of the test results are presented in *Appendix B* and on the test pit logs in *Appendix A*.

Recommendations presented herein are based on analyses of data obtained from our site investigation and our understanding of proposed site development. If project details vary significantly from those described herein, Geocon should be contacted to evaluate the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located at 19993 Grand Avenue in the City of Lake Elsinore, California, and consists of a 16.4-acre irregular shaped parcel (APN # 382-140-002). A single-family residence is located in the southeast portion of the site. Access to the site is through a gated driveway along the eastern boundary, southwest of the intersection of Grand Avenue and Corydon Road.

The site is bounded by unincorporated Riverside County on the west and south, the City of Wildomar on the east and south, and rural residences within the City of Lake Elsinore on the north. Located in the foothills of the Santa Ana Mountains, the property has moderately high relief with granitic slopes descending to the east. Maximum heights in the area are approximately 1602 feet above mean sea level (MSL) at inclinations of approximately 2.3 to 1 (horizontal to vertical). In the area of proposed improvements, the site drains to the east. Vegetation consists of shrubs, grasses, and sparse trees throughout the majority of the property at the time of our field work. Elevations in the vicinity of the proposed structures range from approximately 1,376 feet above MSL in the northwest to approximately 1,355 feet above MSL in the southeast. The existing elevations at the proposed parking lot in the southeast corner of the site range from 1,334 feet above MSL to 1,325 feet above MSL.

The proposed development is currently planned to include a meditation center with a two-story main building, two multi-room guest houses, and associated improvements. The proposed construction will be limited to approximately three-acres, including a parking lot and access roads on the southwest flank of a northwest trending ridge. Plans for the proposed development were provided by Andmore Partners. The proposed structures and pertinent site details are depicted on the *Geologic Map* (see Figure 2).

We expect that the construction will include wood or light gauge steel framed buildings supported on spread footing foundations and with concrete slab-on-grade floors. We expect column loads will be up to 125 kips and wall loads will be up to 5 kips per linear foot. Preliminary geotechnical recommendations for design of the structure are based on these assumptions and provided herein. If structural improvements vary from our description, Geocon should be contacted to provide updated geotechnical recommendations.

The site descriptions and proposed development are based on a reconnaissance, review of published geologic literature, our field investigation, a review of the plans, and discussions with you. If development plans differ from those described herein, Geocon should be contacted for review of the plans and possible revisions to this report.

3. GEOLOGIC SETTING

The property is located in the northern part of the Peninsular Ranges Geomorphic Province, consisting of northwest-trending, predominately Cretaceous-age granitic mountain ranges bisected by alluvial, fault-controlled valleys. Quaternary- to Tertiary-age sediments flank the ranges, and lie at depth beneath the Holocene-age alluvium-filled valleys. The Province is further characterized by relatively stable structural blocks bound by active faulting.

Two distinct, relatively stable structural blocks within the Province, the Santa Ana Block to the west and Perris Block to the east, are bisected by the Elsinore fault zone (Woodford et al., 1971). The Santa Ana block is dominated by the Mesozoic-age undifferentiated low-grade metamorphic rocks and Cretaceous-age crystalline rocks that make up the Santa Ana Mountains in the vicinity of the site. The bedrock is unconformably overlain by Miocene-age basalt flows. Flanking the relatively steep, east facing slopes that define the western edge of the Elsinore fault zone, are Pleistocene-age fanglomerate and sandstone. The eastern edge of the zone is less pronounced, with scarps in the low-lying sandstone hills and buried by young alluvial deposits. The Perris block, bound by the Elsinore fault zone on the West and San Jacinto fault zone on the east, is dominated by Mesozoic-age metasedimentary rocks, Cretaceous-age crystalline ranges, and Pleistocene-age sedimentary rocks (Woodford et al. 1971).

Locally, several Holocene-age alluvium-filled valleys separate the older units. The subject site is on the western flanks of the Elsinore Valley. The Elsinore fault zone in the area of the property is complex (Geocon West, 2019). Based on a review of published geologic maps of the area, the site is underlain by Cretaceous-age granitic rocks (Kennedy, 1977; Mann, 1955) and Holocene-age alluvial deposits (Kennedy, 1977; CDMG, 1977). The granular deposits were derived primarily from the uplifted Elsinore and Santa Ana Mountains just west of the property (CDMG, 1977).

Faulting in the region is dominated by the San Andreas fault system, from east to west consists of the San Andreas, San Jacinto, Elsinore, Newport-Inglewood, and several offshore faults. The faulting predominately of northwest-striking, right lateral faults with local steeply dipping normal components. The Elsinore fault zone includes the Wildomar branch approximately 2,000 feet northeast of site and the Willard branch approximately 680 feet northeast of the site. The property is not located within a State of California Alquist-Priolo Earthquake Fault Zone [APEFZ]. However, it is located within a Riverside County Fault Study Zone (RCFSZ) for the Willard fault zone, a strand of the Elsinore fault zone. Geocon (2019), performed a fault rupture hazard study under separate cover and concluded that active faulting was not present on the site.

4. SOIL AND GEOLOGIC CONDITIONS

The geologic materials encountered consist of a veneer of topsoil, undocumented fill, Holocene-age alluvial fan deposits and Cretaceous-age granitic bedrock consisting of quartz monzonite. The undocumented artificial fill was encountered in the borings to a maximum depth of 4½ feet. Thicker deposits may be encountered between borings in the rest of the property. Descriptions of the soil and geologic conditions are shown on the boring logs located in *Appendix A* and are described herein in order of increasing age.

4.1 Topsoil (No Map Symbol)

A thin veneer of topsoil was encountered overlying the granitic bedrock within test pit T-6 and consisted of grayish brown, dry, silty fine to medium sand, with some coarse sand.

4.2 Undocumented fill (afu)

Undocumented fill was encountered in test pit T-4 and consisted of loose, dry, whitish gray silty fine to coarse sand with some cobble. The undocumented fill is likely derived from an existing road cut into the granitic bedrock.

4.3 Alluvial Fan Deposits (Qal)

Holocene-age alluvial fan deposits were encountered southern and eastern portion of the site overlying the granitic bedrock. As observed during our field exploration, alluvium consisted predominately of silty to gravelly sand, that was gray to light brown, and dry. Varying amounts of granitic cobbles and boulders were observed within the alluvium.

4.4 Quartz Monzonite (Kqm)

Cretaceous-age Quartz Monzonite was observed in western and northern portion of the site and underlies the alluvium at depth. The roadcut exposed bedrock that is highly to moderately weathered. The rock is medium grained, gray, black, and white, and slightly jointed. Where weathered, the granitic bedrock unit was hard and slightly friable. Joints were generally slightly open with some oxidation and more advanced weathering along the joint surface.

5. GROUNDWATER

We did not encounter groundwater or seepage during the site investigation. According to the California Department of Water Resources, measurements within several wells in the area indicated the depth to groundwater is between 50 to 60 feet below the existing ground surface. It is not uncommon for seepage conditions to develop where none previously existed. Groundwater and seepage are dependent on seasonal precipitation, irrigation, land use, among other factors, and varies as a result. Proper surface drainage will be important to future performance of the project.

6. GEOLOGIC HAZARDS

6.1 Faulting

The numerous faults in southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (Bryant and Hart, 2007). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,700 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years) but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a currently established State of California Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards. However, it is within a Riverside County Fault Hazard Zone. Geocon (2019) prepared a fault rupture hazard study for the site and concluded that active fault was not present at the site and the no structural setbacks are required. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site.

According to the *Fault Activity Map of California* (2010), the closest active faults to the site are the Willard strand of the Elsinore fault, located 680 feet to the northeast, and the Wildomar strand of Elsinore fault, located approximately 2,000 feet to the northeast. Faults within a 50-mile radius of the site are listed in Table 6.1.1. Historic earthquakes in southern California of magnitude 6.0 and greater, their magnitude, distance, and direction from the site are listed in Table 6.1.2

TABLE 6.1.1

KNOWN ACTIVE FAULTS WITHIN 50 MILES OF THE SITE

Fault Name	CGS Number	Maximum Earthquake Magnitude (Mw)	Distance from Site (miles)	Direction from Site
Elsinore (Wildomar)	460	6.8	<1	E
Elsinore (Glen Ivy North)	461	6.8	2	E
Wolf Valley	469	6.8	14	SSE
Elsinore (Main Street)	446	6.8	14	S
San Jacinto (Casa Loma)	457	6.9	21	E
San Jacinto (Clark)	459	6.9	23	E
Chino	431	6.7	23	SW
Elsinore (Julian)	483	6.8	23	SE
Elsinore (Whittier)	444	6.8	28	SW
San Gorgonio Pass (Western Extension)	448	7.1	26	E
San Gorgonio Pass	455	7.1	31	E
San Andreas (South Branch-Banning)	452	7.5	31	SE
San Andreas (Cajon Canyon to Burro Flats)	427A	7.5	37	E
San Jacinto (San Jacinto)	401	7.2	39	ENE
Red Hill Etiwanda Avenue	398	6.5	40	E
San Jacinto (Glen Helen)	402	6.7	41	NE
Lytle Creek	400	6.7	41	NE
Cucamonga	399	6.9	41	NE
Newport Inglewood (North Branch)	440	7.1	43	W
Palos Verdes	437	6.5	45	W
Coyote Creek Fault	479	6.9	45	SE
Pinto Mountain	425	7.2	46	E
San Andreas (Palmdale to Cajon Canyon)	358	7.5	50	NE

Historic earthquakes in southern California of magnitude 6.0 and greater, their magnitude, distance, and direction from the site are listed in Table 6.1.2.

TABLE 6.1.2
HISTORIC EARTHQUAKE EVENTS WITH REPECT TO THE SITE

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto	December 25, 1899	6.7	28	NE
San Jacinto	April 21, 1918	6.8	28	NE
Loma Linda Area	July 22, 1923	6.3	27	N
Long Beach	March 10, 1933	6.4	38	W
Buck Ridge	March 25, 1937	6.0	55	SE
Imperial Valley	May 18, 1940	6.9	119	SSE
Desert Hot Springs	December 4, 1948	6.0	63	E
Tehachapi	July 21, 1952	7.5	136	NW
Arroyo Salada	March 19, 1954	6.4	111	S
Borrego Mountain	April 8, 1968	6.5	61	SE
San Fernando	February 9, 1971	6.6	83	NW
Whittier Narrows	October 1, 1987	5.9	54	NW
Joshua Tree	April 22, 1992	6.1	79	ENE
Landers	June 28, 1992	7.3	64	NE
Big Bear	June 28, 1992	6.4	49	NE
Northridge	January 17, 1994	6.7	82	WNW
Hector Mine	October 16, 1999	7.1	90	NE
Ridgecrest/China Lake	July 5, 2019	7.1	149	N

6.2 Ground Rupture

Ground surface rupture occurs when movement along a fault is sufficient to cause a gap or rupture where the upper edge of the fault zone intersects the earth surface. The potential for ground rupture is considered to be very low due to the absence of active or potentially active faults at the subject site.

6.3 Liquefaction

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations. Seismically induced settlement may occur whether the potential for liquefaction exists or not.

Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

As discussed in the Groundwater Section of this report, groundwater is anticipated in greater than 50 feet below the ground surface. Based on the absence of groundwater, the medium dense nature and relatively shallow depth of the alluvium, the potential for liquefaction and seismically induced settlement at the site is negligible and not a design consideration.

6.4 Expansive Soil

The alluvium generally consists of silty and poorly graded sands. Laboratory testing results indicate a sample of the near surface soil exhibits a "very low" expansion potential (expansion index [EI] of 20 or less) with test results showing an expansion index of 0.

6.5 Hydrocompression

Hydrocompression is the tendency of unsaturated soil structure to collapse upon wetting resulting in the overall settlement of the affected soil and overlying foundations or improvements supported thereon. Potentially compressible soils underlying the site are typically removed and recompacted during remedial grading. However, if compressible soil is left in-place, a potential for settlement due to hydrocompression of the soil exists.

Due to the relatively shallow alluvium underlain by granitic bedrock, and the recommended remedial grading in the conclusion section of this report, the potential for hydrocompression is not a design consideration.

6.6 Seiches and Tsunamis

Seiches are caused by the movement of an inland body of water due from a seismic event. Lake Elsinore is approximately 2.3 miles north of the site, with a water surface elevation of approximately 1,238 feet MSL, and a depth of approximately 42 feet. Recent improvements at the lake include channelizing potential influx of water along the southwest portion of the lake into dedicated drainage channels that flow into Murrieta Creek. Therefore, flooding due a seiche is not a design consideration.

A tsunami is a series of long-period waves generated in the ocean by a sudden displacement of large volumes of water. Causes of tsunamis include underwater earthquakes, volcanic eruptions, or offshore slope failures. The site is located approximately 22 miles from the Pacific Ocean at an elevation greater than 1,300 feet MSL, with the Elsinore and Santa Ana Mountains between the coast and the site. Therefore, the risk of tsunamis affecting the site is negligible and not a design consideration.

6.7 Inundation

Lake Elsinore and Canyon Lake are in the vicinity of the site. According to the State of California, Department of Water Resources, Division of Safety of Dams, the site is not within an inundation zone due to dam failure of either lake. Lake Elsinore is in a natural depression, and has no dam to fail. Failure of the Canyon Lake dam would channel water in Lake Elsinore and raise the lake elevation causing flooding to south of the lake. The limits of flooding are approximately Palomar Road and Corydon Road, approximately 3,500 feet east of the site. Therefore, inundation due to dam failure is not a design consideration.

6.8 Landslides

Landslides are not mapped on or near the site. Due to the granitic nature of the slopes at the site, we opine that landslides are not present at the property or at a location that could impact the subject site.

6.9 Rock Fall Hazards

Due to the granitic nature of the ascending slopes and observed boulders near the site, rock falls may impact the site. The slopes are vegetated and observation was obscured. Further evaluation should be considered for potential rock fall evaluation.

6.10 Slope Stability

Graded slopes are not proposed on the site at this time, and the intact nature of the natural granitic slopes near the site lead us to opine slope stability is not a design consideration.

7. SITE INFILTRATION

Percolation testing was performed in accordance with the procedures outlined in *Riverside County Flood Control and Water Conservation District LID BMP, Appendix A* (RC BMP) for infiltration basins. The percolation test locations are depicted on the *Geologic Map* (see Figure 2).

Percolation test holes were excavated to four feet using backhoe equipped with a 24-inch diameter bucket. The final foot was hand excavated and a 10-inch-diameter perforated 5-gallon bucket was placed faced down in the resulting void space. Two inches gravel were place at the bottom of the hole. A 3-inch diameter hole was cut into the bottom of the bucket (facing up). A 3-inch PVC pipe was placed into the hole and extended to the gravel layer. The test pit was backfilled with the PVC pipe just above the surface to convey water into the portion of the hole for testing. The test locations were pre-saturated prior to testing. Percolation testing began within 24 hours after the holes were presaturated. Percolation data sheets are presented in *Appendix A* of this report. Calculations to convert the percolation test rate to infiltration test rates are presented in Table 7.0 below. During the tests, the amount of time it took to pour 5 gallons of water into the test hole and measure the initial reading, the majority of water had already percolated into the ground. At every 10 minute reading interval, all of the water had percolated into the ground. According to RCBMP Appendix A Table I, Infiltration Basin, Option 1, a minimum factor of safety of 3 must be applied to the measured values below.

TABLE 7.0
INFILTRATION TEST RATES FOR PERCOLATION AREAS

Parameter	P-1	P-2
Depth (inches)	55.1	53.4
Test Type	Sandy	Sandy
Change in head over time: ΔH (inches)	8.9	3.0
Average head: Havg (inches)	4.4	1.5
Time Interval (minutes): Δt (minutes)	10	10
Radius of test hole: r (inches)	5	5
Tested Infiltration Rate: It (inches/hour)	19.2	11.2

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 From a geotechnical engineering standpoint, the site is suitable for construction of the proposed development provided the recommendations presented herein are implemented in design and construction of the project.

8.1.2 Potential geologic hazards at the site include seismic shaking.

8.1.3 The site is located less than 1 mile from the nearest active fault. Based on our background research, referenced surface fault rupture hazard investigation, and this investigation, it is our opinion active, potentially active, or inactive faults do not extend across the site. Risks associated with seismic activity consist of the potential for moderate to strong seismic shaking.

8.1.4 Our field investigation indicates geologic units at the site include undocumented fill, alluvium and granitic bedrock at the surface. The undocumented fill and the alluvium are not considered suitable for the support of compacted fill and settlement-sensitive structures. Remedial grading of these deposits will be required as discussed herein. The existing site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed.

8.1.5 A significant amount of on-site soils are granular in nature, having little to no cohesion and may be subject to caving in unshored excavations. It is the responsibility of the contractor to ensure that excavations and trenches are properly shored and maintained in accordance with OSHA rules and regulations to maintain the stability of adjacent existing improvements.

8.1.6 The laboratory tests indicate that the site soils are non-expansive and have a "very low" expansion potential. If medium to highly expansive soils are encountered at the site, they should be exported from the site or selectively graded and placed in the deeper fill areas to allow for the placement of low expansion material at the finish pad grade.

8.1.7 Grading plans were not available to review at the time of this report. However, based on a review of the site plan, existing grades and anticipated grades, cuts and fills of up to 15 feet are expected, not including remedial grading.

8.1.8 Remedial grading will address collapse potential of the alluvial soils. Proper site drainage should be maintained. Landscape planters that saturate the subsurface or stormwater infiltration structures should not be used within 20 feet of the proposed buildings or other on grade improvements.

8.1.9 Excavations into the granitic bedrock and alluvial fan deposits are expected to encounter oversize materials (greater than 12 inches). Oversize materials are not suitable for reuse in the upper 10 feet of engineered fill. Processing of cobbly site soils (screening or crushing) should be anticipated before reuse as fill material.

8.1.10 Due the anticipated granitic bedrock, consideration should be given to overexcavating utility trenches and any other below grade improvements (i.e. perimeter wall footings) during grading.

8.1.11 We did not encounter groundwater during our investigation and do not expect groundwater would impact site improvements. However, wet conditions and seepage could affect proposed construction if grading and improvement operations occur during or shortly after a rain event.

8.1.12 Proper drainage should be maintained in order to preserve the design properties of the fill in the sheet-graded pad and slope areas.

8.1.13 Changes in the design, location or elevation of improvements, as outlined in this report, should be reviewed by this office. Once final grading plans become available, they should be reviewed by this office to evaluate the necessity for review and possible revision of this report.

8.1.14 Recommended grading specifications are provided in *Appendix C*.

8.2 Excavation and Soil Characteristics

8.2.1 Excavation of the undocumented fill and alluvium should be possible with moderate effort using conventional heavy-duty equipment. Some difficulty in excavation may be encountered where cobbles are encountered. Excavations within the upper portions of the bedrock should be rippable. Areas of non-rippable bedrock should be anticipated to be encountered.

8.2.2 The soil encountered in the field investigation is considered to be "non-expansive" (expansion index [EI] of less than 20) as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 8.2.2 presents soil classifications based on the expansion index. Based on the laboratory test results, we expect a majority of the soil encountered will possess a "very low" expansion potential (EI between 0 and 20). Although unlikely, any medium to highly expansive soils encountered at the site should not be placed within 4 feet of the proposed foundations, flatwork or paving improvements. Additional testing for expansion potential should be performed during grading and once final grades are achieved.

TABLE 8.2.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	**Very Low**	**Non-Expansive**
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

8.2.3 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. *Appendix B* presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the location tested possess a sulfate content of 0.000 percent (less than 10 parts per million [ppm]) equating to an exposure class of "S0" as defined by 2016 CBC Section 1904.3 and ACI 318. Table 8.2.3 presents a summary of concrete requirements set forth by 2016 CBC Section 1904.3 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 8.2.3
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	**SO_4<0.10**	**No Type Restriction**	**n/a**	**2,500**
S1	$0.10 \leq SO_4 < 0.20$	II	0.50	4,000
S2	$0.20 \leq SO_4 \leq 2.00$	V	0.45	4,500
S3	$SO_4 > 2.00$	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

8.2.4 Laboratory testing indicates the site soils have a minimum electrical resistivity of 10,300 ohm-cm, possess 36 ppm chloride, less than 10 ppm sulfate, and a pH of 7.9. As shown in Table 8.2.4 below, the site would not be classified as "corrosive" to buried metallic improvements, in accordance with the Caltrans Corrosion Guidelines (Caltrans, 2018).

TABLE 8.2.4
CALTRANS CORROSION GUIDELINES

Corrosion Exposure	Resistivity (ohm-cm)	Chloride (ppm)	Sulfate (ppm)	pH
Corrosive	<1,100	500 or greater	1,500 or greater	5.5 or less

8.2.5 Geocon does not practice in the field of corrosion engineering. Therefore, further evaluation by a corrosion engineer may be performed if improvements that could be susceptible to corrosion are planned.

8.3 Rippability

8.3.1 Based on variability within the granitic bedrock, difficulty in excavating should be expected. We encountered refusal at various depths within the bedrock.

8.3.2 Bedrock will generally be rippable with large construction equipment in good working order such as a D9 dozer with a single shank ripper. Areas of non-rippable bedrock or large core stones may be encountered that will require blasting or expansion breaking to excavate the bedrock should be expected.

8.4 Seismic Design Criteria

8.4.1 We used the computer program *U.S. Seismic Design Maps*, provided by the California Office of Statewide Health Planning and Development (OSHPD) to evaluate the seismic design criteria. Table 8.4.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The building structure and improvements as currently proposed should be designed using a Site Class C in accordance with ASCE 7-10 Section 20.3.1. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10 using blow count data presented on the boring logs in *Appendix A*. The values presented in Table 8.4.1 are for the risk-targeted maximum considered earthquake (MCE_R).

TABLE 8.4.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	C	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	2.25g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.904g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.000	Table 1613.3.3(1)
Site Coefficient, F_V	1.300	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	2.25g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	1.175g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.5g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.783g	Section 1613.3.4 (Eqn 16-40)

8.4.2 Table 8.4.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 8.4.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value	ASCE 7-10 Reference
Site Class	C	Section 1613.3.2
Mapped MCE_G Peak Ground Acceleration, PGA	0.894g	Figures 2 through 42-7
Site Coefficient, F_{PGA}	1.000	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.894g	Section 11.8.3 (Eqn 11.8-1)

8.4.3 Conformance to the criteria in Tables 8.4.1 and 8.4.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

8.5 Temporary Excavations

8.5.1 The recommendations included herein are provided for temporary excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project. Temporary unsurcharged embankments should be designed by the contractor's competent person in accordance with OSHA regulations.

8.5.2 Where there is insufficient space for sloped excavations, shoring or trench shields should be used to support excavations. Shoring may also be necessary where sloped excavation could remove vertical or lateral support of existing improvements, including existing utilities and adjacent structures. Recommendations for temporary shoring can be provided in an addendum if needed.

8.5.3 Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. The contractor's personnel should inspect the soil exposed in the cut slopes during excavation in accordance with OSHA regulations so that modifications of the slopes can be made if variations in the soil conditions occur. Excavations should be stabilized within 30 days of initial excavation.

8.6 Grading

8.6.1 Grading should be performed in accordance with the recommendations provided in this report, the *Recommended Grading Specifications* contained in *Appendix C* and the City of Lake Elsinore standards.

8.6.2 Prior to commencing grading, a pre-construction conference should be held at the site with the owner/developer, City inspector, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling requirements can be discussed at that time.

8.6.3 Site preparation should begin with the removal of deleterious material, debris, buried trash, and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

8.6.4 Undocumented fill and alluvium in the building areas should be removed to expose bedrock. Based on our test pits, the depth of removal should be on the order of 7 to 14 feet., however, test pit TP-8 extended to 15 feet and did not encounter bedrock. The excavations should be extended laterally a minimum distance of 6 feet beyond the building footprint or for a distance equal to the depth of removal, whichever is greater. Where the lateral over-excavation is not possible, structural setbacks or deepened footings may be required.

8.6.5 The actual depth of removal should be evaluated by the engineering geologist during grading operations. The bottom of the excavations should be scarified to a depth of at least 1 foot, moisture conditioned as necessary, and properly compacted.

8.6.6 Cut lots and cut/fill transition lots should be overexcavated to a depth of at least 2 feet below the bottom of footings, or H/3 (where H is the maximum depth of fill within a lot and within a 1:1 projection of the lot).

8.6.7 The site should then be brought to final subgrade elevations with fill compacted in layers. In general, soil native to the site is suitable for use as fill if free from oversize material (rock fragments larger than 6 inches), vegetation, debris and other deleterious material. Layers of fill should be about 6 to 8 inches in loose thickness and no thicker than will allow for adequate bonding and compaction. Fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content, as determined in accordance with ASTM D 1557. Fill materials placed below optimum moisture content may require additional moisture conditioning prior to placing additional fill. The upper 12 inches of subgrade soil underlying pavement should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content shortly before paving operations.

8.6.8 Oversize material should be expected during the grading of the site. Larger rocks (>12") should be kept ten feet below design grades and out of proposed utility trenches. Rock windrows or the placement of induvial rocks for burial may be accomplished under the observation of Geocon in accordance with recommended grading specifications in *Appendix C*.

8.6.9 Import fill soil (if necessary) should consist of granular materials with a "low" expansion potential (EI of less than 50), free of deleterious material and rock fragments larger than 6 inches and should be compacted as recommended herein. Geocon should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

8.6.10 Foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer, prior to placing fill, steel, gravel or concrete.

8.7 Utility Trench Backfill

8.7.1 Utility trenches should be properly backfilled in accordance with the requirements of City of Lake Elsinore and the latest edition of the *Standard Specifications for Public Works Construction* (Greenbook). The pipes should be bedded with well graded crushed rock or clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe. The bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of well graded crushed rock is only acceptable if used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. Backfill of utility trenches should not contain rocks greater than 3 inches in diameter. The use of 2-sack slurry and controlled low strength material (CLSM) are also acceptable as backfill. However, consideration should be given to the possibility of differential settlement where the slurry ends and earthen backfill begins. These transitions should be minimized and additional stabilization should be considered at these transitions.

8.7.2 Trench excavation bottoms must be observed and approved in writing by the Geotechnical Engineer, prior to placing bedding materials, fill, gravel, or concrete.

8.8 Earthwork Grading Factors

8.8.1 Estimates of shrinkage factors are based on empirical judgments comparing the material in its existing or natural state as encountered in the exploratory excavations to a compacted state. Variations in natural soil density and in compacted fill density render shrinkage value estimates very approximate. As an example, the contractor can compact the fill to a dry density of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has an approximately 10 percent range of control over the fill volume. Based on our experience, the shrinkage of undocumented fill and alluvium is expected to be on the order of 5 to 10 percent when compacted to at least 90 percent of the laboratory maximum dry density. The granitic bedrock is expected to bulk on the order of 15 to 20 percent. This estimate is for preliminary quantity estimates only. Due to the variations in the actual shrinkage/bulking factors, a balance area should be provided to accommodate variations

8.9 Foundation and Concrete Slab-On-Grade Recommendations

8.9.1 The foundation recommendations presented herein are for the proposed building subsequent to the recommended grading assuming that the buildings are founded in soils with a low expansion potential. If soils with a medium or high expansion potential are placed within 4 feet of finish grade, Geocon should be contacted for additional recommendations. The proposed structures can be supported on a shallow foundation system bearing in newly placed compacted fill.

8.9.2 Foundations for the structures should consist of either continuous strip footings and/or isolated spread footings. Continuous footings should be at least 18 inches wide and extend at least 18 inches below lowest adjacent pad grade. Isolated spread footings should have a minimum width of 24 inches and should also extend at least 18 inches below lowest adjacent pad grade. A wall/column footing dimension detail depicting footing embedment is provided on Figure 3.

8.9.3 From a geotechnical engineering standpoint, concrete slabs-on-grade for the structure should be at least 4 inches thick and be reinforced with at least No. 3 steel reinforcing bars placed 24 inches on center in both directions. The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slab for supporting equipment and storage loads. A thicker concrete slab may be required for heavier loading conditions. To reduce the effects of differential settlement on the foundation system, thickened slabs and/or an increase in steel reinforcement can provide a benefit to reduce concrete cracking.

8.9.4 Steel reinforcement for continuous footings should consist of at least two No. 4 steel reinforcing bars placed horizontally in the footings, one near the top and one near the bottom. Steel reinforcement for the spread footings should be designed by the project structural engineer.

8.9.5 The recommendations presented herein are based on soil characteristics only (EI of 50 or less) and are not intended to replace steel reinforcement required for structural considerations.

8.9.6 Foundations may be designed for an allowable soil bearing pressure of 3,000 pounds per square foot (psf) (dead plus live load). The value presented herein is for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

8.9.7 The maximum expected static settlement for the planned structures supported on conventional foundation systems with the above allowable bearing pressure and deriving support in engineered fill is estimated to be 1½ inch and to occur below the heaviest loaded structural element. Differential settlement is estimated to be on the order of ¾ inch over a horizontal distance of 40 feet. Once the design and foundation loading configuration proceeds to a more finalized plan, the estimated settlements within this report should be reviewed and revised, if necessary

8.9.8 Slabs-on-grade that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve as a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

8.9.9 The bedding sand thickness should be evaluated by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 4 inches. Placement of 3 inches and 4 inches of sand is common practice in southern California for 5-inch and 4-inch thick slabs, respectively. The foundation engineer should provide appropriate concrete mix design criteria and curing measures that may be utilized to assure proper curing of the slab to reduce the potential for rapid moisture loss and subsequent cracking and/or slab curl.

8.9.10 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisturized to maintain a moist condition as would be expected in any such concrete placement.

8.9.11 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil, or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

8.9.12 Geocon should be consulted to provide additional design parameters as required by the structural engineer.

8.10 Concrete Flatwork

8.10.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with No. 3 reinforcing bars spaced 24 inches on center in each direction to reduce the potential for wide cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

8.10.2 Even with the incorporation of the recommendations within this report, the exterior concrete flatwork has a likelihood of experiencing some movement due to swelling or settlement; therefore, the steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

8.10.3 Where exterior flatwork abuts structures at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

8.10.4 The recommendations presented herein are intended to reduce the potential for cracking as a result of differential movement. However, even with the incorporation of the recommendations presented herein, concrete will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

8.11 Conventional Retaining Walls

8.11.1 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 10 feet. In the event that walls higher than 10 feet or other types of walls are planned, Geocon should be consulted for additional recommendations.

8.11.2 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal to vertical), an active soil pressure of 60 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an EI of 50 or less. For walls where backfill materials do not conform to the criteria herein, Geocon should be consulted for additional recommendations.

8.11.3 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls with a level backfill surface should be designed for a soil pressure equivalent to the pressure exerted by a fluid density of 55 pcf.

8.11.4 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, proposed retaining walls in excess of 6 feet in height should be designed with seismic lateral pressure (Section 1803.5.12 of the 2016 CBC).

8.11.5 A seismic load of 10 pcf should be used for design of walls that support more than 6 feet of backfill in accordance with Section 1803.5.12 of the 2016 CBC. The seismic load is applied as an equivalent fluid pressure along the height of the wall and the calculated loads result in a maximum load exerted at the base of the wall and zero at the top of the wall. This seismic load should be applied in addition to the active earth pressure. The earth pressure is based on half of two-thirds of PGA_M calculated from ASCE 7-10 Section 11.8.3.

8.11.6 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

8.11.7 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The soil immediately adjacent to the backfilled retaining wall should be composed of free draining material completely wrapped in Mirafi 140N (or equivalent) filter fabric for a lateral distance of 1 foot for the bottom two-thirds of the height of the retaining wall. The upper one-third should be backfilled with less permeable compacted fill to reduce water infiltration. Alternatively, a drainage panel, such as a Miradrain 6000 or equivalent, can be placed along the back of the wall. A typical drain detail for each option is shown on Figure 4. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted backfill (EI of 20 or less) with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected or if specific drainage details are desired, Geocon should be contacted for additional recommendations.

8.12 Lateral Loading

8.12.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid density of 300 pounds per cubic foot (pcf) should be used for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

8.12.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.40 should be used for design. The friction coefficient may be reduced depending on the vapor barrier or waterproofing material used for construction in accordance with the manufacturer's recommendations.

8.12.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

8.13 Preliminary Pavement Recommendations

8.13.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) and Lake Elsinore *Standard Drawings* using a of Traffic Index of 5. The project civil engineer and owner should evaluate the final Traffic Index for the pavements and review the pavement designations to determine appropriate locations for pavement thickness. Laboratory testing indicates an R-value of 68. We have used a preliminary R-value of 50 (the maximum allowable by Caltrans Design Manual) for the subgrade soils for the purposes of this analysis. The final pavement sections should be based on the R-value of the subgrade soil encountered at final subgrade elevation. Table 8.13.1 presents the preliminary flexible pavement sections for local street class in accordance with the City of Lake Elsinore *Standard Drawing No. 100A*. Geocon should be contacted for additional recommendations if other TI's are applicable.

TABLE 8.13.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

City Roadway Classification / Anticipated Traffic	Assumed Traffic Index (TI)	Subgrade R-Value	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Local Street / Automobiles and Light-Duty Vehicles	5	50	3.5	4.0

8.13.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

8.13.3 Base materials should conform to Section 26-1.028 of the *Standard Specifications for The State of California Department of Transportation (Caltrans)*. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*.

8.13.4 A rigid Portland cement concrete (PCC) pavement section should be placed in heavy truck areas, driveway aprons, and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R *Guide for Design and Construction of Concrete Parking Lots* and City of Lake Elsinore *Standard Drawing No. 209*. using the parameters presented in Table 8.13.4.

TABLE 8.13.4
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of Subgrade Reaction, k	200 pci
Modulus of Rupture for Concrete, M_R	500 psi
Traffic Category, TC	A, B, and C
Average Daily Truck Traffic, ADTT	10, 25, and 100

8.13.5 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 8.13.5.

TABLE 8.13.5
RIGID PAVEMENT RECOMMENDATIONS

Location	Portland Cement Concrete (inches)
Automobile Parking Stalls (TC=A)	5.0
Moderate Truck Traffic (TC=B)	6.0
Heavy Truck and Fire Lane Areas (TC=C)	6.5

8.13.6 The PCC pavement should be placed over a subgrade that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density at 0 to 2 percent above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

8.13.7 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., 6-inch and 7.5-inch-thick slabs would have an 8- and 9.5-inch-thick edge, respectively). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

8.13.8 In order to control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab in accordance with the referenced ACI report.

8.13.9 The performance of pavements is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement surfaces will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

8.14 Site Drainage and Moisture Protection

8.14.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

8.14.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

8.14.3 Landscape planters that saturate the subsurface should not be used within 20 feet of the proposed structure or other settlement sensitive on grade improvements. Localized surface settlement should be anticipated in areas where water is allowed to infiltrate into the subsurface.

8.14.4 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

8.14.5 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

8.14.6 If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to infiltration areas. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeology study at the site. Down-gradient and adjacent structures may be subjected to seeps, movement of foundations and slabs, or other impacts as a result of water infiltration.

8.15 Grading and Foundation Plan Review

8.15.1 Geocon should review the project grading and foundation plans prior to final design submittal to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations, if necessary.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon.

3. This report is issued with the understanding that it is the responsibility of the owner or their representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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0 400

SOURCE: Google Earth Pro, 2019

VICINITY MAP

GEOCON
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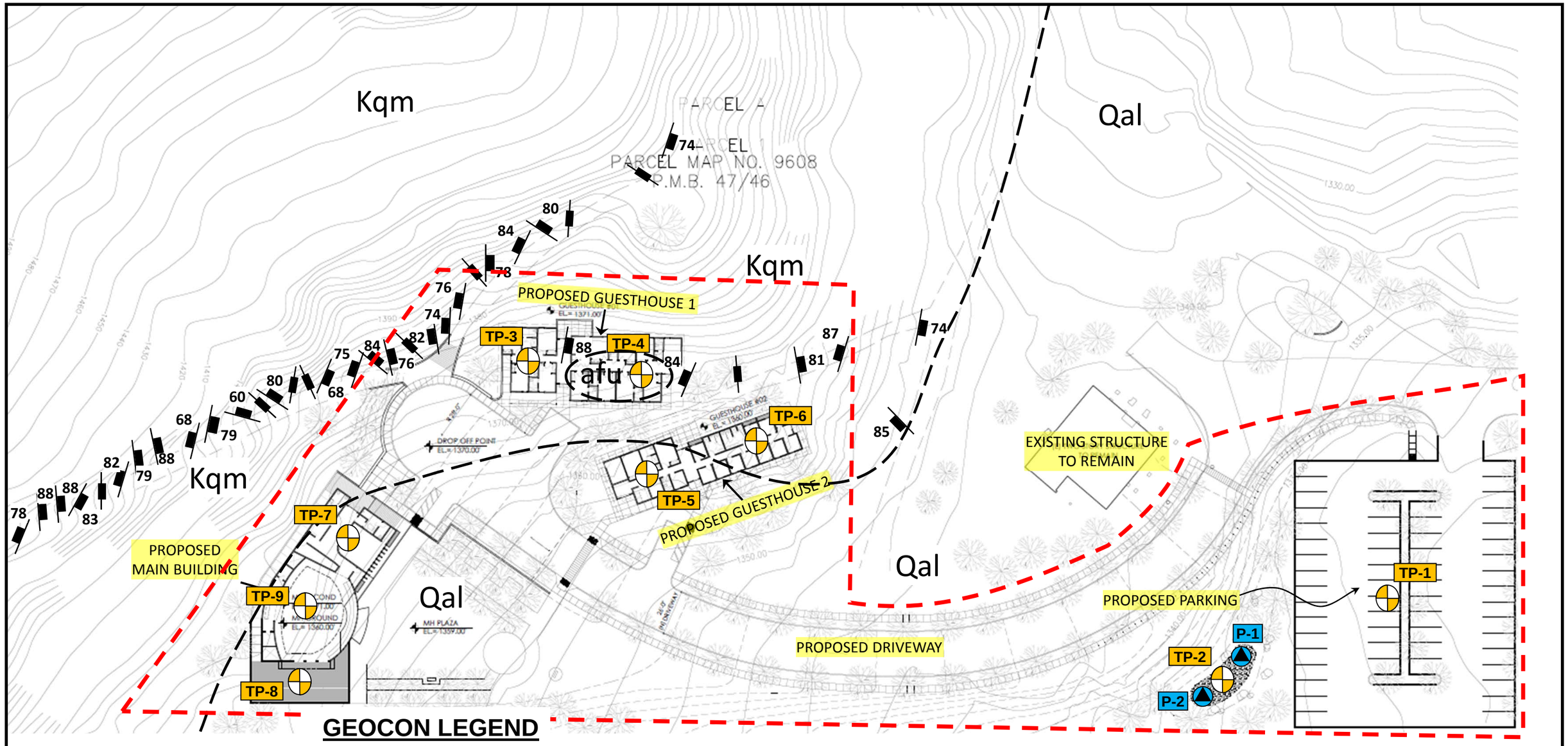
PHONE 951-304-2300 FAX 951-304-2392

PDT		

WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORINA

OCTOBER 2019	PROJECT NO. T2877-22-02	FIG. 1



GEOCON LEGEND

Locations are approximate

TP-9	.....TEST PIT LOCATION
afu	..... UNDOCUMENTED FILL
Qal	..... ALLUVIAL FAN DEPOSITS
Kqm	..... QUARTZ MONZONITE
P-2	..... PERCOLATION TEST LOCATION
80	..... STRIKE AND DIP OF JOINT
	..... STRIKE OF VERTICAL JOINT
	..... GEOLOGIC CONTACT
	..... LIMITS OF THIS REPORT

Source: *Enlarged Site Plan*, Andmore Partners, dated July 22, 2019.

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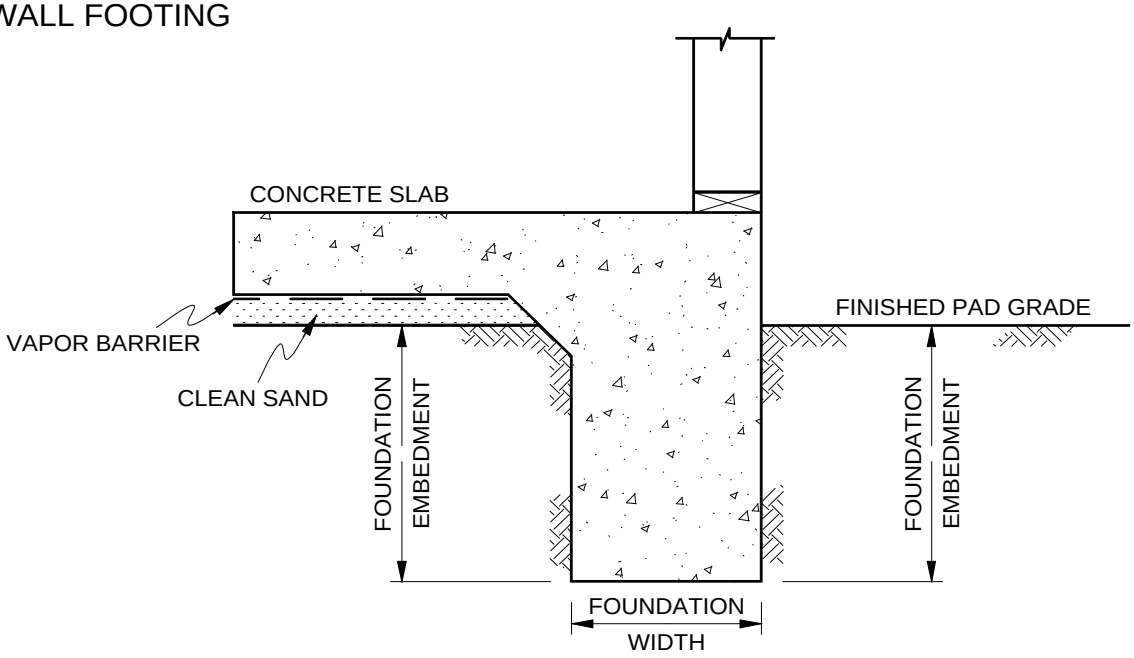
GEOLOGIC MAP

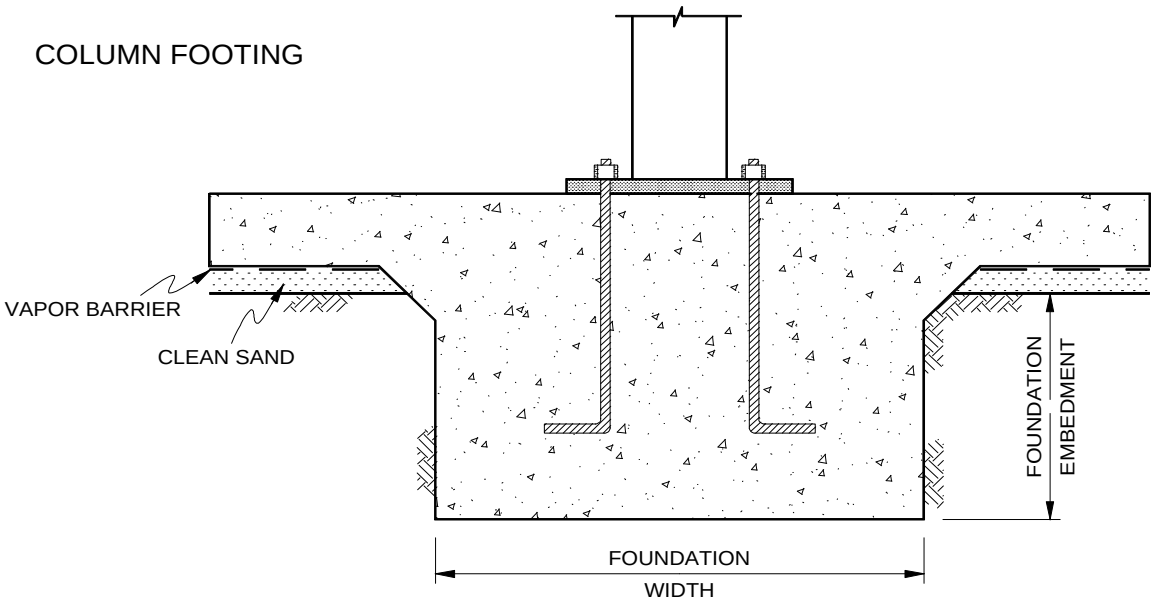
WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORINA

SEPTEMBER 2019 | PROJECT NO. T2877-22-02 | FIG. 2

WALL FOOTING



COLUMN FOOTING



NOTE: SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

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WALL / COLUMN FOOTING DETAIL

WON MEDITATION CENTER
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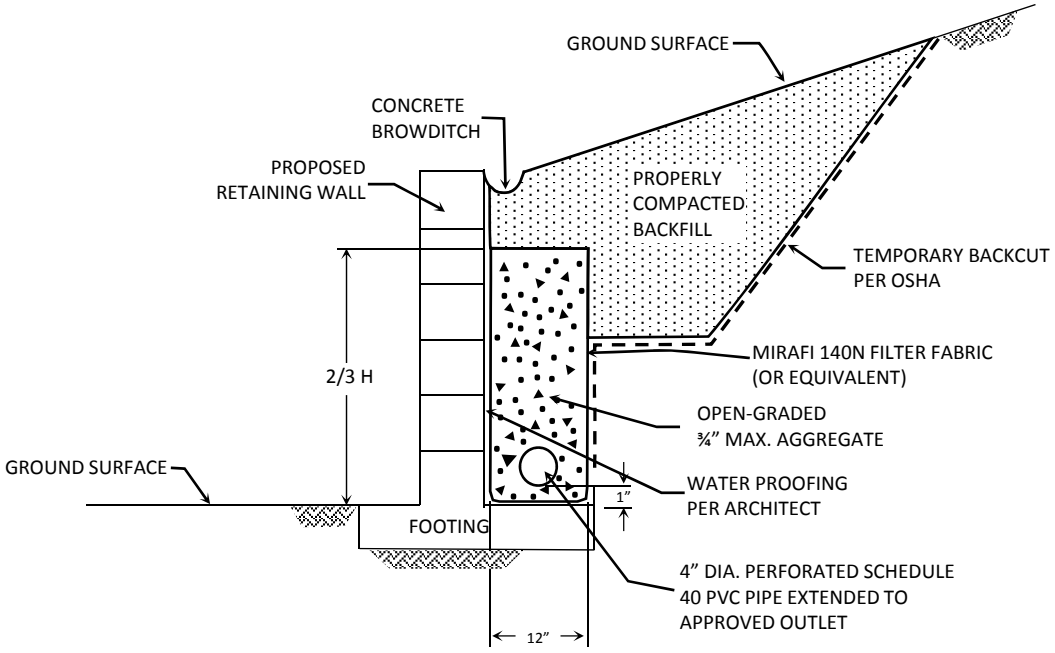
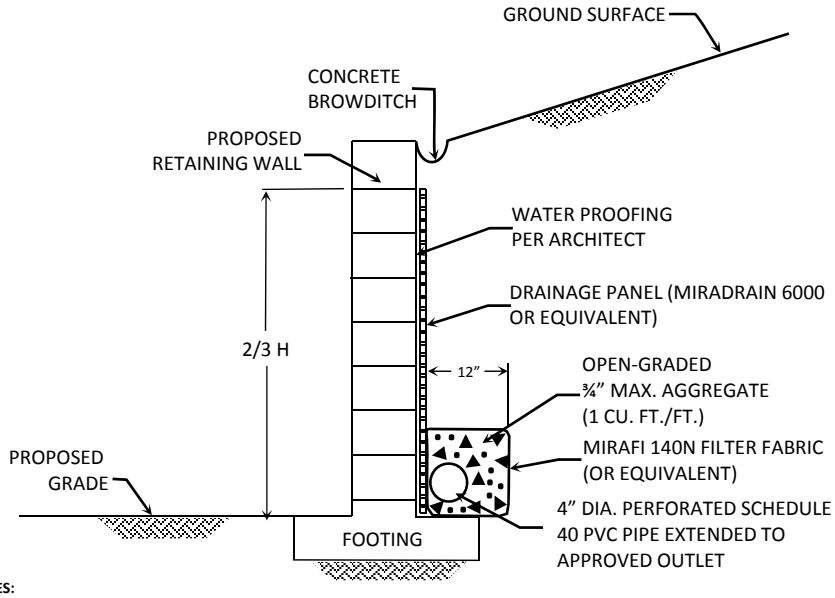
LAKE ELSINORE, CALIFORNIA

OCTOBER 2019	PROJECT NO. T2877-22-02	FIG. 3





NOTES:

DRAIN SHOULD BE UNFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPIMG

CONCRETE BROW DITCH RECOMMENDED FOR SLOPE HEIGHTS
GREATER THAN 6 FEET

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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WON MEDITATION CENTER
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LAKE ELSINORE, CALIFORNIA

OCTOBER 2019	PROJECT NO. T2877-22-02	FIG. 4

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed on September 16 and 17, 2019, and consisted of a site reconnaissance and excavation eleven exploratory test pits utilizing a rubber-tire backhoe equipped with a 24-inch bucket. Field work for our investigation included a subsurface exploration, soil sampling, and percolation testing. The test pits were excavated to depths of 2 to 15 feet below the existing ground surface. We collected bulk samples from the test pits. The samples of disturbed soils were transported to our laboratory for testing.

We visually examined the soil conditions encountered within the test pits, classified, and logged in general accordance with the Unified Soil Classification System (USCS). Logs of the test pits are presented on Figures A-1 through A-11. The logs depict the general soil and geologic conditions encountered and the depth at which we obtained the samples. The *Geologic Map*, Figure 2 presents the locations of the exploratory test pits.

Percolation testing was performed on September 16, 2019 in accordance with *Riverside County Flood Control and Water Conservation District LID BMP, Appendix A* for infiltration basins. The percolation tests were run in accordance with *Section 2.3., Shallow Percolation Test*. The percolation test data is presented on Figures A-12 and A-13.

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TEST PIT TP-1** ELEV. (MSL.) **1328** DATE COMPLETED **09/16/2019** EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**ALLUVIAL FAN DEPOSITS (Qal)** Silty SAND, medium dense, dry, grayish brown; fine to coarse sand; weeds; roots			
2					-Rusted pipe encountered -Some granitic derived cobbles			
4	TP-1@4-5'				-Increase in cobbles			
					Total Depth 5' Groundwater not encountered Backfilled 9/16/2019			

Figure A-1,
Log of Test Pit TP-1, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

TEST PIT TP-2

ELEV. (MSL.) **1332** DATE COMPLETED **09/16/2019**

EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP	**ALLUVIAL FAN DEPOSITS (Qal)** Poorly Graded SAND, medium dense, dry, grayish brown; fine to coarse sand; some gravel; trace silt; weeds; roots			
2							96.6	3.4
4					-Becomes damp		91.7	5.5
6								
8					**QUARTZ MONZONITE (Kqm)** Highly weathered, slightly jointed, yellowish brown, moderately strong, GRANITIC BEDROCK; medium-grained; excavates as a gravelly sand with cobble			
10					-Becomes moderately weathered			
					Total Depth 11.5' (Refusal) Groundwater not encountered Backfilled 9/16/2019			

Figure A-2,
Log of Test Pit TP-2, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP-3	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) **1372** DATE COMPLETED **09/16/2019** EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**			
					MATERIAL DESCRIPTION			
0	TP-3@0-1'				**QUARTZ MONZONITE (Kqm)** Moderately weathered, slightly jointed, yellowish brown, strong, GRANITIC BEDROCK; medium-grained; excavates as a cobbly sand with gravel			
2					Total Depth 2' (Refusal) Groundwater not encountered Backfilled 9/16/2019			

Figure A-3,
Log of Test Pit TP-3, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP-4 ELEV. (MSL.) **1369** DATE COMPLETED **09/16/2019** EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	TP4@1-2'			SP	**UNDOCUMENTED FILL (afu)** Poorly Graded SAND with gravel, loose, dry, whithish light gray; fine to coarse sand; some cobble			
2				SM	Silty SAND, medium dense, dry, brown; fine to coarse sand		106.7	5.5
4								
6					-Becomes damp			
8					**QUARTZ MONZONITE (Kqm)** Highly weathered, slightly jointed, yellowish brown, moderately strong, GRANITIC BEDROCK; medium-grained; excavates as a gravelly sand with silt and cobble			
10					-Becomes predominately fine-grained; some medium-grained; excavates as a silty sand with some friable gravel			
12					-Becomes moderately weathered; strong			
					Total Depth 13' (Refusal) Groundwater not encountered Backfilled 9/16/2019			

Figure A-4,
Log of Test Pit TP-4, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

TEST PIT TP-5

ELEV. (MSL.) **1359** DATE COMPLETED **09/16/2019**

EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIAL FAN DEPOSITS (Qal)** Silty SAND, medium dense, dry, light brown; fine to coarse sand; weeds; roots			
2					-Becomes damp, dark grayish brown; trace porosity; root hairs		103.2	6.8
4								6.1
6								
8								
10								
12					**QUARTZ MONZONITE (Kqm)** Highly weathered, slightly jointed, yellowish brown, moderately strong, GRANITIC BEDROCK; medium-grained; excavates as a silty sand with gravel			
14					-Becomes moderately weathered; strong Total Depth 14' (Refusal) Groundwater not encountered Backfilled 9/16/2019			

Figure A-5,
Log of Test Pit TP-5, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP-6 ELEV. (MSL.) **1362** DATE COMPLETED **09/16/2019** EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Silty SAND, loose, dry, grayish brown; fim to medium sand; roots; weeds			
2					**QUARTZ MONZONITE (Kqm)** Moderately weathered, slightly jointed, yellowish brown, strong, GRANITIC BEDROCK; medium-grained; excavates as a cobbly sand with gravel -Becomes moderately weathered; strong			
					Total Depth 3' (Refusal) Groundwater not encountered Backfilled 9/16/2019			

Figure A-6,
Log of Test Pit TP-6, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

TEST PIT TP-7

ELEV. (MSL.) **1366** DATE COMPLETED **09/16/2019**

EQUIPMENT **BACKHOE BUCKET 24"** BY: **PDT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP	**ALLUVIAL FAN DEPOSITS (Qal)** Poorly Graded SAND with silt, medium dense, dry, brown; fine to coarse sand; trace gravel; weeds; roots			
2							112.1	4.4
					-Some gravel			
4	TP-4@4-5'						108.2	4.2
					-Becomes damp; some cobble			
6					-Becomes moist			
8								
10								
12								
14					**QUARTZ MONZONITE (Kqm)** Highly weathered, slightly jointed, yellowish brown, moderately strong, GRANITIC BEDROCK; medium-grained; excavates as a gravelly sand with silt and cobble			

Total Depth 15'
Groundwater not encountered
Backfilled 9/16/2019

Figure A-7,
Log of Test Pit TP-7, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP-8 ELEV. (MSL.) 1363 DATE COMPLETED 09/16/2019 EQUIPMENT BACKHOE BUCKET 24" BY: PDT MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIAL FAN DEPOSITS (Qal)** Silty SAND, medium dense, dry, brown; fine to coarse sand; trace porosity; weeds; roots			
2							100.1	4.4
4					-Becomes damp		109.6	5.4
6					-Becomes moist			
8								
10								
12								
14								
					Total Depth 15' Groundwater not encountered Backfilled 9/16/2019			

Figure A-8,
Log of Test Pit TP-8, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT TP-9 ELEV. (MSL.) 1371 DATE COMPLETED 09/16/2019 EQUIPMENT BACKHOE BUCKET 24" BY: PDT MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ALLUVIAL FAN DEPOSITS (Qal)** Silty SAND, medium dense, dry, brown; fine to coarse sand; weeds; roots			
2								
4					-Becomes damp; trace porosity			
6					-Few cobbles			
8					-Becomes moist			
10								
12								
14					**QUARTZ MONZONITE (Kqm)** Moderately weathered, slightly jointed, yellowish brown, strong, GRANITIC BEDROCK; medium-grained; excavates as a cobbly sand with gravel Total Depth 14' (Refusal) Groundwater not encountered Backfilled 9/16/2019			

Figure A-9,
Log of Test Pit TP-9, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT P-1 ELEV. (MSL.) 1331 DATE COMPLETED 09/16/2019 EQUIPMENT BACKHOE BUCKET 24" BY: PDT	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SP	**ALLUVIAL FAN DEPOSITS (Qal)** Poorly Graded SAND with silt, loose, dry, grayish brown; fine to coarse sand; some gravel; roots; weeds			
2					-Decrease in silt; increase in sand and gravel			
4	P-1@4-5'							
					Total Depth 5' Final foot excavated by hand Groundwater not encountered Backfilled 9/17/2019			

Figure A-10,
Log of Test Pit P-1, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. T2877-22-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT P-2 ELEV. (MSL.) 1333 DATE COMPLETED 09/16/2019 EQUIPMENT BACKHOE BUCKET 24" BY: PDT	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SP	**ALLUVIAL FAN DEPOSITS (Qal)** Poorly Graded SAND, medium dense, dry, grayish brown; fine to coarse sand; some gravel; trace silt; roots; weeds			
2								
4	P-2@4-5'							
					Total Depth 5' Final foot excavated by hand Groundwater not encountered Backfilled 9/17/2019			

Figure A-11,
Log of Test Pit P-2, Page 1 of 1

T287-22-02 TEST PITS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PERCOLATION TEST REPORT							
Project Name:		Andmore Won Meditation Center			**Project No.:**		T2877-22-02
Test Hole No.:		P-1			**Date Excavated:**		9/16/2019
Length of Test Pipe:			61.7	inches	**Soil Classification:**		SP
Height of Pipe above Ground:			6.6	inches	**Presoak Date:**		9/16/2019
Depth of Test Hole:			55.1	inches	**Perc Test Date:**		9/17/2019
Check for Sandy Soil Criteria Tested by:				Weidman	**Percolation Tested by:**		Weidman
Water level measured from BOTTOM of hole							
Sandy Soil Criteria Test							
Trial No.	**Time**	**Time**	**Total**	**Initial Water**	**Final Water**	**Δ in Water**	**Percolation**
		Interval	**Elapsed**	**Level**	**Level**	**Level**	**Rate**
		(min)	**Time (min)**	**(in)**	**(in)**	**(in)**	**(min/inch)**
1	7:50 AM 8:15 AM	25	25	19.7	0.0	19.7	1.3
2	8:15 AM 8:40 AM	25	50	8.9	0.0	8.9	2.8
			Soil Criteria: Sandy				
			Percolation Test				
Reading	**Time**	**Time**	**Total**	**Initial Water**	**Final Water**	**Δ in Water**	**Percolation**
No.		**Interval**	**Elapsed**	**Head**	**Head**	**Level**	**Rate**
		(min)	**Time (min)**	**(in)**	**(in)**	**(in)**	**(min/inch)**
1	8:40 AM 8:50 AM	10	10	8.9	0.0	8.9	1.1
2	8:50 AM 9:00 AM	10	20	8.9	0.0	8.9	1.1
3	9:00 AM 9:10 AM	10	30	8.9	0.0	8.9	1.1
4	9:10 AM 9:20 AM	10	40	7.3	0.0	7.3	1.4
5	9:20 AM 9:30 AM	10	50	8.9	0.0	8.9	1.1
6	9:30 AM 9:40 AM	10	60	8.9	0.0	8.9	1.1
Infiltration Rate (in/hr):			19.2				
Radius of test hole (in):			5				**Figure A-12**
Average Head (in):			4.4				

PERCOLATION TEST REPORT

Project Name:		Andmore Won Meditation Center			**Project No.:**		T2877-22-02
Test Hole No.:		P-2			**Date Excavated:**		9/16/2019
Length of Test Pipe:			60.0	inches	**Soil Classification:**		SP
Height of Pipe above Ground:			6.6	inches	**Presoak Date:**		9/16/2019
Depth of Test Hole:			53.4	inches	**Perc Test Date:**		9/17/2019
Check for Sandy Soil Criteria Tested by:				Weidman	**Percolation Tested by:**		Weidman
Water level measured from BOTTOM of hole							

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Level (in)	Final Water Level (in)	Δ in Water Level (in)	Percolation Rate (min/inch)
1	7:50 AM 8:15 AM	25	25	18.0	0.0	18.0	1.4
2	8:15 AM 8:40 AM	25	50	2.4	0.0	2.4	10.4
			Soil Criteria: Sandy				

Percolation Test

Reading No.	Time	Time Interval (min)	Total Elapsed Time (min)	Initial Water Head (in)	Final Water Head (in)	Δ in Water Level (in)	Percolation Rate (min/inch)
1	8:40 AM 8:50 AM	10	10	3.6	0.0	3.6	2.8
2	8:50 AM 9:00 AM	10	20	3.2	0.0	3.2	3.1
3	9:00 AM 9:10 AM	10	30	3.0	0.0	3.0	3.3
4	9:10 AM 9:20 AM	10	40	3.0	0.0	3.0	3.3
5	9:20 AM 9:30 AM	10	50	3.0	0.0	3.0	3.3
6	9:30 AM 9:40 AM	10	60	3.0	0.0	3.0	3.3

Infiltration Rate (in/hr):			11.2				
Radius of test hole (in):			5				**Figure A-13**
Average Head (in):			1.5				

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with current, generally accepted test methods of ASTM International (ASTM) or other suggested procedures. We analyzed selected soil samples for maximum dry density and optimum moisture content, expansion index, corrosivity, grain size distribution, R-values, and direct shear strength. The results of the laboratory tests are presented on Figures B-1 through B-3.

SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS ASTM D1557

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% of dry wt.)
TP-5 @ 4-5’	Silty SAND (SM), dark grayish brown	134.0	9.0
TP-7 @ 4-5’	Poorly graded SAND with silt, trace gravel, brown	135.5	7.0

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS ASTM D4829

Sample No.	Moisture Content		After Test Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
TP-5 @ 4-5’	8.0	12.7	120.3	0

SUMMARY OF CORROSIVITY TEST RESULTS

Sample No.	Chloride Content (ppm)	Sulfate Content (%)	pH	Resistivity (ohm-centimeter)
TP-5 @ 4-5’	36	0.000	7.9	10,300

Chloride content determined by California Test 422.
Water-soluble sulfate determined by California Test 417.
Resistivity and pH determined by Caltrans Test 643.

SUMMARY OF LABORATORY R-VALUE TEST RESULTS ASTM D2844

Sample No.	R-Value
TP-1 @ 0-5’	68

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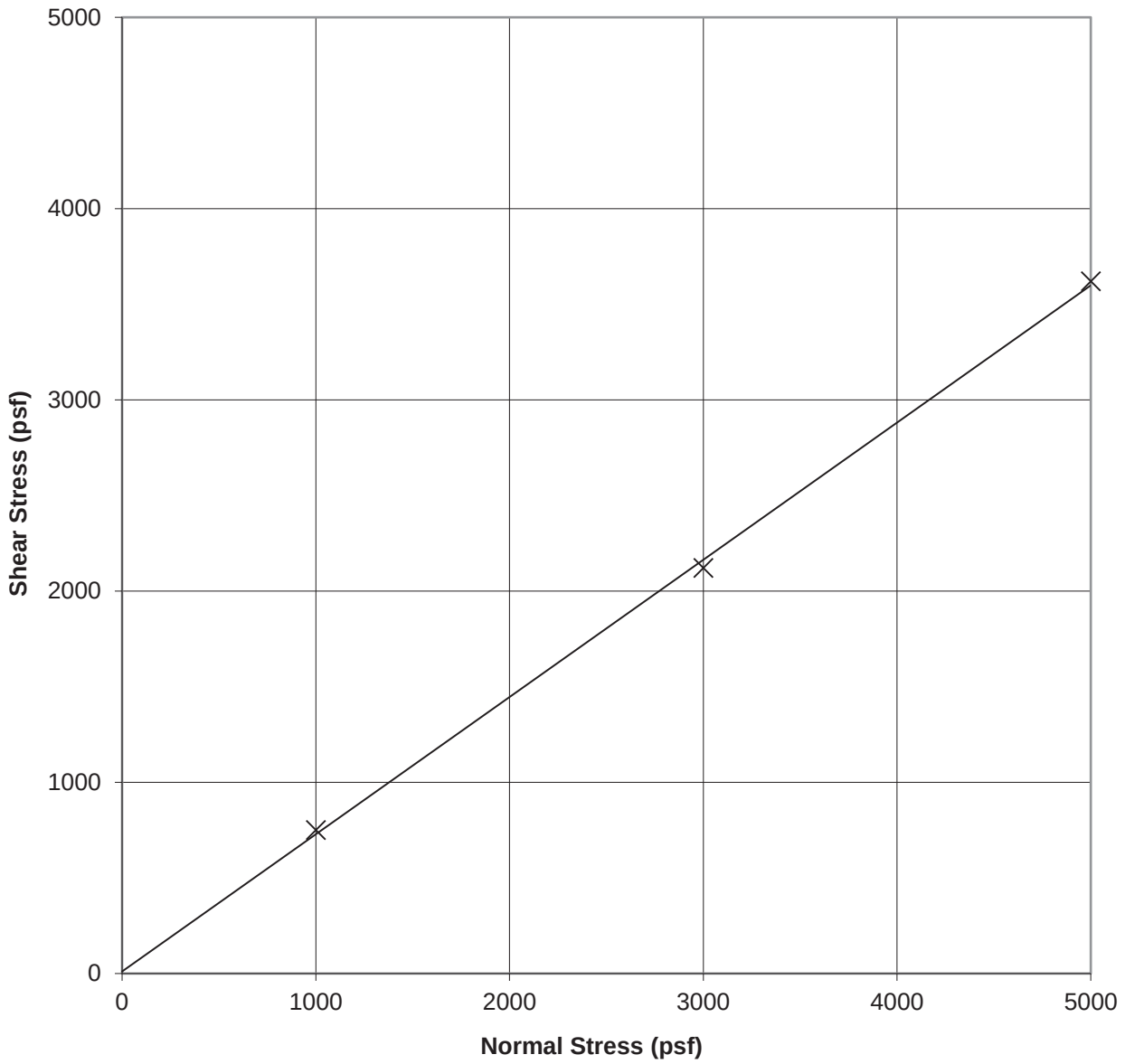
GEOTECHNICAL ENVIRONMENTAL MATERIALS
41571 CORNING PLACE, SUITE 101, MURRIETA, CA 92562-7065
PHONE 951-304-2300 FAX 951-304-2392

PDT

LABORATORY TEST RESULTS

WON MEDITAION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA

OCTOBER 2019 | PROJECT NO. T2877-22-02 | FIG B-1



SAMPLE ID	SOIL TYPE	INITIAL DRY DENSITY (pcf)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)	C (psf)	ϕ (deg)
*TP-7 @ 4'	SP	122.0	6.9	9.8	230	34

*Sample remolded to approximately 90% of the test maximum dry density at optimum moisture content.

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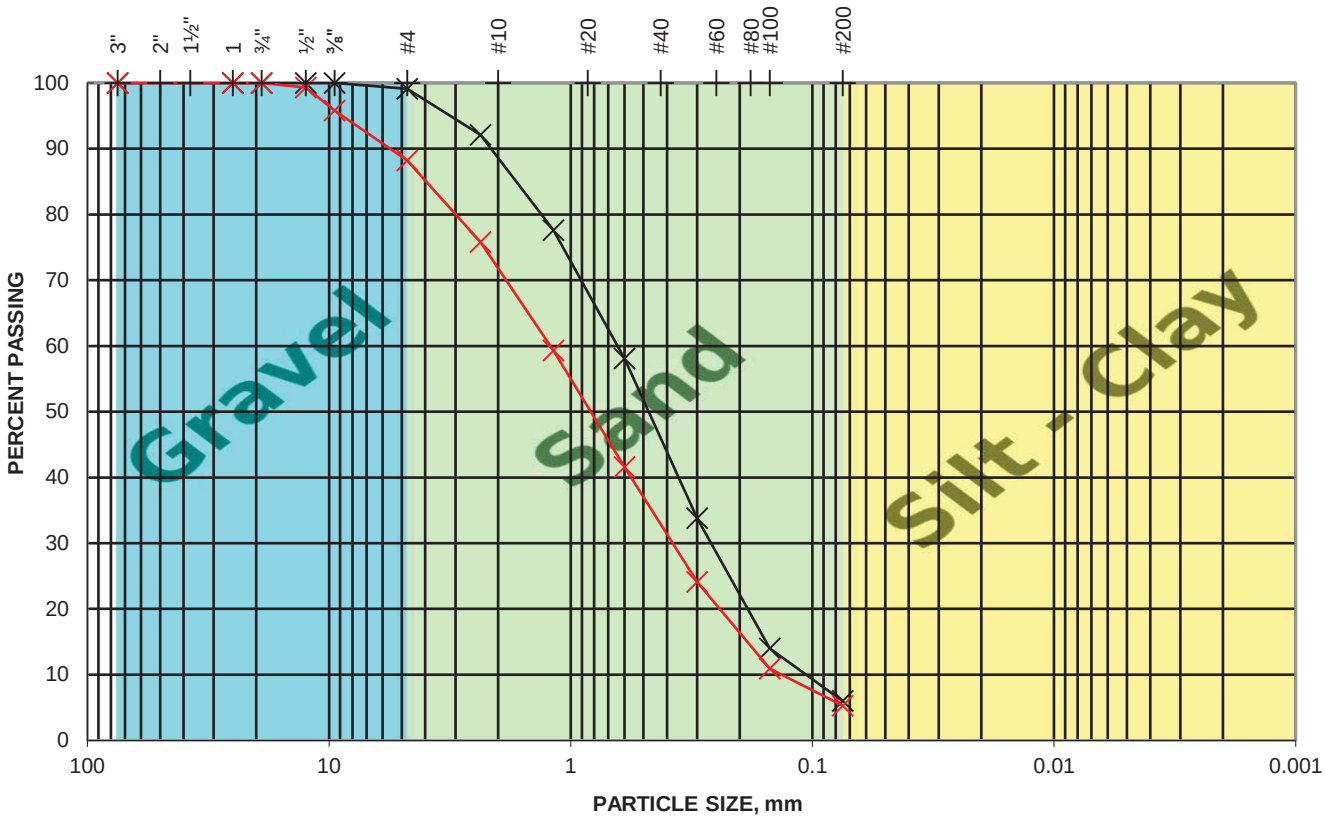
DIRECT SHEAR TEST RESULTS

WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA

OCTOBER 2019	PROJECT NO. T2877-22-02	FIG B-2



SAMPLE ID	SAMPLE DESCRIPTION
P-1 @ 4-5'	SP - Poorly Graded SAND, few silt, trace gravel
P-2 @ 4-5'	SP - Poorly Graded SAND, some gravel, trace silt

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WEST, INC.
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PDT		

GRAIN SIZE DISTRIBUTION

WON MEDITAION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA

OCTOBER 2019	PROJECT NO. T2877-22-02	FIG B-3

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

WON MEDITATION CENTER
19993 GRAND AVENUE
LAKE ELSINORE, CALIFORNIA

PROJECT NO. T2877-22-02

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

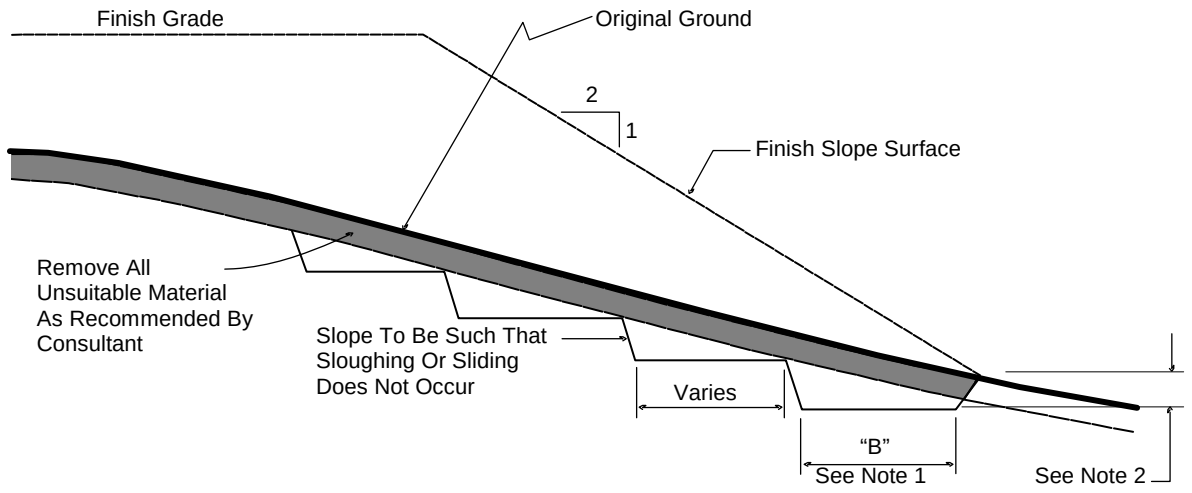
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection

variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

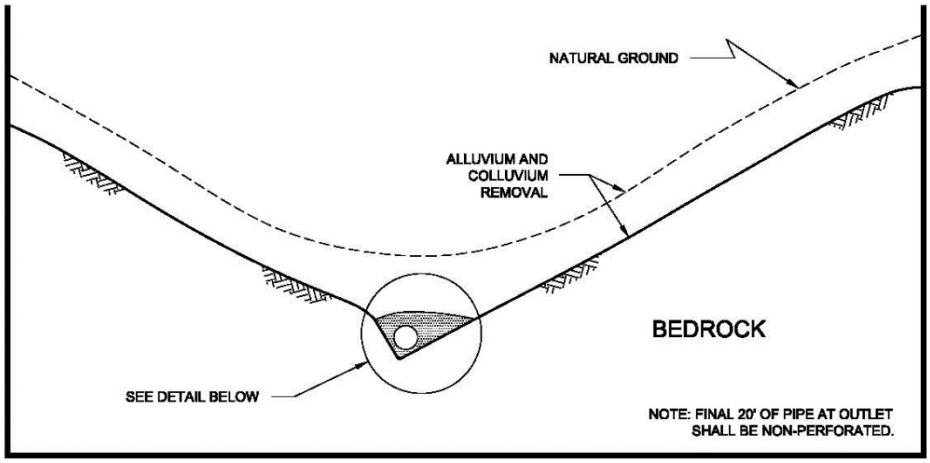
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

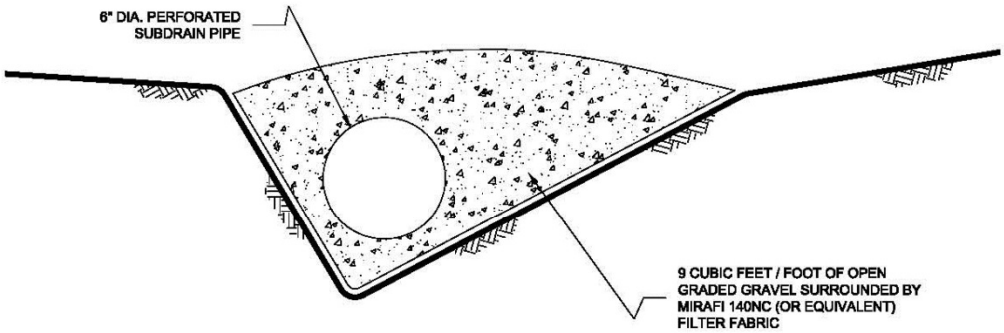
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL





NOTES:

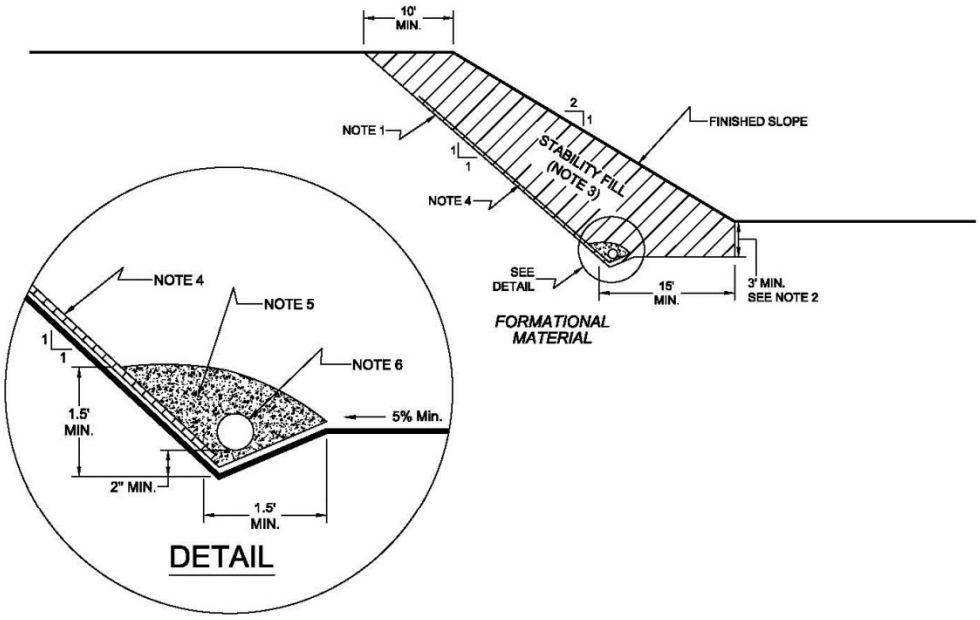
1.....6-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS
IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS
LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

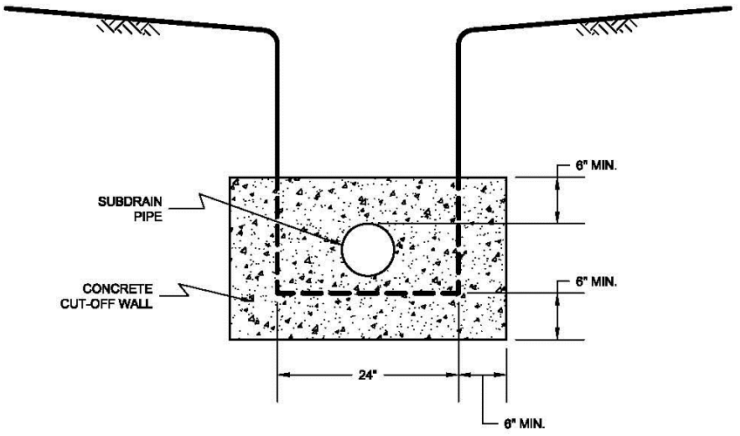
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

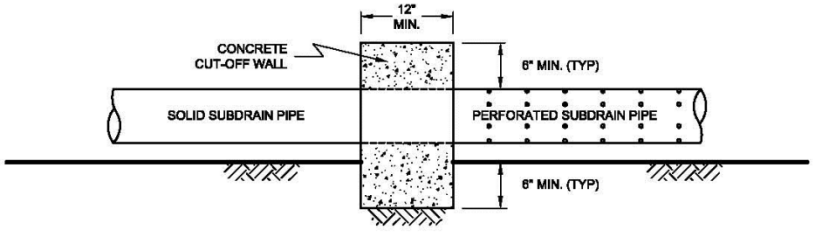
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

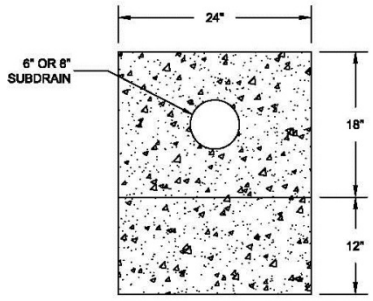


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

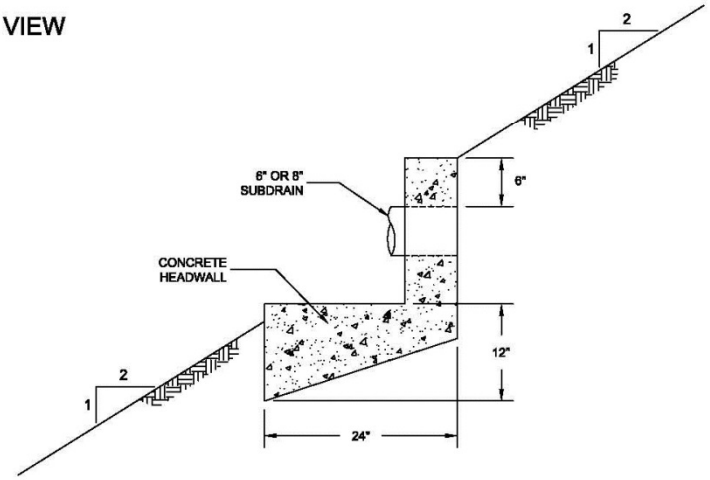
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

Appendix 4: Historical Site Conditions

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

N/A

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

SEE PERCOLATION TEST IN SOIL REPORT

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.

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	PGI	Date	10/21/2019
Designed by	Mai	County/City Case No	PAR 19-0044
Company Project Number/Name	Won Meditation Center		
Drainage Area Number/Name	1-A, 1-B, 1-C, 1-D, 1-E, 1-F, 1-G		

Enter the Area Tributary to this Feature A_T = 1.32 acres

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

Site Location

Township 07S

Range 04W

Section 28 & 33

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.75

Determine the Effective Impervious Fraction

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

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 = 0.67 (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} = 3,210 ft^3

Notes:

Permeable Pavement - Design Procedure	BMP ID	Legend:	Required Entries
			Calculated Cells

Company Name:	PGI	Date:	10/21/2019
Designed by:	Mai	County/City Case No.:	PAR19-0044

Design Volume

BMP & HYDROMODIFICATION

Enter the area tributary to this feature — A_T= 7.77 acres

Enter V_{BMP} determines from Section 2.1 of this Handbook — V_{BMP}= 6,251 ft^3

Permeable Pavement Surface Area

Reservoir Layer Depth, b_{TH} — b_{TH}= 12 inches

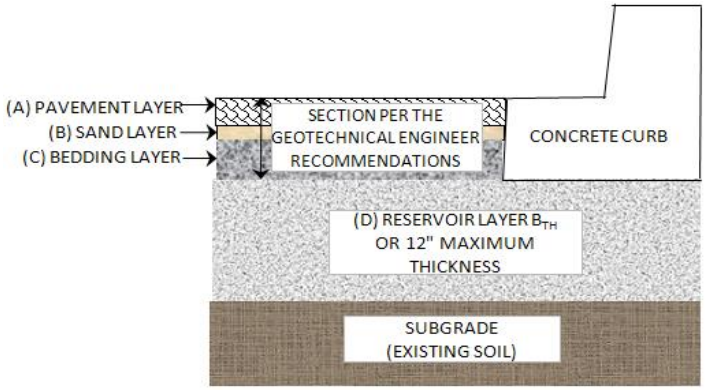
Minimum Surface Area Required, A_S

$$A_{S\,(ft)} = \frac{V_{BMP}\,(ft^3)}{(0.4 \times b_{TH}\,(in)) / 12(in/ft)}$$

A_S= 15,628 ft^2

Proposed Surface Area = 18,245 ft^2

Permeable Pavement Cross Section



Per the Geotechnical	(A)	0	in
Engineer's	(B)	0	in
Recommendations	(C)	0	in
Reservoir Layer	(D)	12	in
Total Permeable Pavement Section			in
Slope of Permeable Pavement		3	%

Sediment Control Provided? (Use pulldown) — Yes

Geotechnical report attached? (Use pulldown) — Yes

Describe Surrounding Vegetation:

Notes:

If the permeable pavement has been designed correctly, there should be no error messages on the spreadsheet.

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.

HYDROLOGY & HYDRAULIC STUDY

FOR

Won Meditation/ Retreat Center

19993 Grand Ave Wildomar, CA

Prepared by:

Pacific Geotech, Inc

Engineer _Jirayus Pukkanasut_____Registration No._RCE 73728___

15038 Clark Ave,
Hacienda Heights, CA 91746
(714) 723-9703

Prepared on: 10/21/19

TABLE OF CONTENTS

Introduction

Onsite area

The Project is a proposed Meditation hall, guest houses, and parking lot. The total area in this study is 7.77 acres.

Existing Condition

The site is mostly undeveloped land with a 3,720 sf building and 11,221 sf paved area.

Proposed Condition

The Project is a proposed Meditation hall, guest houses, and parking lot.

The total area in this study is 7.77 acres.

Methodology

Hydrologic calculation were performed using the Riverside County Rational Method per the RCFC & WCD Hydrology Manual, dated April 1978. Using AES software.

Calculation

Total Property Area = 21.7 acres

Total Study Area = 7.77 acres

Existing Impervious	=	0.34 acres	=	4.4% impervious
Existing Pervious	=	7.43 acres	=	95.6% pervious
Proposed Impervious	=	1.32 acres	=	16.98% impervious
Proposed Pervious	=	6.45 acres	=	83.02% pervious

Rational Method Equation. The Rational Method is based on the direct relationship between rainfall and runoff, and is expressed by the following equation:

$$Q = CIA$$

In which:
Q = the maximum rate of runoff (cubic feet per second [cfs])
C = the runoff coefficient that is the ratio between the runoff volume from an area and the average rainfall depth over a given duration for that area
I = the average intensity of rainfall for a duration equal to the time of concentration (inches/hour)
A = basin area (acres)

Pre Development

Pre Development				
Storm Frequency	Runoff	Volume		
	Q(cfs)	V(cf)		
100yr-24hr	16.15	59394		

Post Development

Post Development

Storm Frequency	Runoff	Volume
	Q(cfs)	V(cf)
100yr-24hr	16.67	62435

ΔV 100-24 62,435-59,394 = 3,041 cf

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1693

                          Analysis prepared by:



--------------------------------------------------------------------------
  FILE NAME: WONPOST.DAT
  TIME/DATE OF STUDY: 11:48 10/21/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.02
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.320
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.980
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.540
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.500
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4809628
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4792280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.500
  SLOPE OF INTENSITY DURATION CURVE = 0.4792
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1296.00
  UPSTREAM ELEVATION(FEET) =   1666.00
  DOWNSTREAM ELEVATION(FEET) =   1324.50
  ELEVATION DIFFERENCE(FEET) =    341.50
  TC = 0.709*[( 1296.00**3)/(   341.50)]**.2 =   16.285
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.802
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7415
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     13.40
  TOTAL AREA(ACRES) =      6.45   TOTAL RUNOFF(CFS) =     13.40

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.802
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8841
  SOIL CLASSIFICATION IS "C"
  SUBAREA AREA(ACRES) =    1.32   SUBAREA RUNOFF(CFS) =    3.27
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      16.67
  TC(MIN.) =   16.28
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        7.8  TC(MIN.) =     16.28
  PEAK FLOW RATE(CFS)   =      16.67
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
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             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2016 Advanced Engineering Software (aes)
                 (Synthetic Unit Hydrograph Version 23.0)
                 Release Date: 07/01/2016  License ID 1693

                          Analysis prepared by:




--------------------------------------------------------------------------
  FILE NAME: WONUPOST.DAT
  TIME/DATE OF STUDY: 17:58 07/25/2019


**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       7.770 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
         *USER ENTERED "LAG" TIME =   10.000 HOURS
         FOOTHILL S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.351
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.800
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.190
         USER-ENTERED RAINFALL =  6.27 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =   2.500



==========================================================================
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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.162	0.051
2	0.488	0.102
3	0.812	0.102
4	1.138	0.102
5	1.462	0.102
6	1.788	0.102
7	2.181	0.123
8	2.644	0.145
9	3.106	0.145
10	3.569	0.145
11	4.060	0.154
12	4.611	0.173
13	5.167	0.174
14	5.722	0.174
15	6.417	0.218
16	7.250	0.261
17	8.046	0.249
18	8.688	0.201
19	9.312	0.196
20	9.947	0.199
21	10.725	0.244
22	11.575	0.266
23	12.500	0.290
24	13.500	0.313
25	14.625	0.352
26	15.875	0.392
27	17.125	0.392
28	18.375	0.392
29	19.628	0.393
30	20.992	0.427
31	22.390	0.438
32	24.350	0.614
33	26.250	0.595
34	28.483	0.700
35	30.717	0.700
36	33.590	0.900
37	36.540	0.924
38	41.440	1.535
39	45.180	1.171
40	48.700	1.103
41	50.833	0.668
42	52.500	0.522
43	54.167	0.522
44	55.880	0.537

45	57.358	0.463
46	58.382	0.321
47	59.633	0.392
48	61.167	0.480
49	62.475	0.410
50	63.425	0.298
51	64.275	0.266
52	65.025	0.235
53	65.777	0.235
54	66.583	0.253
55	67.417	0.261
56	68.383	0.303
57	69.250	0.271
58	69.750	0.157
59	70.475	0.227
60	71.425	0.298
61	71.974	0.172
62	72.500	0.165
63	73.214	0.224
64	73.921	0.222
65	74.562	0.201
66	75.188	0.196
67	75.811	0.195
68	76.394	0.182
69	76.956	0.176
70	77.519	0.176
71	77.929	0.129
72	78.318	0.122
73	78.773	0.142
74	79.227	0.142
75	79.682	0.142
76	80.137	0.142
77	80.591	0.142
78	81.046	0.142
79	81.500	0.142
80	81.998	0.156
81	82.567	0.178
82	82.900	0.104
83	83.233	0.104
84	83.567	0.104
85	83.901	0.105
86	84.259	0.112
87	84.630	0.116
88	85.000	0.116
89	85.370	0.116
90	85.741	0.116
91	86.089	0.109
92	86.394	0.095
93	86.697	0.095
94	87.000	0.095

95	87.303	0.095
96	87.606	0.095
97	87.908	0.095
98	88.175	0.084
99	88.425	0.078
100	88.675	0.078
101	88.925	0.078
102	89.175	0.078
103	89.425	0.078
104	89.675	0.078
105	89.925	0.078
106	90.159	0.073
107	90.386	0.071
108	90.614	0.071
109	90.841	0.071
110	91.068	0.071
111	91.296	0.071
112	91.523	0.071
113	91.750	0.071
114	91.974	0.070
115	92.166	0.060
116	92.351	0.058
117	92.537	0.058
118	92.722	0.058
119	92.908	0.058
120	93.092	0.058
121	93.278	0.058
122	93.463	0.058
123	93.648	0.058
124	93.834	0.058
125	94.009	0.055
126	94.148	0.044
127	94.284	0.043
128	94.419	0.042
129	94.554	0.042
130	94.689	0.042
131	94.824	0.042
132	94.959	0.042
133	95.095	0.043
134	95.230	0.042
135	95.365	0.042
136	95.500	0.042
137	95.635	0.042
138	95.770	0.042
139	95.905	0.042
140	96.023	0.037
141	96.105	0.026
142	96.186	0.025
143	96.266	0.025
144	96.347	0.025

145	96.427	0.025
146	96.509	0.025
147	96.588	0.025
148	96.670	0.025
149	96.750	0.025
150	96.830	0.025
151	96.912	0.025
152	96.991	0.025
153	97.073	0.025
154	97.153	0.025
155	97.234	0.025
156	97.314	0.025
157	97.395	0.025
158	97.476	0.025
159	97.556	0.025
160	97.637	0.025
161	97.718	0.025
162	97.798	0.025
163	97.880	0.025
164	97.959	0.025
165	98.006	0.015
166	98.020	0.004
167	98.032	0.004
168	98.045	0.004
169	98.059	0.004
170	98.071	0.004
171	98.084	0.004
172	98.097	0.004
173	98.109	0.004
174	98.123	0.004
175	98.135	0.004
176	98.149	0.004
177	98.162	0.004
178	98.174	0.004
179	98.188	0.004
180	98.201	0.004
181	98.213	0.004
182	98.226	0.004
183	98.240	0.004
184	98.252	0.004
185	98.266	0.004
186	98.277	0.003
187	98.292	0.005
188	98.305	0.004
189	98.316	0.003
190	98.331	0.005
191	98.341	0.003
192	98.356	0.005
193	98.369	0.004
194	98.381	0.004

195	98.394	0.004
196	98.408	0.004
197	98.420	0.004
198	98.434	0.004
199	98.445	0.003
200	98.458	0.004
201	98.473	0.005
202	98.484	0.003
203	98.498	0.004
204	98.509	0.003
205	98.525	0.005
206	98.537	0.004
207	98.548	0.003
208	98.562	0.004
209	98.577	0.004
210	98.589	0.004
211	98.602	0.004
212	98.614	0.004
213	98.627	0.004
214	98.641	0.004
215	98.653	0.004
216	98.666	0.004
217	98.678	0.004
218	98.691	0.004
219	98.705	0.004
220	98.717	0.004
221	98.731	0.004
222	98.744	0.004
223	98.756	0.004
224	98.769	0.004
225	98.784	0.005
226	98.794	0.003
227	98.809	0.005
228	98.820	0.003
229	98.834	0.004
230	98.847	0.004
231	98.861	0.004
232	98.872	0.003
233	98.884	0.004
234	98.900	0.005
235	98.911	0.003
236	98.925	0.004
237	98.938	0.004
238	98.950	0.004
239	98.964	0.004
240	98.977	0.004
241	98.989	0.004
242	99.002	0.004
243	99.014	0.004
244	99.027	0.004

245	99.039	0.004
246	99.052	0.004
247	99.064	0.004
248	99.077	0.004
249	99.089	0.004
250	99.102	0.004
251	99.114	0.004
252	99.127	0.004
253	99.139	0.004
254	99.152	0.004
255	99.164	0.004
256	99.177	0.004
257	99.189	0.004
258	99.202	0.004
259	99.214	0.004
260	99.227	0.004
261	99.239	0.004
262	99.252	0.004
263	99.264	0.004
264	99.276	0.004
265	99.289	0.004
266	99.301	0.004
267	99.314	0.004
268	99.326	0.004
269	99.339	0.004
270	99.351	0.004
271	99.364	0.004
272	99.376	0.004
273	99.389	0.004
274	99.401	0.004
275	99.414	0.004
276	99.426	0.004
277	99.439	0.004
278	99.451	0.004
279	99.464	0.004
280	99.476	0.004
281	99.489	0.004
282	99.501	0.004
283	99.514	0.004
284	99.526	0.004
285	99.539	0.004
286	99.551	0.004
287	99.564	0.004
288	99.576	0.004
289	99.589	0.004
290	99.601	0.004
291	99.614	0.004
292	99.626	0.004
293	99.639	0.004
294	99.651	0.004

295	99.664	0.004
296	99.676	0.004
297	99.689	0.004
298	99.701	0.004
299	99.714	0.004
300	99.726	0.004
301	99.739	0.004
302	99.751	0.004
303	99.764	0.004
304	99.776	0.004
305	99.789	0.004
306	99.801	0.004
307	99.814	0.004
308	99.826	0.004
309	99.839	0.004
310	99.851	0.004
311	99.864	0.004
312	99.876	0.004
313	99.889	0.004
314	99.901	0.004
315	99.914	0.004
316	99.926	0.004
317	99.939	0.004
318	99.951	0.004
319	99.964	0.004
320	99.976	0.004
321	99.989	0.004
322	100.000	0.004

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0125	0.0100	0.0025
2	0.0188	0.0150	0.0038
3	0.0188	0.0150	0.0038
4	0.0251	0.0201	0.0050
5	0.0188	0.0150	0.0038
6	0.0188	0.0150	0.0038
7	0.0188	0.0150	0.0038
8	0.0251	0.0201	0.0050
9	0.0251	0.0201	0.0050
10	0.0251	0.0201	0.0050
11	0.0313	0.0251	0.0063
12	0.0313	0.0251	0.0063
13	0.0313	0.0251	0.0063
14	0.0313	0.0251	0.0063

15	0.0313	0.0251	0.0063
16	0.0376	0.0301	0.0075
17	0.0376	0.0301	0.0075
18	0.0439	0.0351	0.0088
19	0.0439	0.0351	0.0088
20	0.0502	0.0401	0.0100
21	0.0376	0.0301	0.0075
22	0.0439	0.0351	0.0088
23	0.0502	0.0401	0.0100
24	0.0502	0.0401	0.0100
25	0.0564	0.0451	0.0113
26	0.0564	0.0451	0.0113
27	0.0627	0.0502	0.0125
28	0.0627	0.0502	0.0125
29	0.0627	0.0502	0.0125
30	0.0690	0.0552	0.0138
31	0.0752	0.0602	0.0150
32	0.0815	0.0652	0.0163
33	0.0940	0.0752	0.0188
34	0.0940	0.0752	0.0188
35	0.1003	0.0803	0.0201
36	0.1066	0.0853	0.0213
37	0.1191	0.0953	0.0238
38	0.1254	0.0952	0.0302
39	0.1317	0.0939	0.0378
40	0.1379	0.0927	0.0453
41	0.0940	0.0752	0.0188
42	0.0940	0.0752	0.0188
43	0.1254	0.0890	0.0364
44	0.1254	0.0878	0.0376
45	0.1191	0.0866	0.0325
46	0.1191	0.0855	0.0337
47	0.1066	0.0843	0.0223
48	0.1129	0.0832	0.0297
49	0.1567	0.0820	0.0747
50	0.1630	0.0809	0.0821
51	0.1756	0.0798	0.0958
52	0.1818	0.0787	0.1031
53	0.2132	0.0776	0.1356
54	0.2132	0.0766	0.1366
55	0.1442	0.0755	0.0687
56	0.1442	0.0745	0.0697
57	0.1693	0.0734	0.0959
58	0.1630	0.0724	0.0906
59	0.1630	0.0714	0.0916
60	0.1567	0.0704	0.0863
61	0.1505	0.0695	0.0810
62	0.1442	0.0685	0.0757
63	0.1191	0.0676	0.0515
64	0.1191	0.0667	0.0525

65	0.0251	0.0201	0.0050
66	0.0251	0.0201	0.0050
67	0.0188	0.0150	0.0038
68	0.0188	0.0150	0.0038
69	0.0313	0.0251	0.0063
70	0.0313	0.0251	0.0063
71	0.0313	0.0251	0.0063
72	0.0251	0.0201	0.0050
73	0.0251	0.0201	0.0050
74	0.0251	0.0201	0.0050
75	0.0188	0.0150	0.0038
76	0.0125	0.0100	0.0025
77	0.0188	0.0150	0.0038
78	0.0251	0.0201	0.0050
79	0.0188	0.0150	0.0038
80	0.0125	0.0100	0.0025
81	0.0188	0.0150	0.0038
82	0.0188	0.0150	0.0038
83	0.0188	0.0150	0.0038
84	0.0125	0.0100	0.0025
85	0.0188	0.0150	0.0038
86	0.0125	0.0100	0.0025
87	0.0188	0.0150	0.0038
88	0.0125	0.0100	0.0025
89	0.0188	0.0150	0.0038
90	0.0125	0.0100	0.0025
91	0.0125	0.0100	0.0025
92	0.0125	0.0100	0.0025
93	0.0125	0.0100	0.0025
94	0.0125	0.0100	0.0025
95	0.0125	0.0100	0.0025
96	0.0125	0.0100	0.0025

TOTAL STORM RAINFALL(INCHES) = 6.27
TOTAL SOIL-LOSS(INCHES) = 4.06
TOTAL EFFECTIVE RAINFALL(INCHES) = 2.21

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2.6258
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 1.4333

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0000	0.00	Q	.	.	.	.
0.250	0.0000	0.00	Q	.	.	.	.
0.333	0.0000	0.00	Q	.	.	.	.
0.417	0.0000	0.00	Q	.	.	.	.
0.500	0.0000	0.00	Q	.	.	.	.
0.583	0.0000	0.00	Q	.	.	.	.
0.667	0.0000	0.00	Q	.	.	.	.
0.750	0.0000	0.00	Q	.	.	.	.
0.833	0.0000	0.00	Q	.	.	.	.
0.917	0.0000	0.00	Q	.	.	.	.
1.000	0.0001	0.00	Q	.	.	.	.
1.083	0.0001	0.00	Q	.	.	.	.
1.167	0.0001	0.00	Q	.	.	.	.
1.250	0.0001	0.00	Q	.	.	.	.
1.333	0.0001	0.00	Q	.	.	.	.
1.417	0.0001	0.00	Q	.	.	.	.
1.500	0.0001	0.00	Q	.	.	.	.
1.583	0.0002	0.00	Q	.	.	.	.
1.667	0.0002	0.00	Q	.	.	.	.
1.750	0.0002	0.00	Q	.	.	.	.
1.833	0.0002	0.00	Q	.	.	.	.
1.917	0.0002	0.00	Q	.	.	.	.
2.000	0.0003	0.00	Q	.	.	.	.
2.083	0.0003	0.00	Q	.	.	.	.
2.167	0.0003	0.00	Q	.	.	.	.
2.250	0.0003	0.00	Q	.	.	.	.
2.333	0.0004	0.00	Q	.	.	.	.
2.417	0.0004	0.00	Q	.	.	.	.
2.500	0.0004	0.00	Q	.	.	.	.
2.583	0.0005	0.01	Q	.	.	.	.
2.667	0.0005	0.01	Q	.	.	.	.
2.750	0.0005	0.01	Q	.	.	.	.
2.833	0.0006	0.01	Q	.	.	.	.
2.917	0.0006	0.01	Q	.	.	.	.
3.000	0.0007	0.01	Q	.	.	.	.
3.083	0.0007	0.01	Q	.	.	.	.
3.167	0.0008	0.01	Q	.	.	.	.
3.250	0.0008	0.01	Q	.	.	.	.
3.333	0.0009	0.01	Q	.	.	.	.
3.417	0.0009	0.01	Q	.	.	.	.
3.500	0.0010	0.01	Q	.	.	.	.
3.583	0.0010	0.01	Q	.	.	.	.
3.667	0.0011	0.01	Q	.	.	.	.
3.750	0.0012	0.01	Q	.	.	.	.
3.833	0.0012	0.01	Q	.	.	.	.
3.917	0.0013	0.01	Q	.	.	.	.

4.000	0.0014	0.01	Q	.	.	.	.
4.083	0.0015	0.01	Q	.	.	.	.
4.167	0.0015	0.01	Q	.	.	.	.
4.250	0.0016	0.01	Q	.	.	.	.
4.333	0.0017	0.01	Q	.	.	.	.
4.417	0.0018	0.01	Q	.	.	.	.
4.500	0.0019	0.01	Q	.	.	.	.
4.583	0.0020	0.01	Q	.	.	.	.
4.667	0.0021	0.01	Q	.	.	.	.
4.750	0.0022	0.01	Q	.	.	.	.
4.833	0.0023	0.02	Q	.	.	.	.
4.917	0.0024	0.02	Q	.	.	.	.
5.000	0.0025	0.02	Q	.	.	.	.
5.083	0.0027	0.02	Q	.	.	.	.
5.167	0.0028	0.02	Q	.	.	.	.
5.250	0.0029	0.02	Q	.	.	.	.
5.333	0.0030	0.02	Q	.	.	.	.
5.417	0.0032	0.02	Q	.	.	.	.
5.500	0.0033	0.02	Q	.	.	.	.
5.583	0.0034	0.02	Q	.	.	.	.
5.667	0.0036	0.02	Q	.	.	.	.
5.750	0.0037	0.02	Q	.	.	.	.
5.833	0.0039	0.02	Q	.	.	.	.
5.917	0.0041	0.02	Q	.	.	.	.
6.000	0.0042	0.02	Q	.	.	.	.
6.083	0.0044	0.03	Q	.	.	.	.
6.167	0.0046	0.03	Q	.	.	.	.
6.250	0.0048	0.03	Q	.	.	.	.
6.333	0.0050	0.03	Q	.	.	.	.
6.417	0.0051	0.03	Q	.	.	.	.
6.500	0.0053	0.03	Q	.	.	.	.
6.583	0.0056	0.03	Q	.	.	.	.
6.667	0.0058	0.03	Q	.	.	.	.
6.750	0.0060	0.03	Q	.	.	.	.
6.833	0.0062	0.03	Q	.	.	.	.
6.917	0.0065	0.03	Q	.	.	.	.
7.000	0.0067	0.03	Q	.	.	.	.
7.083	0.0070	0.04	Q	.	.	.	.
7.167	0.0072	0.04	Q	.	.	.	.
7.250	0.0075	0.04	Q	.	.	.	.
7.333	0.0077	0.04	Q	.	.	.	.
7.417	0.0080	0.04	Q	.	.	.	.
7.500	0.0083	0.04	Q	.	.	.	.
7.583	0.0086	0.04	Q	.	.	.	.
7.667	0.0089	0.04	Q	.	.	.	.
7.750	0.0092	0.04	Q	.	.	.	.
7.833	0.0095	0.05	Q	.	.	.	.
7.917	0.0099	0.05	Q	.	.	.	.
8.000	0.0102	0.05	Q	.	.	.	.
8.083	0.0106	0.05	Q	.	.	.	.

8.167	0.0109	0.05	Q	.	.	.	.
8.250	0.0113	0.05	Q	.	.	.	.
8.333	0.0117	0.06	Q	.	.	.	.
8.417	0.0121	0.06	Q	.	.	.	.
8.500	0.0125	0.06	Q	.	.	.	.
8.583	0.0129	0.06	Q	.	.	.	.
8.667	0.0134	0.06	Q	.	.	.	.
8.750	0.0138	0.06	Q	.	.	.	.
8.833	0.0143	0.07	Q	.	.	.	.
8.917	0.0148	0.07	Q	.	.	.	.
9.000	0.0153	0.07	Q	.	.	.	.
9.083	0.0158	0.08	Q	.	.	.	.
9.167	0.0163	0.08	Q	.	.	.	.
9.250	0.0168	0.08	Q	.	.	.	.
9.333	0.0174	0.09	Q	.	.	.	.
9.417	0.0180	0.09	Q	.	.	.	.
9.500	0.0186	0.09	Q	.	.	.	.
9.583	0.0193	0.10	Q	.	.	.	.
9.667	0.0199	0.10	Q	.	.	.	.
9.750	0.0206	0.10	Q	.	.	.	.
9.833	0.0213	0.11	Q	.	.	.	.
9.917	0.0221	0.11	Q	.	.	.	.
10.000	0.0228	0.11	Q	.	.	.	.
10.083	0.0236	0.12	Q	.	.	.	.
10.167	0.0244	0.12	Q	.	.	.	.
10.250	0.0252	0.12	Q	.	.	.	.
10.333	0.0260	0.12	Q	.	.	.	.
10.417	0.0269	0.12	Q	.	.	.	.
10.500	0.0277	0.12	Q	.	.	.	.
10.583	0.0286	0.13	Q	.	.	.	.
10.667	0.0295	0.13	Q	.	.	.	.
10.750	0.0304	0.13	Q	.	.	.	.
10.833	0.0313	0.14	Q	.	.	.	.
10.917	0.0323	0.14	Q	.	.	.	.
11.000	0.0332	0.14	Q	.	.	.	.
11.083	0.0343	0.15	Q	.	.	.	.
11.167	0.0353	0.15	Q	.	.	.	.
11.250	0.0363	0.15	QV	.	.	.	.
11.333	0.0374	0.16	QV	.	.	.	.
11.417	0.0385	0.16	QV	.	.	.	.
11.500	0.0396	0.16	QV	.	.	.	.
11.583	0.0407	0.17	QV	.	.	.	.
11.667	0.0419	0.17	QV	.	.	.	.
11.750	0.0430	0.17	QV	.	.	.	.
11.833	0.0443	0.18	QV	.	.	.	.
11.917	0.0455	0.18	QV	.	.	.	.
12.000	0.0467	0.18	QV	.	.	.	.
12.083	0.0480	0.19	QV	.	.	.	.
12.167	0.0493	0.19	QV	.	.	.	.
12.250	0.0506	0.19	QV	.	.	.	.

12.333	0.0520	0.20	QV	.	.	.	.
12.417	0.0534	0.20	QV	.	.	.	.
12.500	0.0548	0.20	QV	.	.	.	.
12.583	0.0563	0.22	QV	.	.	.	.
12.667	0.0579	0.22	QV	.	.	.	.
12.750	0.0594	0.22	QV	.	.	.	.
12.833	0.0610	0.24	QV	.	.	.	.
12.917	0.0626	0.24	QV	.	.	.	.
13.000	0.0643	0.24	QV	.	.	.	.
13.083	0.0660	0.26	.Q	.	.	.	.
13.167	0.0678	0.26	.Q	.	.	.	.
13.250	0.0696	0.26	.Q	.	.	.	.
13.333	0.0715	0.28	.Q	.	.	.	.
13.417	0.0734	0.28	.QV	.	.	.	.
13.500	0.0754	0.28	.QV	.	.	.	.
13.583	0.0774	0.30	.QV	.	.	.	.
13.667	0.0795	0.30	.QV	.	.	.	.
13.750	0.0816	0.30	.QV	.	.	.	.
13.833	0.0837	0.32	.QV	.	.	.	.
13.917	0.0859	0.32	.QV	.	.	.	.
14.000	0.0881	0.32	.QV	.	.	.	.
14.083	0.0904	0.33	.QV	.	.	.	.
14.167	0.0927	0.33	.QV	.	.	.	.
14.250	0.0950	0.33	.QV	.	.	.	.
14.333	0.0974	0.36	.QV	.	.	.	.
14.417	0.0999	0.36	.QV	.	.	.	.
14.500	0.1023	0.36	.QV	.	.	.	.
14.583	0.1049	0.38	.QV	.	.	.	.
14.667	0.1075	0.38	.Q V	.	.	.	.
14.750	0.1101	0.38	.Q V	.	.	.	.
14.833	0.1129	0.40	.Q V	.	.	.	.
14.917	0.1157	0.40	.Q V	.	.	.	.
15.000	0.1185	0.40	.Q V	.	.	.	.
15.083	0.1214	0.43	.Q V	.	.	.	.
15.167	0.1244	0.43	.Q V	.	.	.	.
15.250	0.1273	0.43	.Q V	.	.	.	.
15.333	0.1304	0.45	.Q V	.	.	.	.
15.417	0.1335	0.45	.Q V	.	.	.	.
15.500	0.1366	0.45	.Q V	.	.	.	.
15.583	0.1398	0.47	.Q V	.	.	.	.
15.667	0.1431	0.47	.Q V	.	.	.	.
15.750	0.1463	0.47	.Q V	.	.	.	.
15.833	0.1498	0.50	. Q V	.	.	.	.
15.917	0.1532	0.50	. Q V	.	.	.	.
16.000	0.1567	0.50	. Q V	.	.	.	.
16.083	0.1603	0.52	. Q V	.	.	.	.
16.167	0.1639	0.52	. Q V	.	.	.	.
16.250	0.1675	0.52	. Q V	.	.	.	.
16.333	0.1713	0.54	. Q V	.	.	.	.
16.417	0.1750	0.54	. Q V	.	.	.	.

16.500	0.1787	0.54	. Q V	.	.	.	.
16.583	0.1826	0.56	. Q V	.	.	.	.
16.667	0.1865	0.56	. Q V	.	.	.	.
16.750	0.1904	0.56	. Q V	.	.	.	.
16.833	0.1945	0.59	. Q V	.	.	.	.
16.917	0.1985	0.59	. Q V	.	.	.	.
17.000	0.2026	0.59	. Q V	.	.	.	.
17.083	0.2068	0.61	. Q V	.	.	.	.
17.167	0.2110	0.61	. Q V	.	.	.	.
17.250	0.2152	0.61	. Q V	.	.	.	.
17.333	0.2195	0.63	. Q V	.	.	.	.
17.417	0.2238	0.63	. Q V	.	.	.	.
17.500	0.2282	0.63	. Q V	.	.	.	.
17.583	0.2327	0.65	. Q V	.	.	.	.
17.667	0.2372	0.65	. Q V	.	.	.	.
17.750	0.2417	0.65	. Q V	.	.	.	.
17.833	0.2463	0.68	. Q V	.	.	.	.
17.917	0.2510	0.68	. Q V	.	.	.	.
18.000	0.2557	0.68	. Q V	.	.	.	.
18.083	0.2605	0.71	. Q V	.	.	.	.
18.167	0.2654	0.71	. Q V	.	.	.	.
18.250	0.2702	0.71	. Q V	.	.	.	.
18.333	0.2753	0.74	. Q V	.	.	.	.
18.417	0.2804	0.74	. Q V	.	.	.	.
18.500	0.2855	0.74	. Q V	.	.	.	.
18.583	0.2908	0.77	. Q V	.	.	.	.
18.667	0.2961	0.77	. Q V	.	.	.	.
18.750	0.3015	0.77	. Q V	.	.	.	.
18.833	0.3070	0.80	. Q V	.	.	.	.
18.917	0.3125	0.80	. Q V	.	.	.	.
19.000	0.3180	0.80	. Q V	.	.	.	.
19.083	0.3238	0.83	. Q V.	.	.	.	.
19.167	0.3295	0.83	. Q V.	.	.	.	.
19.250	0.3352	0.83	. Q V.	.	.	.	.
19.333	0.3410	0.84	. Q V.	.	.	.	.
19.417	0.3468	0.84	. Q V.	.	.	.	.
19.500	0.3526	0.84	. Q V.	.	.	.	.
19.583	0.3585	0.85	. Q V	.	.	.	.
19.667	0.3644	0.85	. Q V	.	.	.	.
19.750	0.3702	0.85	. Q V	.	.	.	.
19.833	0.3763	0.88	. Q V	.	.	.	.
19.917	0.3823	0.88	. Q V	.	.	.	.
20.000	0.3884	0.88	. Q V	.	.	.	.
20.083	0.3946	0.91	. Q .V	.	.	.	.
20.167	0.4009	0.91	. Q .V	.	.	.	.
20.250	0.4071	0.91	. Q .V	.	.	.	.
20.333	0.4137	0.95	. Q .V	.	.	.	.
20.417	0.4202	0.95	. Q .V	.	.	.	.
20.500	0.4267	0.95	. Q .V	.	.	.	.
20.583	0.4334	0.98	. Q . V	.	.	.	.

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20.667      0.4402      0.98  .  Q      . V       .         .         .
20.750      0.4469      0.98  .  Q      . V       .         .         .
20.833      0.4539      1.01  .   Q     . V       .         .         .
20.917      0.4609      1.01  .   Q     . V       .         .         .
21.000      0.4679      1.01  .   Q     .  V      .         .         .
21.083      0.4751      1.06  .   Q     .  V      .         .         .
21.167      0.4824      1.06  .   Q     .  V      .         .         .
21.250      0.4897      1.06  .   Q     .  V      .         .         .
21.333      0.4975      1.13  .   Q     .  V      .         .         .
21.417      0.5053      1.13  .   Q     .   V     .         .         .
21.500      0.5130      1.13  .   Q     .   V     .         .         .
21.583      0.5212      1.19  .   Q     .   V     .         .         .
21.667      0.5294      1.19  .   Q     .   V     .         .         .
21.750      0.5375      1.19  .   Q     .    V    .         .         .
21.833      0.5461      1.24  .   Q     .    V    .         .         .
21.917      0.5546      1.24  .   Q     .    V    .         .         .
22.000      0.5631      1.24  .   Q     .    V    .         .         .
22.083      0.5719      1.27  .    Q    .    V    .         .         .
22.167      0.5807      1.27  .    Q    .     V   .         .         .
22.250      0.5894      1.27  .    Q    .     V   .         .         .
22.333      0.5984      1.30  .    Q    .     V   .         .         .
22.417      0.6074      1.30  .    Q    .     V   .         .         .
22.500      0.6164      1.30  .    Q    .      V  .         .         .
22.583      0.6254      1.31  .    Q    .      V  .         .         .
22.667      0.6345      1.31  .    Q    .      V  .         .         .
22.750      0.6435      1.31  .    Q    .      V  .         .         .
22.833      0.6523      1.28  .    Q    .       V .         .         .
22.917      0.6611      1.28  .    Q    .       V .         .         .
23.000      0.6699      1.28  .    Q    .       V .         .         .
23.083      0.6785      1.24  .   Q     .       V .         .         .
23.166      0.6870      1.24  .   Q     .        V.         .         .
23.250      0.6956      1.24  .   Q     .        V.         .         .
23.333      0.7039      1.21  .   Q     .        V.         .         .
23.416      0.7123      1.21  .   Q     .        V.         .         .
23.500      0.7206      1.21  .   Q     .         V         .         .
23.583      0.7289      1.20  .   Q     .         V         .         .
23.666      0.7371      1.20  .   Q     .         V         .         .
23.750      0.7453      1.20  .   Q     .         V         .         .
23.833      0.7534      1.18  .   Q     .         .V        .         .
23.916      0.7616      1.18  .   Q     .         .V        .         .
24.000      0.7697      1.18  .   Q     .         .V        .         .
24.083      0.7776      1.14  .   Q     .         .V        .         .
24.166      0.7855      1.14  .   Q     .         .V        .         .
24.250      0.7933      1.14  .   Q     .         . V       .         .
24.333      0.8009      1.09  .   Q     .         . V       .         .
24.416      0.8084      1.09  .   Q     .         . V       .         .
24.500      0.8159      1.09  .   Q     .         . V       .         .
24.583      0.8230      1.04  .   Q     .         . V       .         .
24.666      0.8302      1.04  .   Q     .         .  V      .         .
24.750      0.8373      1.04  .   Q     .         .  V      .         .
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24.833      0.8440      0.97  .  Q      .          .  V      .          .
24.916      0.8506      0.97  .  Q      .          .  V      .          .
25.000      0.8573      0.97  .  Q      .          .  V      .          .
25.083      0.8635      0.90  .  Q      .          .   V     .          .
25.166      0.8698      0.90  .  Q      .          .   V     .          .
25.250      0.8760      0.90  .  Q      .          .   V     .          .
25.333      0.8815      0.81  .  Q      .          .   V     .          .
25.416      0.8871      0.81  .  Q      .          .   V     .          .
25.500      0.8926      0.81  .  Q      .          .   V     .          .
25.583      0.8977      0.74  . Q       .          .    V    .          .
25.666      0.9028      0.74  . Q       .          .    V    .          .
25.750      0.9079      0.74  . Q       .          .    V    .          .
25.833      0.9126      0.69  . Q       .          .    V    .          .
25.916      0.9174      0.69  . Q       .          .    V    .          .
26.000      0.9221      0.69  . Q       .          .    V    .          .
26.083      0.9266      0.66  . Q       .          .    V    .          .
26.166      0.9312      0.66  . Q       .          .    V    .          .
26.250      0.9357      0.66  . Q       .          .     V   .          .
26.333      0.9400      0.63  . Q       .          .     V   .          .
26.416      0.9444      0.63  . Q       .          .     V   .          .
26.500      0.9488      0.63  . Q       .          .     V   .          .
26.583      0.9530      0.61  . Q       .          .     V   .          .
26.666      0.9572      0.61  . Q       .          .     V   .          .
26.750      0.9614      0.61  . Q       .          .     V   .          .
26.833      0.9654      0.59  . Q       .          .     V   .          .
26.916      0.9695      0.59  . Q       .          .      V  .          .
27.000      0.9736      0.59  . Q       .          .      V  .          .
27.083      0.9775      0.56  . Q       .          .      V  .          .
27.166      0.9813      0.56  . Q       .          .      V  .          .
27.250      0.9852      0.56  . Q       .          .      V  .          .
27.333      0.9889      0.54  . Q       .          .      V  .          .
27.416      0.9926      0.54  . Q       .          .      V  .          .
27.500      0.9963      0.54  . Q       .          .      V  .          .
27.583      0.9999      0.52  . Q       .          .      V  .          .
27.666      1.0035      0.52  . Q       .          .       V .          .
27.750      1.0070      0.52  . Q       .          .       V .          .
27.833      1.0105      0.51  . Q       .          .       V .          .
27.916      1.0140      0.51  . Q       .          .       V .          .
28.000      1.0175      0.51  . Q       .          .       V .          .
28.083      1.0209      0.49  .Q        .          .       V .          .
28.166      1.0242      0.49  .Q        .          .       V .          .
28.250      1.0276      0.49  .Q        .          .       V .          .
28.333      1.0308      0.47  .Q        .          .       V .          .
28.416      1.0341      0.47  .Q        .          .       V .          .
28.500      1.0373      0.47  .Q        .          .       V .          .
28.583      1.0405      0.46  .Q        .          .        V.          .
28.666      1.0437      0.46  .Q        .          .        V.          .
28.750      1.0469      0.46  .Q        .          .        V.          .
28.833      1.0501      0.46  .Q        .          .        V.          .
28.916      1.0533      0.46  .Q        .          .        V.          .
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29.000	1.0564	0.46	.Q	.	.	V.	.
29.083	1.0595	0.45	.Q	.	.	V.	.
29.166	1.0626	0.45	.Q	.	.	V.	.
29.250	1.0657	0.45	.Q	.	.	V.	.
29.333	1.0688	0.44	.Q	.	.	V.	.
29.416	1.0718	0.44	.Q	.	.	V.	.
29.500	1.0748	0.44	.Q	.	.	V.	.
29.583	1.0777	0.42	.Q	.	.	V	.
29.666	1.0806	0.42	.Q	.	.	V	.
29.750	1.0836	0.42	.Q	.	.	V	.
29.833	1.0864	0.41	.Q	.	.	V	.
29.916	1.0892	0.41	.Q	.	.	V	.
30.000	1.0921	0.41	.Q	.	.	V	.
30.083	1.0948	0.40	.Q	.	.	V	.
30.166	1.0975	0.40	.Q	.	.	V	.
30.250	1.1003	0.40	.Q	.	.	V	.
30.333	1.1029	0.39	.Q	.	.	V	.
30.416	1.1056	0.39	.Q	.	.	V	.
30.500	1.1083	0.39	.Q	.	.	V	.
30.583	1.1109	0.38	.Q	.	.	.V	.
30.666	1.1135	0.38	.Q	.	.	.V	.
30.750	1.1161	0.38	.Q	.	.	.V	.
30.833	1.1186	0.36	.Q	.	.	.V	.
30.916	1.1211	0.36	.Q	.	.	.V	.
31.000	1.1236	0.36	.Q	.	.	.V	.
31.083	1.1261	0.36	.Q	.	.	.V	.
31.166	1.1286	0.36	.Q	.	.	.V	.
31.250	1.1310	0.36	.Q	.	.	.V	.
31.333	1.1335	0.35	.Q	.	.	.V	.
31.416	1.1359	0.35	.Q	.	.	.V	.
31.500	1.1384	0.35	.Q	.	.	.V	.
31.583	1.1407	0.34	.Q	.	.	.V	.
31.666	1.1431	0.34	.Q	.	.	.V	.
31.750	1.1454	0.34	.Q	.	.	.V	.
31.833	1.1477	0.33	.Q	.	.	. V	.
31.916	1.1500	0.33	.Q	.	.	. V	.
32.000	1.1523	0.33	.Q	.	.	. V	.
32.083	1.1546	0.33	.Q	.	.	. V	.
32.166	1.1568	0.33	.Q	.	.	. V	.
32.250	1.1591	0.33	.Q	.	.	. V	.
32.333	1.1613	0.32	.Q	.	.	. V	.
32.416	1.1635	0.32	.Q	.	.	. V	.
32.500	1.1657	0.32	.Q	.	.	. V	.
32.583	1.1678	0.31	.Q	.	.	. V	.
32.666	1.1699	0.31	.Q	.	.	. V	.
32.750	1.1720	0.31	.Q	.	.	. V	.
32.833	1.1741	0.30	.Q	.	.	. V	.
32.916	1.1762	0.30	.Q	.	.	. V	.
33.000	1.1783	0.30	.Q	.	.	. V	.
33.083	1.1803	0.29	.Q	.	.	. V	.

33.166	1.1823	0.29	.Q	.	.	. V	.
33.250	1.1843	0.29	.Q	.	.	. V	.
33.333	1.1863	0.28	.Q	.	.	. V	.
33.416	1.1882	0.28	.Q	.	.	. V	.
33.500	1.1902	0.28	.Q	.	.	. V	.
33.583	1.1920	0.27	.Q	.	.	. V	.
33.666	1.1939	0.27	.Q	.	.	. V	.
33.750	1.1958	0.27	.Q	.	.	. V	.
33.833	1.1976	0.27	.Q	.	.	. V	.
33.916	1.1994	0.27	.Q	.	.	. V	.
34.000	1.2013	0.27	.Q	.	.	. V	.
34.083	1.2031	0.26	.Q	.	.	. V	.
34.166	1.2049	0.26	.Q	.	.	. V	.
34.250	1.2067	0.26	.Q	.	.	. V	.
34.333	1.2085	0.26	.Q	.	.	. V	.
34.416	1.2103	0.26	.Q	.	.	. V	.
34.500	1.2120	0.26	.Q	.	.	. V	.
34.583	1.2138	0.25	.Q	.	.	. V	.
34.666	1.2155	0.25	.Q	.	.	. V	.
34.750	1.2173	0.25	.Q	.	.	. V	.
34.833	1.2190	0.25	Q	.	.	. V	.
34.916	1.2207	0.25	Q	.	.	. V	.
35.000	1.2224	0.25	Q	.	.	. V	.
35.083	1.2240	0.24	Q	.	.	. V	.
35.166	1.2257	0.24	Q	.	.	. V	.
35.250	1.2273	0.24	Q	.	.	. V	.
35.333	1.2289	0.23	Q	.	.	. V	.
35.416	1.2306	0.23	Q	.	.	. V	.
35.500	1.2322	0.23	Q	.	.	. V	.
35.583	1.2337	0.23	Q	.	.	. V	.
35.666	1.2353	0.23	Q	.	.	. V	.
35.750	1.2369	0.23	Q	.	.	. V	.
35.833	1.2384	0.22	Q	.	.	. V	.
35.916	1.2399	0.22	Q	.	.	. V	.
36.000	1.2414	0.22	Q	.	.	. V	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	2175.0
10%	1875.0
20%	1260.0
30%	930.0
40%	675.0
50%	510.0
60%	405.0

70%	285.0
80%	210.0
90%	135.0

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END OF FLOODSCx ROUTING ANALYSIS

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1693

                          Analysis prepared by:



--------------------------------------------------------------------------
  FILE NAME: WONPRE.DAT
  TIME/DATE OF STUDY: 14:48 07/25/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.02
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.320
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.980
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.540
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.500
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4809628
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4792280
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.500
  SLOPE OF INTENSITY DURATION CURVE = 0.4792
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

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****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1296.00
  UPSTREAM ELEVATION(FEET) =   1666.00
  DOWNSTREAM ELEVATION(FEET) =   1324.50
  ELEVATION DIFFERENCE(FEET) =    341.50
  TC = 0.709*[( 1296.00**3)/(   341.50)]**.2 =   16.285
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.802
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7415
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     16.15
  TOTAL AREA(ACRES) =      7.77   TOTAL RUNOFF(CFS) =     16.15
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        7.8  TC(MIN.) =     16.28
  PEAK FLOW RATE(CFS)   =      16.15
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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             F L O O D    R O U T I N G    A N A L Y S I S

ACCORDING TO RIVERSIDE COUNTY FLOOD CONTORL AND WATER CONSERVATION DISTRICT
                    (RCFC&WCD) 1978 HYDROLOGY MANUAL
         (c) Copyright 1989-2016 Advanced Engineering Software (aes)
                  (Synthetic Unit Hydrograph Version 23.0)
                  Release Date: 07/01/2016  License ID 1693

                           Analysis prepared by:




--------------------------------------------------------------------------
  FILE NAME: WONUPRE.DAT
  TIME/DATE OF STUDY: 17:56 07/25/2019


**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =       7.770 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
  Warning: Watershed Area is less than 10 acres
         *USER ENTERED "LAG" TIME =   10.000 HOURS
         FOOTHILL S-GRAPH SELECTED
         UNIFORM MEAN SOIL-LOSS(INCH/HOUR) =  0.374
         LOW SOIL-LOSS RATE PERCENT(DECIMAL) = 0.800
         MINIMUM SOIL-LOSS RATE(INCH/HOUR) =   0.190
         USER-ENTERED RAINFALL =  6.27 INCHES
         RCFC&WCD 24-Hour Storm (15-Minute period) SELECTED
         RCFC&WCD DEPTH-AREA ADJUSTMENT FACTOR(PLATE E-5.8) = 1.0000


         UNIT HYDROGRAPH TIME UNIT =  15.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =   2.500



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UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	0.162	0.051
2	0.488	0.102
3	0.812	0.102
4	1.138	0.102
5	1.462	0.102
6	1.788	0.102
7	2.181	0.123
8	2.644	0.145
9	3.106	0.145
10	3.569	0.145
11	4.060	0.154
12	4.611	0.173
13	5.167	0.174
14	5.722	0.174
15	6.417	0.218
16	7.250	0.261
17	8.046	0.249
18	8.688	0.201
19	9.312	0.196
20	9.947	0.199
21	10.725	0.244
22	11.575	0.266
23	12.500	0.290
24	13.500	0.313
25	14.625	0.352
26	15.875	0.392
27	17.125	0.392
28	18.375	0.392
29	19.628	0.393
30	20.992	0.427
31	22.390	0.438
32	24.350	0.614
33	26.250	0.595
34	28.483	0.700
35	30.717	0.700
36	33.590	0.900
37	36.540	0.924
38	41.440	1.535
39	45.180	1.171
40	48.700	1.103
41	50.833	0.668
42	52.500	0.522
43	54.167	0.522
44	55.880	0.537

45	57.358	0.463
46	58.382	0.321
47	59.633	0.392
48	61.167	0.480
49	62.475	0.410
50	63.425	0.298
51	64.275	0.266
52	65.025	0.235
53	65.777	0.235
54	66.583	0.253
55	67.417	0.261
56	68.383	0.303
57	69.250	0.271
58	69.750	0.157
59	70.475	0.227
60	71.425	0.298
61	71.974	0.172
62	72.500	0.165
63	73.214	0.224
64	73.921	0.222
65	74.562	0.201
66	75.188	0.196
67	75.811	0.195
68	76.394	0.182
69	76.956	0.176
70	77.519	0.176
71	77.929	0.129
72	78.318	0.122
73	78.773	0.142
74	79.227	0.142
75	79.682	0.142
76	80.137	0.142
77	80.591	0.142
78	81.046	0.142
79	81.500	0.142
80	81.998	0.156
81	82.567	0.178
82	82.900	0.104
83	83.233	0.104
84	83.567	0.104
85	83.901	0.105
86	84.259	0.112
87	84.630	0.116
88	85.000	0.116
89	85.370	0.116
90	85.741	0.116
91	86.089	0.109
92	86.394	0.095
93	86.697	0.095
94	87.000	0.095

95	87.303	0.095
96	87.606	0.095
97	87.908	0.095
98	88.175	0.084
99	88.425	0.078
100	88.675	0.078
101	88.925	0.078
102	89.175	0.078
103	89.425	0.078
104	89.675	0.078
105	89.925	0.078
106	90.159	0.073
107	90.386	0.071
108	90.614	0.071
109	90.841	0.071
110	91.068	0.071
111	91.296	0.071
112	91.523	0.071
113	91.750	0.071
114	91.974	0.070
115	92.166	0.060
116	92.351	0.058
117	92.537	0.058
118	92.722	0.058
119	92.908	0.058
120	93.092	0.058
121	93.278	0.058
122	93.463	0.058
123	93.648	0.058
124	93.834	0.058
125	94.009	0.055
126	94.148	0.044
127	94.284	0.043
128	94.419	0.042
129	94.554	0.042
130	94.689	0.042
131	94.824	0.042
132	94.959	0.042
133	95.095	0.043
134	95.230	0.042
135	95.365	0.042
136	95.500	0.042
137	95.635	0.042
138	95.770	0.042
139	95.905	0.042
140	96.023	0.037
141	96.105	0.026
142	96.186	0.025
143	96.266	0.025
144	96.347	0.025

145	96.427	0.025
146	96.509	0.025
147	96.588	0.025
148	96.670	0.025
149	96.750	0.025
150	96.830	0.025
151	96.912	0.025
152	96.991	0.025
153	97.073	0.025
154	97.153	0.025
155	97.234	0.025
156	97.314	0.025
157	97.395	0.025
158	97.476	0.025
159	97.556	0.025
160	97.637	0.025
161	97.718	0.025
162	97.798	0.025
163	97.880	0.025
164	97.959	0.025
165	98.006	0.015
166	98.020	0.004
167	98.032	0.004
168	98.045	0.004
169	98.059	0.004
170	98.071	0.004
171	98.084	0.004
172	98.097	0.004
173	98.109	0.004
174	98.123	0.004
175	98.135	0.004
176	98.149	0.004
177	98.162	0.004
178	98.174	0.004
179	98.188	0.004
180	98.201	0.004
181	98.213	0.004
182	98.226	0.004
183	98.240	0.004
184	98.252	0.004
185	98.266	0.004
186	98.277	0.003
187	98.292	0.005
188	98.305	0.004
189	98.316	0.003
190	98.331	0.005
191	98.341	0.003
192	98.356	0.005
193	98.369	0.004
194	98.381	0.004

195	98.394	0.004
196	98.408	0.004
197	98.420	0.004
198	98.434	0.004
199	98.445	0.003
200	98.458	0.004
201	98.473	0.005
202	98.484	0.003
203	98.498	0.004
204	98.509	0.003
205	98.525	0.005
206	98.537	0.004
207	98.548	0.003
208	98.562	0.004
209	98.577	0.004
210	98.589	0.004
211	98.602	0.004
212	98.614	0.004
213	98.627	0.004
214	98.641	0.004
215	98.653	0.004
216	98.666	0.004
217	98.678	0.004
218	98.691	0.004
219	98.705	0.004
220	98.717	0.004
221	98.731	0.004
222	98.744	0.004
223	98.756	0.004
224	98.769	0.004
225	98.784	0.005
226	98.794	0.003
227	98.809	0.005
228	98.820	0.003
229	98.834	0.004
230	98.847	0.004
231	98.861	0.004
232	98.872	0.003
233	98.884	0.004
234	98.900	0.005
235	98.911	0.003
236	98.925	0.004
237	98.938	0.004
238	98.950	0.004
239	98.964	0.004
240	98.977	0.004
241	98.989	0.004
242	99.002	0.004
243	99.014	0.004
244	99.027	0.004

245	99.039	0.004
246	99.052	0.004
247	99.064	0.004
248	99.077	0.004
249	99.089	0.004
250	99.102	0.004
251	99.114	0.004
252	99.127	0.004
253	99.139	0.004
254	99.152	0.004
255	99.164	0.004
256	99.177	0.004
257	99.189	0.004
258	99.202	0.004
259	99.214	0.004
260	99.227	0.004
261	99.239	0.004
262	99.252	0.004
263	99.264	0.004
264	99.276	0.004
265	99.289	0.004
266	99.301	0.004
267	99.314	0.004
268	99.326	0.004
269	99.339	0.004
270	99.351	0.004
271	99.364	0.004
272	99.376	0.004
273	99.389	0.004
274	99.401	0.004
275	99.414	0.004
276	99.426	0.004
277	99.439	0.004
278	99.451	0.004
279	99.464	0.004
280	99.476	0.004
281	99.489	0.004
282	99.501	0.004
283	99.514	0.004
284	99.526	0.004
285	99.539	0.004
286	99.551	0.004
287	99.564	0.004
288	99.576	0.004
289	99.589	0.004
290	99.601	0.004
291	99.614	0.004
292	99.626	0.004
293	99.639	0.004
294	99.651	0.004

295	99.664	0.004
296	99.676	0.004
297	99.689	0.004
298	99.701	0.004
299	99.714	0.004
300	99.726	0.004
301	99.739	0.004
302	99.751	0.004
303	99.764	0.004
304	99.776	0.004
305	99.789	0.004
306	99.801	0.004
307	99.814	0.004
308	99.826	0.004
309	99.839	0.004
310	99.851	0.004
311	99.864	0.004
312	99.876	0.004
313	99.889	0.004
314	99.901	0.004
315	99.914	0.004
316	99.926	0.004
317	99.939	0.004
318	99.951	0.004
319	99.964	0.004
320	99.976	0.004
321	99.989	0.004
322	100.000	0.004

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UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0125	0.0100	0.0025
2	0.0188	0.0150	0.0038
3	0.0188	0.0150	0.0038
4	0.0251	0.0201	0.0050
5	0.0188	0.0150	0.0038
6	0.0188	0.0150	0.0038
7	0.0188	0.0150	0.0038
8	0.0251	0.0201	0.0050
9	0.0251	0.0201	0.0050
10	0.0251	0.0201	0.0050
11	0.0313	0.0251	0.0063
12	0.0313	0.0251	0.0063
13	0.0313	0.0251	0.0063
14	0.0313	0.0251	0.0063

15	0.0313	0.0251	0.0063
16	0.0376	0.0301	0.0075
17	0.0376	0.0301	0.0075
18	0.0439	0.0351	0.0088
19	0.0439	0.0351	0.0088
20	0.0502	0.0401	0.0100
21	0.0376	0.0301	0.0075
22	0.0439	0.0351	0.0088
23	0.0502	0.0401	0.0100
24	0.0502	0.0401	0.0100
25	0.0564	0.0451	0.0113
26	0.0564	0.0451	0.0113
27	0.0627	0.0502	0.0125
28	0.0627	0.0502	0.0125
29	0.0627	0.0502	0.0125
30	0.0690	0.0552	0.0138
31	0.0752	0.0602	0.0150
32	0.0815	0.0652	0.0163
33	0.0940	0.0752	0.0188
34	0.0940	0.0752	0.0188
35	0.1003	0.0803	0.0201
36	0.1066	0.0853	0.0213
37	0.1191	0.0953	0.0238
38	0.1254	0.1003	0.0251
39	0.1317	0.1005	0.0311
40	0.1379	0.0991	0.0388
41	0.0940	0.0752	0.0188
42	0.0940	0.0752	0.0188
43	0.1254	0.0949	0.0305
44	0.1254	0.0936	0.0318
45	0.1191	0.0922	0.0269
46	0.1191	0.0909	0.0283
47	0.1066	0.0853	0.0213
48	0.1129	0.0882	0.0246
49	0.1567	0.0869	0.0698
50	0.1630	0.0857	0.0773
51	0.1756	0.0844	0.0912
52	0.1818	0.0832	0.0987
53	0.2132	0.0819	0.1313
54	0.2132	0.0807	0.1325
55	0.1442	0.0795	0.0647
56	0.1442	0.0783	0.0659
57	0.1693	0.0771	0.0921
58	0.1630	0.0760	0.0870
59	0.1630	0.0748	0.0882
60	0.1567	0.0737	0.0830
61	0.1505	0.0726	0.0779
62	0.1442	0.0715	0.0727
63	0.1191	0.0705	0.0487
64	0.1191	0.0694	0.0497

65	0.0251	0.0201	0.0050
66	0.0251	0.0201	0.0050
67	0.0188	0.0150	0.0038
68	0.0188	0.0150	0.0038
69	0.0313	0.0251	0.0063
70	0.0313	0.0251	0.0063
71	0.0313	0.0251	0.0063
72	0.0251	0.0201	0.0050
73	0.0251	0.0201	0.0050
74	0.0251	0.0201	0.0050
75	0.0188	0.0150	0.0038
76	0.0125	0.0100	0.0025
77	0.0188	0.0150	0.0038
78	0.0251	0.0201	0.0050
79	0.0188	0.0150	0.0038
80	0.0125	0.0100	0.0025
81	0.0188	0.0150	0.0038
82	0.0188	0.0150	0.0038
83	0.0188	0.0150	0.0038
84	0.0125	0.0100	0.0025
85	0.0188	0.0150	0.0038
86	0.0125	0.0100	0.0025
87	0.0188	0.0150	0.0038
88	0.0125	0.0100	0.0025
89	0.0188	0.0150	0.0038
90	0.0125	0.0100	0.0025
91	0.0125	0.0100	0.0025
92	0.0125	0.0100	0.0025
93	0.0125	0.0100	0.0025
94	0.0125	0.0100	0.0025
95	0.0125	0.0100	0.0025
96	0.0125	0.0100	0.0025

TOTAL STORM RAINFALL(INCHES) = 6.27
TOTAL SOIL-LOSS(INCHES) = 4.16
TOTAL EFFECTIVE RAINFALL(INCHES) = 2.11

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 2.6956
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 1.3635

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	2.5	5.0	7.5	10.0
0.083	0.0000	0.00	Q	.	.	.	.
0.167	0.0000	0.00	Q	.	.	.	.
0.250	0.0000	0.00	Q	.	.	.	.
0.333	0.0000	0.00	Q	.	.	.	.
0.417	0.0000	0.00	Q	.	.	.	.
0.500	0.0000	0.00	Q	.	.	.	.
0.583	0.0000	0.00	Q	.	.	.	.
0.667	0.0000	0.00	Q	.	.	.	.
0.750	0.0000	0.00	Q	.	.	.	.
0.833	0.0000	0.00	Q	.	.	.	.
0.917	0.0000	0.00	Q	.	.	.	.
1.000	0.0001	0.00	Q	.	.	.	.
1.083	0.0001	0.00	Q	.	.	.	.
1.167	0.0001	0.00	Q	.	.	.	.
1.250	0.0001	0.00	Q	.	.	.	.
1.333	0.0001	0.00	Q	.	.	.	.
1.417	0.0001	0.00	Q	.	.	.	.
1.500	0.0001	0.00	Q	.	.	.	.
1.583	0.0002	0.00	Q	.	.	.	.
1.667	0.0002	0.00	Q	.	.	.	.
1.750	0.0002	0.00	Q	.	.	.	.
1.833	0.0002	0.00	Q	.	.	.	.
1.917	0.0002	0.00	Q	.	.	.	.
2.000	0.0003	0.00	Q	.	.	.	.
2.083	0.0003	0.00	Q	.	.	.	.
2.167	0.0003	0.00	Q	.	.	.	.
2.250	0.0003	0.00	Q	.	.	.	.
2.333	0.0004	0.00	Q	.	.	.	.
2.417	0.0004	0.00	Q	.	.	.	.
2.500	0.0004	0.00	Q	.	.	.	.
2.583	0.0005	0.01	Q	.	.	.	.
2.667	0.0005	0.01	Q	.	.	.	.
2.750	0.0005	0.01	Q	.	.	.	.
2.833	0.0006	0.01	Q	.	.	.	.
2.917	0.0006	0.01	Q	.	.	.	.
3.000	0.0007	0.01	Q	.	.	.	.
3.083	0.0007	0.01	Q	.	.	.	.
3.167	0.0008	0.01	Q	.	.	.	.
3.250	0.0008	0.01	Q	.	.	.	.
3.333	0.0009	0.01	Q	.	.	.	.
3.417	0.0009	0.01	Q	.	.	.	.
3.500	0.0010	0.01	Q	.	.	.	.
3.583	0.0010	0.01	Q	.	.	.	.
3.667	0.0011	0.01	Q	.	.	.	.
3.750	0.0012	0.01	Q	.	.	.	.
3.833	0.0012	0.01	Q	.	.	.	.
3.917	0.0013	0.01	Q	.	.	.	.

4.000	0.0014	0.01	Q	.	.	.	.
4.083	0.0015	0.01	Q	.	.	.	.
4.167	0.0015	0.01	Q	.	.	.	.
4.250	0.0016	0.01	Q	.	.	.	.
4.333	0.0017	0.01	Q	.	.	.	.
4.417	0.0018	0.01	Q	.	.	.	.
4.500	0.0019	0.01	Q	.	.	.	.
4.583	0.0020	0.01	Q	.	.	.	.
4.667	0.0021	0.01	Q	.	.	.	.
4.750	0.0022	0.01	Q	.	.	.	.
4.833	0.0023	0.02	Q	.	.	.	.
4.917	0.0024	0.02	Q	.	.	.	.
5.000	0.0025	0.02	Q	.	.	.	.
5.083	0.0027	0.02	Q	.	.	.	.
5.167	0.0028	0.02	Q	.	.	.	.
5.250	0.0029	0.02	Q	.	.	.	.
5.333	0.0030	0.02	Q	.	.	.	.
5.417	0.0032	0.02	Q	.	.	.	.
5.500	0.0033	0.02	Q	.	.	.	.
5.583	0.0034	0.02	Q	.	.	.	.
5.667	0.0036	0.02	Q	.	.	.	.
5.750	0.0037	0.02	Q	.	.	.	.
5.833	0.0039	0.02	Q	.	.	.	.
5.917	0.0041	0.02	Q	.	.	.	.
6.000	0.0042	0.02	Q	.	.	.	.
6.083	0.0044	0.03	Q	.	.	.	.
6.167	0.0046	0.03	Q	.	.	.	.
6.250	0.0048	0.03	Q	.	.	.	.
6.333	0.0050	0.03	Q	.	.	.	.
6.417	0.0051	0.03	Q	.	.	.	.
6.500	0.0053	0.03	Q	.	.	.	.
6.583	0.0056	0.03	Q	.	.	.	.
6.667	0.0058	0.03	Q	.	.	.	.
6.750	0.0060	0.03	Q	.	.	.	.
6.833	0.0062	0.03	Q	.	.	.	.
6.917	0.0065	0.03	Q	.	.	.	.
7.000	0.0067	0.03	Q	.	.	.	.
7.083	0.0070	0.04	Q	.	.	.	.
7.167	0.0072	0.04	Q	.	.	.	.
7.250	0.0075	0.04	Q	.	.	.	.
7.333	0.0077	0.04	Q	.	.	.	.
7.417	0.0080	0.04	Q	.	.	.	.
7.500	0.0083	0.04	Q	.	.	.	.
7.583	0.0086	0.04	Q	.	.	.	.
7.667	0.0089	0.04	Q	.	.	.	.
7.750	0.0092	0.04	Q	.	.	.	.
7.833	0.0095	0.05	Q	.	.	.	.
7.917	0.0099	0.05	Q	.	.	.	.
8.000	0.0102	0.05	Q	.	.	.	.
8.083	0.0106	0.05	Q	.	.	.	.

8.167	0.0109	0.05	Q	.	.	.	.
8.250	0.0113	0.05	Q	.	.	.	.
8.333	0.0117	0.06	Q	.	.	.	.
8.417	0.0121	0.06	Q	.	.	.	.
8.500	0.0125	0.06	Q	.	.	.	.
8.583	0.0129	0.06	Q	.	.	.	.
8.667	0.0134	0.06	Q	.	.	.	.
8.750	0.0138	0.06	Q	.	.	.	.
8.833	0.0143	0.07	Q	.	.	.	.
8.917	0.0148	0.07	Q	.	.	.	.
9.000	0.0153	0.07	Q	.	.	.	.
9.083	0.0158	0.08	Q	.	.	.	.
9.167	0.0163	0.08	Q	.	.	.	.
9.250	0.0168	0.08	Q	.	.	.	.
9.333	0.0174	0.09	Q	.	.	.	.
9.417	0.0180	0.09	Q	.	.	.	.
9.500	0.0186	0.09	Q	.	.	.	.
9.583	0.0193	0.10	Q	.	.	.	.
9.667	0.0199	0.10	Q	.	.	.	.
9.750	0.0206	0.10	Q	.	.	.	.
9.833	0.0213	0.11	Q	.	.	.	.
9.917	0.0220	0.11	Q	.	.	.	.
10.000	0.0227	0.11	Q	.	.	.	.
10.083	0.0235	0.11	Q	.	.	.	.
10.167	0.0243	0.11	Q	.	.	.	.
10.250	0.0251	0.11	Q	.	.	.	.
10.333	0.0259	0.12	Q	.	.	.	.
10.417	0.0268	0.12	Q	.	.	.	.
10.500	0.0276	0.12	Q	.	.	.	.
10.583	0.0285	0.13	Q	.	.	.	.
10.667	0.0293	0.13	Q	.	.	.	.
10.750	0.0302	0.13	Q	.	.	.	.
10.833	0.0311	0.14	Q	.	.	.	.
10.917	0.0321	0.14	Q	.	.	.	.
11.000	0.0330	0.14	Q	.	.	.	.
11.083	0.0340	0.14	Q	.	.	.	.
11.167	0.0350	0.14	QV	.	.	.	.
11.250	0.0360	0.14	QV	.	.	.	.
11.333	0.0371	0.15	QV	.	.	.	.
11.417	0.0381	0.15	QV	.	.	.	.
11.500	0.0392	0.15	QV	.	.	.	.
11.583	0.0403	0.16	QV	.	.	.	.
11.667	0.0414	0.16	QV	.	.	.	.
11.750	0.0425	0.16	QV	.	.	.	.
11.833	0.0437	0.17	QV	.	.	.	.
11.917	0.0449	0.17	QV	.	.	.	.
12.000	0.0461	0.17	QV	.	.	.	.
12.083	0.0473	0.18	QV	.	.	.	.
12.167	0.0486	0.18	QV	.	.	.	.
12.250	0.0499	0.18	QV	.	.	.	.

12.333	0.0512	0.20	QV	.	.	.	.
12.417	0.0526	0.20	QV	.	.	.	.
12.500	0.0539	0.20	QV	.	.	.	.
12.583	0.0554	0.21	QV	.	.	.	.
12.667	0.0569	0.21	QV	.	.	.	.
12.750	0.0583	0.21	QV	.	.	.	.
12.833	0.0599	0.23	QV	.	.	.	.
12.917	0.0615	0.23	QV	.	.	.	.
13.000	0.0630	0.23	QV	.	.	.	.
13.083	0.0647	0.25	QV	.	.	.	.
13.167	0.0664	0.25	QV	.	.	.	.
13.250	0.0681	0.25	QV	.	.	.	.
13.333	0.0700	0.27	.QV	.	.	.	.
13.417	0.0718	0.27	.QV	.	.	.	.
13.500	0.0737	0.27	.QV	.	.	.	.
13.583	0.0757	0.29	.QV	.	.	.	.
13.667	0.0776	0.29	.QV	.	.	.	.
13.750	0.0796	0.29	.QV	.	.	.	.
13.833	0.0817	0.30	.QV	.	.	.	.
13.917	0.0838	0.30	.QV	.	.	.	.
14.000	0.0859	0.30	.QV	.	.	.	.
14.083	0.0881	0.32	.QV	.	.	.	.
14.167	0.0903	0.32	.QV	.	.	.	.
14.250	0.0925	0.32	.QV	.	.	.	.
14.333	0.0949	0.34	.QV	.	.	.	.
14.417	0.0972	0.34	.QV	.	.	.	.
14.500	0.0996	0.34	.QV	.	.	.	.
14.583	0.1021	0.36	.QV	.	.	.	.
14.667	0.1046	0.36	.Q V	.	.	.	.
14.750	0.1071	0.36	.Q V	.	.	.	.
14.833	0.1097	0.39	.Q V	.	.	.	.
14.917	0.1124	0.39	.Q V	.	.	.	.
15.000	0.1151	0.39	.Q V	.	.	.	.
15.083	0.1179	0.41	.Q V	.	.	.	.
15.167	0.1207	0.41	.Q V	.	.	.	.
15.250	0.1235	0.41	.Q V	.	.	.	.
15.333	0.1264	0.43	.Q V	.	.	.	.
15.417	0.1294	0.43	.Q V	.	.	.	.
15.500	0.1324	0.43	.Q V	.	.	.	.
15.583	0.1355	0.45	.Q V	.	.	.	.
15.667	0.1386	0.45	.Q V	.	.	.	.
15.750	0.1417	0.45	.Q V	.	.	.	.
15.833	0.1450	0.48	.Q V	.	.	.	.
15.917	0.1483	0.48	.Q V	.	.	.	.
16.000	0.1516	0.48	.Q V	.	.	.	.
16.083	0.1550	0.50	. Q V	.	.	.	.
16.167	0.1585	0.50	. Q V	.	.	.	.
16.250	0.1619	0.50	. Q V	.	.	.	.
16.333	0.1655	0.52	. Q V	.	.	.	.
16.417	0.1691	0.52	. Q V	.	.	.	.

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16.500      0.1726      0.52  . Q  V    .         .         .         .
16.583      0.1763      0.54  . Q  V    .         .         .         .
16.667      0.1801      0.54  . Q  V    .         .         .         .
16.750      0.1838      0.54  . Q  V    .         .         .         .
16.833      0.1876      0.56  . Q  V    .         .         .         .
16.917      0.1915      0.56  . Q  V    .         .         .         .
17.000      0.1953      0.56  . Q  V    .         .         .         .
17.083      0.1993      0.58  . Q  V    .         .         .         .
17.167      0.2033      0.58  . Q  V    .         .         .         .
17.250      0.2073      0.58  . Q   V   .         .         .         .
17.333      0.2114      0.60  . Q   V   .         .         .         .
17.417      0.2155      0.60  . Q   V   .         .         .         .
17.500      0.2197      0.60  . Q   V   .         .         .         .
17.583      0.2239      0.62  . Q   V   .         .         .         .
17.667      0.2282      0.62  . Q   V   .         .         .         .
17.750      0.2324      0.62  . Q   V   .         .         .         .
17.833      0.2368      0.64  . Q   V   .         .         .         .
17.917      0.2412      0.64  . Q    V  .         .         .         .
18.000      0.2457      0.64  . Q    V  .         .         .         .
18.083      0.2502      0.67  . Q    V  .         .         .         .
18.167      0.2548      0.67  . Q    V  .         .         .         .
18.250      0.2594      0.67  . Q    V  .         .         .         .
18.333      0.2642      0.70  . Q    V  .         .         .         .
18.417      0.2690      0.70  . Q    V  .         .         .         .
18.500      0.2738      0.70  . Q     V .         .         .         .
18.583      0.2787      0.72  . Q     V .         .         .         .
18.667      0.2837      0.72  . Q     V .         .         .         .
18.750      0.2887      0.72  . Q     V .         .         .         .
18.833      0.2938      0.75  . Q     V .         .         .         .
18.917      0.2990      0.75  . Q     V .         .         .         .
19.000      0.3041      0.75  . Q     V .         .         .         .
19.083      0.3095      0.77  .  Q     V.         .         .         .
19.167      0.3148      0.77  .  Q     V.         .         .         .
19.250      0.3201      0.77  .  Q     V.         .         .         .
19.333      0.3255      0.78  .  Q     V.         .         .         .
19.417      0.3309      0.78  .  Q     V.         .         .         .
19.500      0.3363      0.78  .  Q     V.         .         .         .
19.583      0.3418      0.80  .  Q      V         .         .         .
19.667      0.3473      0.80  .  Q      V         .         .         .
19.750      0.3528      0.80  .  Q      V         .         .         .
19.833      0.3584      0.82  .  Q      V         .         .         .
19.917      0.3641      0.82  .  Q      V         .         .         .
20.000      0.3697      0.82  .  Q      V         .         .         .
20.083      0.3755      0.85  .  Q      .V        .         .         .
20.167      0.3814      0.85  .  Q      .V        .         .         .
20.250      0.3872      0.85  .  Q      .V        .         .         .
20.333      0.3932      0.88  .  Q      .V        .         .         .
20.417      0.3993      0.88  .  Q      .V        .         .         .
20.500      0.4054      0.88  .  Q      .V        .         .         .
20.583      0.4117      0.91  .  Q      . V       .         .         .
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20.667      0.4180      0.91  .  Q      . V       .         .         .
20.750      0.4242      0.91  .  Q      . V       .         .         .
20.833      0.4308      0.95  .  Q      . V       .         .         .
20.917      0.4373      0.95  .  Q      . V       .         .         .
21.000      0.4439      0.95  .  Q      .  V      .         .         .
21.083      0.4507      0.99  .  Q      .  V      .         .         .
21.167      0.4576      0.99  .  Q      .  V      .         .         .
21.250      0.4644      0.99  .  Q      .  V      .         .         .
21.333      0.4717      1.06  .   Q     .  V      .         .         .
21.417      0.4790      1.06  .   Q     .   V     .         .         .
21.500      0.4864      1.06  .   Q     .   V     .         .         .
21.583      0.4941      1.12  .   Q     .   V     .         .         .
21.667      0.5018      1.12  .   Q     .   V     .         .         .
21.750      0.5095      1.12  .   Q     .   V     .         .         .
21.833      0.5175      1.17  .   Q     .    V    .         .         .
21.917      0.5256      1.17  .   Q     .    V    .         .         .
22.000      0.5337      1.17  .   Q     .    V    .         .         .
22.083      0.5421      1.21  .   Q     .    V    .         .         .
22.167      0.5504      1.21  .   Q     .     V   .         .         .
22.250      0.5587      1.21  .   Q     .     V   .         .         .
22.333      0.5673      1.24  .   Q     .     V   .         .         .
22.417      0.5758      1.24  .   Q     .     V   .         .         .
22.500      0.5844      1.24  .   Q     .      V  .         .         .
22.583      0.5930      1.25  .    Q    .      V  .         .         .
22.667      0.6016      1.25  .    Q    .      V  .         .         .
22.750      0.6102      1.25  .    Q    .      V  .         .         .
22.833      0.6186      1.22  .   Q     .       V .         .         .
22.917      0.6269      1.22  .   Q     .       V .         .         .
23.000      0.6353      1.22  .   Q     .       V .         .         .
23.083      0.6435      1.18  .   Q     .       V .         .         .
23.166      0.6516      1.18  .   Q     .        V.         .         .
23.250      0.6598      1.18  .   Q     .        V.         .         .
23.333      0.6677      1.15  .   Q     .        V.         .         .
23.416      0.6756      1.15  .   Q     .        V.         .         .
23.500      0.6836      1.15  .   Q     .         V         .         .
23.583      0.6914      1.14  .   Q     .         V         .         .
23.666      0.6993      1.14  .   Q     .         V         .         .
23.750      0.7071      1.14  .   Q     .         V         .         .
23.833      0.7149      1.13  .   Q     .         V         .         .
23.916      0.7226      1.13  .   Q     .          V        .         .
24.000      0.7304      1.13  .   Q     .          V        .         .
24.083      0.7379      1.09  .   Q     .         .V        .         .
24.166      0.7454      1.09  .   Q     .         .V        .         .
24.250      0.7530      1.09  .   Q     .         . V       .         .
24.333      0.7601      1.04  .   Q     .         . V       .         .
24.416      0.7673      1.04  .   Q     .         . V       .         .
24.500      0.7744      1.04  .   Q     .         . V       .         .
24.583      0.7813      0.99  .  Q      .         . V       .         .
24.666      0.7881      0.99  .  Q      .         .  V      .         .
24.750      0.7949      0.99  .  Q      .         .  V      .         .
```

```
24.833      0.8012      0.92  .  Q      .          .  V      .          .
24.916      0.8076      0.92  .  Q      .          .  V      .          .
25.000      0.8139      0.92  .  Q      .          .  V      .          .
25.083      0.8199      0.86  .  Q      .          .   V     .          .
25.166      0.8258      0.86  .  Q      .          .   V     .          .
25.250      0.8318      0.86  .  Q      .          .   V     .          .
25.333      0.8371      0.77  .  Q      .          .   V     .          .
25.416      0.8423      0.77  .  Q      .          .   V     .          .
25.500      0.8476      0.77  .  Q      .          .   V     .          .
25.583      0.8525      0.70  . Q       .          .    V    .          .
25.666      0.8573      0.70  . Q       .          .    V    .          .
25.750      0.8622      0.70  . Q       .          .    V    .          .
25.833      0.8667      0.66  . Q       .          .    V    .          .
25.916      0.8712      0.66  . Q       .          .    V    .          .
26.000      0.8757      0.66  . Q       .          .    V    .          .
26.083      0.8800      0.63  . Q       .          .    V    .          .
26.166      0.8843      0.63  . Q       .          .    V    .          .
26.250      0.8887      0.63  . Q       .          .     V   .          .
26.333      0.8928      0.60  . Q       .          .     V   .          .
26.416      0.8970      0.60  . Q       .          .     V   .          .
26.500      0.9011      0.60  . Q       .          .     V   .          .
26.583      0.9051      0.58  . Q       .          .     V   .          .
26.666      0.9091      0.58  . Q       .          .     V   .          .
26.750      0.9131      0.58  . Q       .          .     V   .          .
26.833      0.9170      0.56  . Q       .          .     V   .          .
26.916      0.9209      0.56  . Q       .          .      V  .          .
27.000      0.9248      0.56  . Q       .          .      V  .          .
27.083      0.9285      0.54  . Q       .          .      V  .          .
27.166      0.9322      0.54  . Q       .          .      V  .          .
27.250      0.9360      0.54  . Q       .          .      V  .          .
27.333      0.9395      0.51  . Q       .          .      V  .          .
27.416      0.9430      0.51  . Q       .          .      V  .          .
27.500      0.9466      0.51  . Q       .          .      V  .          .
27.583      0.9500      0.49  .Q        .          .      V  .          .
27.666      0.9534      0.49  .Q        .          .      V  .          .
27.750      0.9568      0.49  .Q        .          .       V .          .
27.833      0.9601      0.48  .Q        .          .       V .          .
27.916      0.9634      0.48  .Q        .          .       V .          .
28.000      0.9668      0.48  .Q        .          .       V .          .
28.083      0.9700      0.47  .Q        .          .       V .          .
28.166      0.9732      0.47  .Q        .          .       V .          .
28.250      0.9764      0.47  .Q        .          .       V .          .
28.333      0.9795      0.45  .Q        .          .       V .          .
28.416      0.9826      0.45  .Q        .          .       V .          .
28.500      0.9857      0.45  .Q        .          .       V .          .
28.583      0.9888      0.44  .Q        .          .        V.          .
28.666      0.9918      0.44  .Q        .          .        V.          .
28.750      0.9949      0.44  .Q        .          .        V.          .
28.833      0.9979      0.44  .Q        .          .        V.          .
28.916      1.0010      0.44  .Q        .          .        V.          .
```

29.000	1.0040	0.44	.Q	.	.	V.	.
29.083	1.0070	0.43	.Q	.	.	V.	.
29.166	1.0099	0.43	.Q	.	.	V.	.
29.250	1.0129	0.43	.Q	.	.	V.	.
29.333	1.0158	0.42	.Q	.	.	V.	.
29.416	1.0186	0.42	.Q	.	.	V.	.
29.500	1.0215	0.42	.Q	.	.	V.	.
29.583	1.0243	0.41	.Q	.	.	V	.
29.666	1.0271	0.41	.Q	.	.	V	.
29.750	1.0299	0.41	.Q	.	.	V	.
29.833	1.0326	0.39	.Q	.	.	V	.
29.916	1.0353	0.39	.Q	.	.	V	.
30.000	1.0381	0.39	.Q	.	.	V	.
30.083	1.0407	0.38	.Q	.	.	V	.
30.166	1.0433	0.38	.Q	.	.	V	.
30.250	1.0459	0.38	.Q	.	.	V	.
30.333	1.0485	0.37	.Q	.	.	V	.
30.416	1.0510	0.37	.Q	.	.	V	.
30.500	1.0536	0.37	.Q	.	.	V	.
30.583	1.0561	0.36	.Q	.	.	V	.
30.666	1.0585	0.36	.Q	.	.	V	.
30.750	1.0610	0.36	.Q	.	.	V	.
30.833	1.0634	0.35	.Q	.	.	.V	.
30.916	1.0658	0.35	.Q	.	.	.V	.
31.000	1.0682	0.35	.Q	.	.	.V	.
31.083	1.0706	0.34	.Q	.	.	.V	.
31.166	1.0729	0.34	.Q	.	.	.V	.
31.250	1.0753	0.34	.Q	.	.	.V	.
31.333	1.0776	0.34	.Q	.	.	.V	.
31.416	1.0800	0.34	.Q	.	.	.V	.
31.500	1.0823	0.34	.Q	.	.	.V	.
31.583	1.0845	0.33	.Q	.	.	.V	.
31.666	1.0868	0.33	.Q	.	.	.V	.
31.750	1.0891	0.33	.Q	.	.	.V	.
31.833	1.0913	0.32	.Q	.	.	. V	.
31.916	1.0934	0.32	.Q	.	.	. V	.
32.000	1.0956	0.32	.Q	.	.	. V	.
32.083	1.0978	0.31	.Q	.	.	. V	.
32.166	1.1000	0.31	.Q	.	.	. V	.
32.250	1.1021	0.31	.Q	.	.	. V	.
32.333	1.1042	0.30	.Q	.	.	. V	.
32.416	1.1063	0.30	.Q	.	.	. V	.
32.500	1.1084	0.30	.Q	.	.	. V	.
32.583	1.1104	0.30	.Q	.	.	. V	.
32.666	1.1125	0.30	.Q	.	.	. V	.
32.750	1.1145	0.30	.Q	.	.	. V	.
32.833	1.1165	0.29	.Q	.	.	. V	.
32.916	1.1184	0.29	.Q	.	.	. V	.
33.000	1.1204	0.29	.Q	.	.	. V	.
33.083	1.1224	0.28	.Q	.	.	. V	.

33.166	1.1243	0.28	.Q	.	.	. V	.
33.250	1.1262	0.28	.Q	.	.	. V	.
33.333	1.1281	0.27	.Q	.	.	. V	.
33.416	1.1299	0.27	.Q	.	.	. V	.
33.500	1.1318	0.27	.Q	.	.	. V	.
33.583	1.1336	0.26	.Q	.	.	. V	.
33.666	1.1353	0.26	.Q	.	.	. V	.
33.750	1.1371	0.26	.Q	.	.	. V	.
33.833	1.1389	0.25	.Q	.	.	. V	.
33.916	1.1406	0.25	.Q	.	.	. V	.
34.000	1.1424	0.25	.Q	.	.	. V	.
34.083	1.1441	0.25	.Q	.	.	. V	.
34.166	1.1458	0.25	.Q	.	.	. V	.
34.250	1.1476	0.25	.Q	.	.	. V	.
34.333	1.1493	0.25	Q	.	.	. V	.
34.416	1.1510	0.25	Q	.	.	. V	.
34.500	1.1527	0.25	Q	.	.	. V	.
34.583	1.1543	0.24	Q	.	.	. V	.
34.666	1.1560	0.24	Q	.	.	. V	.
34.750	1.1577	0.24	Q	.	.	. V	.
34.833	1.1593	0.24	Q	.	.	. V	.
34.916	1.1609	0.24	Q	.	.	. V	.
35.000	1.1625	0.24	Q	.	.	. V	.
35.083	1.1641	0.23	Q	.	.	. V	.
35.166	1.1657	0.23	Q	.	.	. V	.
35.250	1.1672	0.23	Q	.	.	. V	.
35.333	1.1688	0.22	Q	.	.	. V	.
35.416	1.1703	0.22	Q	.	.	. V	.
35.500	1.1719	0.22	Q	.	.	. V	.
35.583	1.1733	0.22	Q	.	.	. V	.
35.666	1.1748	0.22	Q	.	.	. V	.
35.750	1.1763	0.22	Q	.	.	. V	.
35.833	1.1778	0.21	Q	.	.	. V	.
35.916	1.1792	0.21	Q	.	.	. V	.
36.000	1.1807	0.21	Q	.	.	. V	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	2175.0
10%	1890.0
20%	1260.0
30%	930.0
40%	690.0
50%	510.0
60%	390.0

70%	285.0
80%	195.0
90%	135.0

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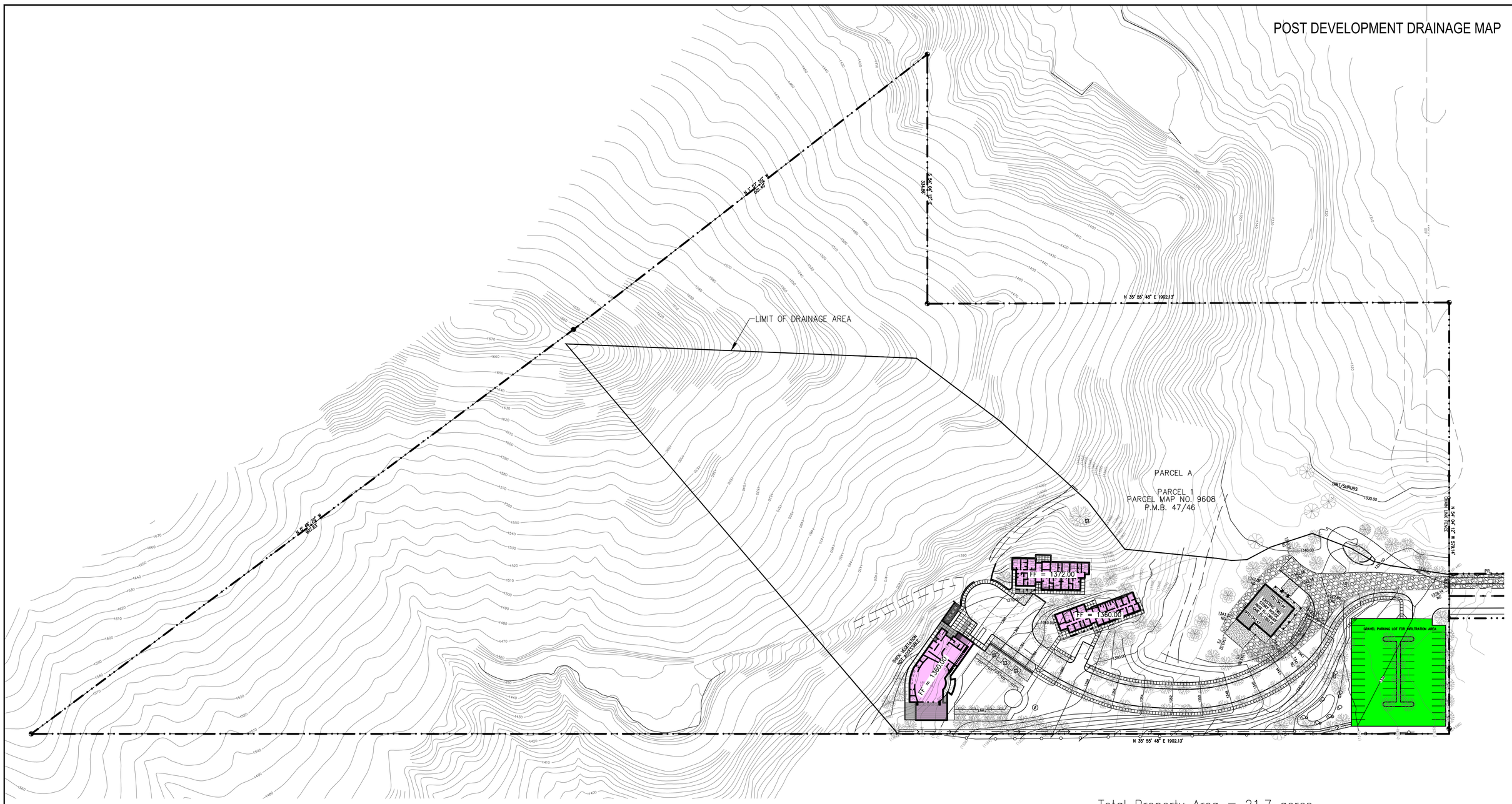
END OF FLOODSCx ROUTING ANALYSIS

POST DEVELOPMENT DRAINAGE MAP



Total Property Area = 21.7 acres
Total Study Area = 7.77 acres

Proposed Impervious = 1.32 acres = 16.98% impervious
Proposed Pervious = 6.45 acres = 83.02% pervious

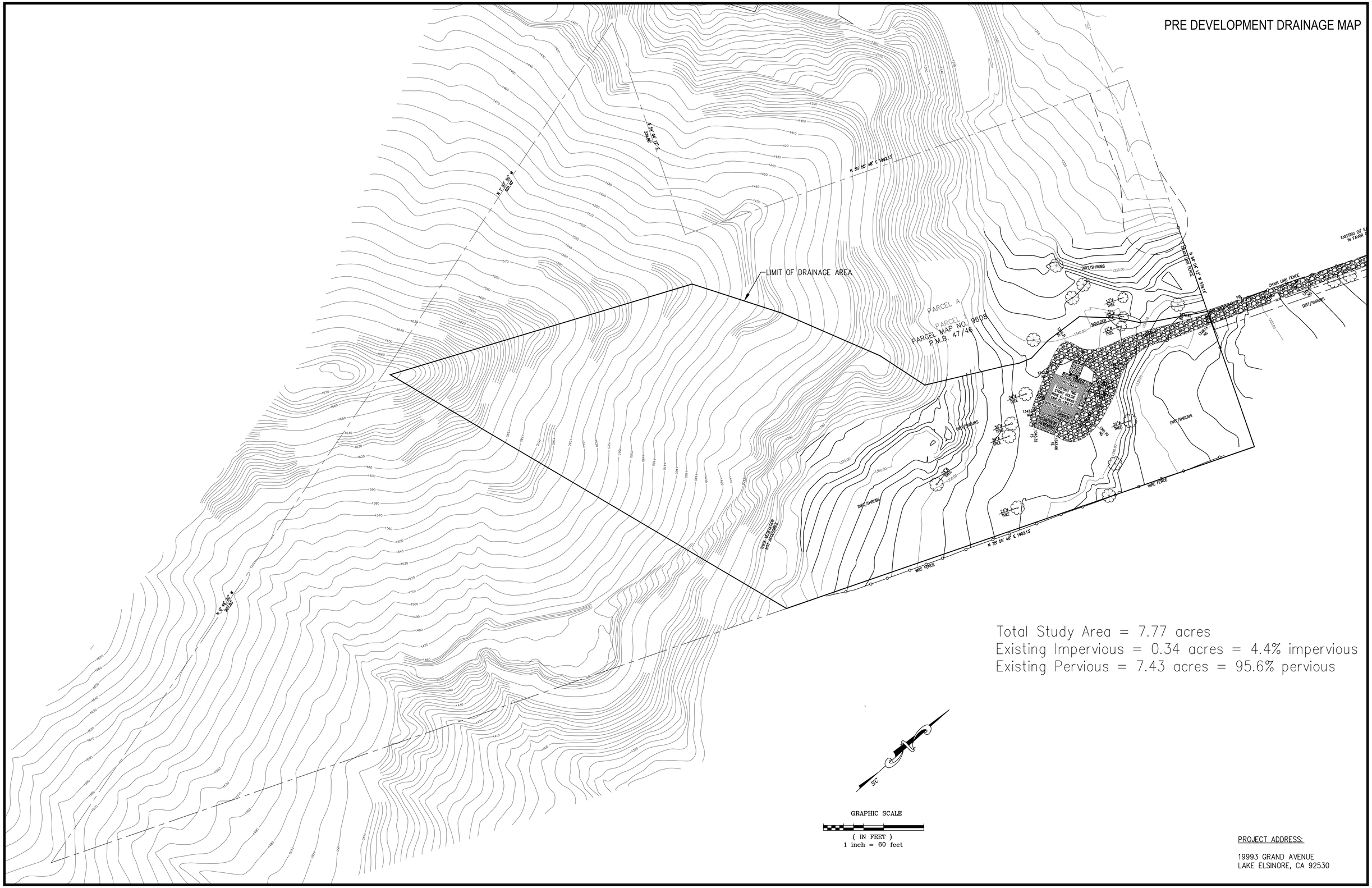
0 60' 120' 180'

Scale 1" =60'

19993 GRAND AVENUE
WILDOMAR, CA

10/21/19

PRE DEVELOPMENT DRAINAGE MAP



Total Study Area = 7.77 acres
Existing Impervious = 0.34 acres = 4.4% impervious
Existing Pervious = 7.43 acres = 95.6% pervious

GRAPHIC SCALE

(IN FEET)
1 inch = 60 feet

PROJECT ADDRESS:

19993 GRAND AVENUE
LAKE ELSINORE, CA 92530

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.

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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.

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ **D1. Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ **D2. Landscape/ Outdoor Pesticide Use**	☒ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☒ **Show self-retaining landscape areas, if any.** ☐ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	☒**State that final landscape plans will accomplish all of the following.** ☒ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** ☒ **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater/Downloads/LandscapeGardenBrochure.pdf** ☒ **Provide IPM information to new owners, lessees and operators.**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

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

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ H. Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ☐ 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

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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 shutoff to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	☐ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ☐ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/** ☐**Car dealerships and similar may rinse cars with water only.**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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.

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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.**	

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included 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

Include the completed Operation and Maintenance Plan in this Appendix along with additional documentation of Finance and Maintenance Recording Mechanisms for the site. Refer to Sections 3.10 and 5 of the SMR WQMP and Section J of this Template.

WQMP
Operation & Maintenance (O&M) Plan

Project Name:

OPERATION& MAINTENANCE
FOR

Won Meditation Center
19993 Grand Ave, Wildomar, CA

Prepared for:

Won Meditation Center
19993 Grand Ave, Wildomar, CA

Prepared by:

Pacific Geotech,Inc.
15038 CLARK AVE
HACIENDA HEIGHTS, CA 91745
TEL (714) 723-9703

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

Project Information

Address: 19993 Grand Ave, Wildomar, CA
Site Size: 21.7 acres
Permeable Parking infiltration
Land Use: Church

Drainage area	=	7.77 acres		
Proposed Impervious	=	1.32 acres	=	64% impervious
Proposed Pervious	=	6.45 acres	=	36% pervious

Responsible Party

"The owner is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the WQMP."

The property owner is **Won Meditation Center** It will be responsible for all BMPs related.

Won Meditation Center

19993 Grand Ave

Wildomar, CA

Contact : TBD

Record Keeping

~~Parties responsible for the O&M plan shall retain records for at least 5 years.~~

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

Vector Control

Standing water which exists for longer than 72 hours may contribute to mosquito breeding areas. Best Management Practices (BMPs) shall be inspected for standing water on a regular basis. Standing water may indicate that the BMP is not functioning properly and proper action to remedy the situation shall be taken in a timely manner.

Elimination of standing water and managing garbage, lawn clippings, and pet droppings, can help decrease the presence of mosquitoes and flies in the area.

Inspections

The City may conduct a site inspection to evaluate compliance with the Project WQMP, at any time, in accordance with Seal Beach~~Dana Point~~ Municipal Code Chapter 15.10, Storm Water/Surface Runoff Water Quality.

8.1.1 Monitoring Plan

The City or other agencies may require a monitoring plan. Details regarding monitoring plan, such as parameters to be tested, frequency, testing locations, laboratory, etc. shall be included as appropriate.

8.1.2 Operation and Maintenance Requirements

Education of Property Owners, Tenants, and Occupants, Activity Restriction & Employee Training				
Responsibility	Inspection		Maintenance	
	Activity	Frequency	Activity	Frequency
Owner	Verify that employees/tenants adhere to WQMP report contents as outlined. Review & retain as required.	Ongoing	Provide WQMP training orientation to new tenants, who will, in turn, provide training to their employees within two weeks of hire/occupancy.	Minimum once a year to include educational materials contained in the approved Water Quality Management Plan
Street Sweeping Private (Street & Parking Lots)				
Responsibility	Inspection		Maintenance	
	Activity	Frequency	Activity	Frequency
Owner			Sweep the parking area to remove debris	Every 2 weeks.
Common Area Inlet Inspection				
Responsibility	Inspection		Maintenance	
	Activity	Frequency	Activity	Frequency
Owner	To verify inlets are clean and increased inspection during the rainy season (October 15th to April 15th).	Monthly during regular inspection	Remove obstructions and clean catch basins to ensure they continue to function properly	Monthly during regular maintenance.
Infiltration				
Responsibility	Inspection		Maintenance	
	Activity	Frequency	Activity	Frequency

Owner	To verify bio retention area are clean and increased inspection during the rainy season (October 15th to April 15th).	Monthly during regular inspection	Remove obstructions and clean bioretention area to ensure they continue to function properly	Monthly during regular maintenance.
BMP ID#	Description of BMP	Maintenance Responsibility	Funding Source for O & M	Maintenance Schedule

Planter box with under drain Operations and Maintenance

General Requirements

Planter box with under drain areas require annual plant, soil, and mulch layer maintenance to ensure optimum infiltration, storage, and pollutant removal capabilities. In general, planter box with under drain maintenance requirements are typical landscape care procedures and include:

1. Watering: Plants should be selected to be drought tolerant and not require watering after establishment (2 to 3 years). Watering may be required during prolonged dry periods after plants are established.
2. Erosion control: Inspect flow entrances, ponding area, and surface overflow areas periodically, and replace soil, plant material, and/or mulch layer in areas if erosion has occurred (see Appendix E for guidance on facility inspection and Appendix F for a planter box with under drain inspection and maintenance checklist). Properly designed facilities with appropriate flow velocities should not have erosion problems except perhaps in extreme events. If erosion problems occur the following should be reassessed: (1) flow velocities and gradients within the cell, and (2) flow dissipation and erosion protection strategies in the pretreatment area and flow entrance. If sediment is deposited in the planter box with under drain area, immediately determine the source within the contributing area, stabilize, and remove excess surface deposits.
3. Plant material: Depending on aesthetic requirements, occasional pruning and removing of dead plant material may be necessary. Replace all dead plants and if specific plants have a high mortality rate, assess the cause and, if necessary, replace with more appropriate species. Periodic weeding is necessary until plants are established. The weeding schedule should become less frequent if the appropriate plant species and planting density have been used and, as a result, undesirable plants excluded.
4. Nutrient and pesticides: The soil mix and plants are selected for optimum fertility, plant establishment, and growth. Nutrient and pesticide inputs should not be required and may degrade the pollutant processing capability of the planter box with under drain area, as well as contribute pollutant loads to receiving waters. By design, planter box with under drain facilities are located in areas where phosphorous and nitrogen levels are often elevated and these should not be limiting nutrients. If in question, have soil analyzed for fertility.
5. Mulch: Replace mulch annually in planter box with under drain facilities where heavy metal deposition is likely (e.g., contributing areas that include industrial and auto dealer/repair parking lots and roads). In residential lots or other areas where metal deposition is not a concern, replace or add mulch as needed to maintain a 2 to 3 inch depth at least once every two years.
6. Soil: Soil mixes for planter box with under drain facilities are designed to maintain long-term fertility and pollutant processing capability. Estimates from metal attenuation research suggest that metal accumulation should not present an environmental concern for at least 20 years in planter box with under drain systems. Replacing mulch in planter box with under drain facilities where heavy metal deposition is likely provides an additional level of protection for prolonged performance. If in question, have soil analyzed for fertility and pollutant levels.

Maintenance Standards - Inspection and Maintenance Activities Summary

Routine Maintenance

_ Repair small eroded areas and ruts by filling with gravel. Overseed bare areas to reestablish vegetation
_ Remove trash and debris and rake surface soils to mitigate ponding
_ Remove accumulated fine sediments, dead leaves and trash to restore surface permeability
_ Remove any evidence of visual contamination from floatables such as oil and grease
_ Eradicate weeds and prune back excess plant growth that interferes with facility operation. Remove invasive vegetation and replace with non-invasive species
_ Remove sediment and debris accumulation near inlet and outlet structures to alleviate clogging
_ Clean and reset flow spreaders (if present) as needed to restore original function
_ Mow routinely to maintain ideal grass height and to suppress weeds

_ Periodically observe function under wet weather conditions

Major Maintenance

_ Repair structural damage to flow control structures including inlet, outlet and overflow structures

_ Clean out under-drain, if present, to alleviate ponding. Replace media if ponding or loss of infiltrative capacity persists and revegetate

_ Regrade and revegetate to repair damage from severe erosion/scour channelization and to restore sheet flow

_ Take photographs before and after major maintenance (encouraged)

Vegetated Swale Maintenance Standards

General Requirements

1. Inspect vegetated swales for erosion or damage to vegetation after every storm greater than 0.75" for on-line swales and at least twice annually for off-line swales, preferably at the end of the wet season to schedule summer maintenance and in the fall to ensure readiness for winter (see Appendix E for guidance on facility inspection). Additional inspection after periods of heavy runoff is recommended. Each swale should be checked for debris and litter and areas of sediment accumulation (see Appendix F for a vegetated swale inspection and maintenance checklist).

2. Swale inlets (curb cuts or pipes) should maintain a calm flow of water entering the swale. Remove sediment as needed at the inlet if vegetation growth is inhibited in greater than 10% of the swale or if the sediment is blocking even distribution and entry of the water. Following sediment removal activities, replanting and/or reseeding of vegetation may be required for reestablishment.

3. Flow spreaders should provide even dispersion of flows across the swale. Sediments and debris should be removed from the flow spreader if blocking flows. Splash pads should be repaired if needed to prevent erosion. Spreader level should be checked and releveled if necessary.

4. Side slopes should be maintained to prevent erosion that introduces sediment into the swale. Slopes should be stabilized and planted using appropriate erosion control measures when native soil is exposed or erosion channels are forming.

5. Swales should drain within 48 hours of the end of a storm. Till the swale if compaction or clogging occurs and revegetate. The perforated underdrain pipe, if present, should be cleaned if necessary.

6. Vegetation should be healthy and dense enough to provide filtering while protecting underlying soils from erosion:

- Mulch should be replenished as needed to ensure survival of vegetation.
- Vegetation, large shrubs or trees that interfere with landscape swale operation should be pruned.
- Fallen leaves and debris from deciduous plant foliage should be removed.
- Grassy swales should be mowed to keep grass 4” to 6” in height. Grass clippings shall be removed.
- Invasive vegetation, such as Alligatorweed (Alternanthera philoxeroides), Halogeton (Halogeton glomeratus), Spotted Knapweed (Centaurea maculosa), Giant Reed (Arundo donax), Castor Bean (Ricinus communis), Perennial Pepperweed (Lepidium latifolium), and Yellow Starthistle (Centaurea solstitalis) must be removed and replaced with noninvasive species. Invasive species should never contribute more than 10% of the vegetated area. For more information on invasive weeds, including biology and control of listed weeds, look at the “encycloweedia” located at the California Department of Food and Agriculture website at http://www.cdfa.ca.gov/wma or the California Invasive Plant Council website at http://portal.cal-ipc.org/weedlist.
- Dead vegetation should be removed if greater than 10% of area coverage or when swale function is impaired. Vegetation should be replaced and established before the wet season to maintain cover density and control erosion where soils are exposed.

7. Check dams (if present) should control and distribute flow across the swale. Causes for altered water flow and/or channelization should be identified and obstructions cleared. Check dams and swale should be repaired if damaged.

Maintenance Standards
Inspection and Maintenance Activities Summary
Routine Maintenance

- Remove excess sediment as needed
- Removal trash and debris
- Clean underdrain (where applicable) and/or unclog outlet to eliminate standing water
- Clean and reset flow spreaders as needed to restore original function
- Restore sunlight access to shaded regions. Remove overhanging tree branches as needed to prevent excessive shading.
- Remove any evidence of visual contamination from floatables such as oil and grease
- Mow routinely to maintain ideal grass height and to suppress weeds
- Replace invasive vegetation with non-invasive species
- Remove sediment and debris accumulation near inlet and outlet structures
- Stabilize/repair minor erosion and scouring with gravel
- Take photographs before and after maintenance (encouraged)

Major Maintenance

- Regrade swale bottom and reseed to mitigate ponding of water between storms or excessive erosion and scouring
- Install or replace low flow channel using pea gravel media to better convey nuisance flows
- Revegetate bare exposed portions of the swale to restore vegetation to original level of coverage
- De-thatch grass to remove accumulated sediment and aerate compacted areas to promote infiltration.

EDUCATIONAL MATERIALS

The following is a selection of Educational Materials for Homeowners, Contractors and employees that address BMPS and water quality issues. Many are available in English and Spanish.

To meet the educational requirements of this O&M Plan, educational brochures can be downloaded or requested at no charge at www.ocwatersheds.com for inclusion on a website, in a newsletter or mailed to property owners, tenants and/or contractors. Property owners, tenants, staff and/or contractors must receive education/training at least once per year.

Brochure	Pollutant(s) Addressed	Activities Addressed
"The Ocean Begins At Your Front Door" – English, Spanish, Vietnamese	Household hazardous waste, trash, motor oil, chlorine, overwatering, green waste, dirt, pesticides/fertilizer, pet waste	Household maintenance and activities (i.e. hosing driveway), automotive maintenance and washing, pool maintenance, landscape and gardening, trash disposal, pet care
Homeowners Guide for Sustainable Water Use Pamphlet	Household hazardous waste, trash, motor oil, chlorine, overwatering, green waste, dirt, pesticides/fertilizer, pet waste	Preventing urban runoff through low impact development in residential properties, water conservation, use of IPM techniques and California-friendly landscaping, general water pollution prevention methods
"Help Prevent Ocean Pollution: Your Local Used Oil Collection Center" - South– English, Spanish, Vietnamese	Motor Oil	Automotive Maintenance, Disposal of Used Motor Oil
"Help Prevent Ocean Pollution: Tips for Pool Maintenance" – English, Spanish	Chlorine, runoff	Pool Drainage/Maintenance
"Help Prevent Ocean Pollution: Tips for Landscape and Gardening" – English, Spanish	Fertilizer, pesticide, dirt, overwatering, green waste	Landscape maintenance, pesticide/fertilizer application, proper disposal of household hazardous waste and green waste
"Help Prevent Ocean Pollution: Tips for Pet Care" – English, Spanish	Surfactants, chemicals, pet waste	Proper disposal of pet waste, proper pet bathing techniques
"Help Prevent Ocean Pollution: Household Tips" – English, Spanish	Household hazardous waste, pet waste, pesticides/fertilizers, overwatering, green waste, surfactants, motor oil, trash	Household maintenance and activities (i.e. hosing driveway), automotive maintenance and washing, pool maintenance, landscape and gardening, trash disposal, pet care
"Help Prevent Ocean Pollution: Proper Disposal of Household Hazardous Materials" – English, Spanish, Vietnamese	Household hazardous wastes	Proper identification and disposal of household hazardous wastes
"Help Prevent Ocean Pollution: Maintenance Practices for Your Business" – English, Spanish	Fertilizer, pesticides, green waste, overwatering, trash, toxic substances	Landscape maintenance, proper application of pesticides and fertilizers, trash management, proper storage of materials

Brochure	Pollutant(s) Addressed	Activities Addressed
"Help Prevent Ocean Pollution: Tips for Using Concrete and Mortar" – English, Spanish	Concrete and mortar, slurry	Proper preparation, use, clean up and disposal of concrete and mortar
"Responsible Pest Control"	Pesticides	Proper identification of pests, selection of least toxic chemical, proper pesticide application, spill prevention and proper storage and disposal of pesticides (use of Integrated Pest Management (IPM) techniques)
"Help Prevent Ocean Pollution: Residential Pool, Landscape and Hardscape Drains" – English, Spanish	Chlorine, chemicals, pet waste, green waste, overwatering, motor oil and vehicle fluids	Pool maintenance, spill prevention, proper disposal of household hazardous waste, proper disposal of pet waste, proper use of pesticides and fertilizers, proper vehicle maintenance
"Help Prevent Ocean Pollution: Proper Use and Disposal of Paint" – English, Spanish	Paint, chemicals	Proper use, storage and disposal of paint
"Help Prevent Ocean Pollution: Tips for Home Improvement Projects" – English, Spanish	Construction debris, concrete, paint, household hazardous waste, sediment	Proper storage of construction materials, recycling of construction materials, proper disposal of household hazardous waste, proper erosion and spill control
"Help Prevent Ocean Pollution: Children's Coloring & Activity Book"	Trash, pet waste, motor oil, green waste	Litter control, proper disposal of pet waste, proper spill clean up (e.g. use of cat litter)
"Help Prevent Ocean Pollution: Tips for the Automotive Industry" – English, Spanish	Motor oil, metals, surfactants, toxic substances, dirt	Proper maintenance and washing practices for automobiles, proper storage and disposal of automotive liquids and materials
"Help Prevent Ocean Pollution: Tips for the Home Mechanic"	Motor oil, metals, surfactants, toxic substances	Proper maintenance and washing practices for automobiles and automotive detailing materials, proper storage and disposal of automotive liquids and materials, use of used oil collection centers
"Compliance Best Management Practices for Mobile Businesses"	Surfactants, toxic substances, dirt, metals	Mobile car washing and detailing, proper high pressure cleaning, proper storage and disposal of washwater from mobile automotive detailing, washing and carpet and fabric cleaning
"Help Prevent Ocean Pollution: A Guide for Food Service Facilities" – English, Spanish, Vietnamese	Grease, food waste, trash	Proper food waste disposal, proper grease and oil disposal, proper procedures for spill cleanup, proper maintenance of trash dumpsters, proper floor mat cleaning, proper wastewater disposal

BMP OPERATION & MAINTENANCE LOG
PROPOSED CARWASH

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

TRAINING / EDUCATIONAL LOG

Date of Training/Educational Activity: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

Topic of Training/Educational Activity: _____

_____

Name of Participant	Signature of Participant

For newsletter or mailer educational activities, please include the following information:

- **Date of mailing**
- **Number distributed**
- **Method of distribution**
- **Topics addressed**

If a newsletter article was distributed, please include a copy of it.

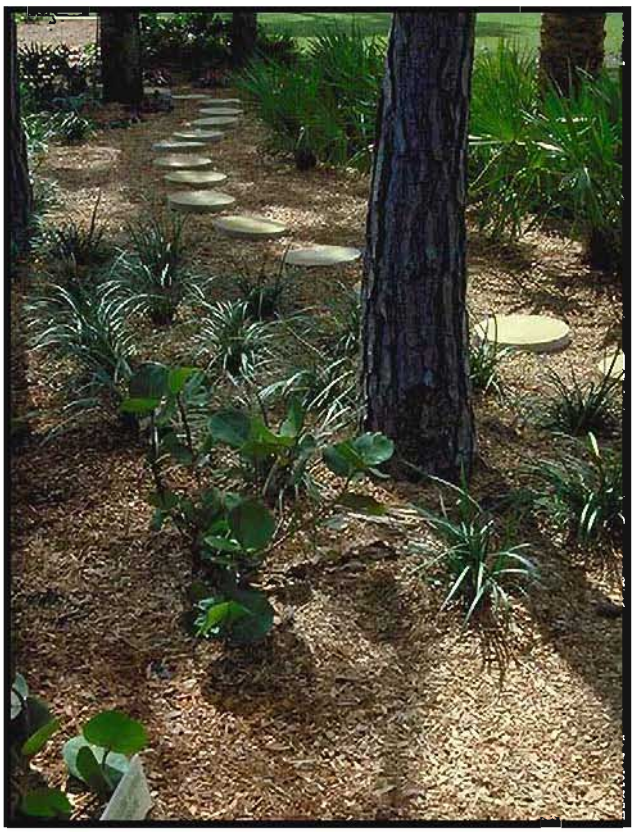
Appendix 10: Educational Materials

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

Examples of material to provide in Appendix 10 may include but are not limited to the following:

- BMP Fact Sheets for proposed BMPs form Exhibit C: LID BMP Design Handbook of the SMR WQMP,
- Source control information and training material for site owners and operators,
- O&M training material,
- Other educational/training material related to site drainage and BMPs.

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.

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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.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

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

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

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.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

- Signage on top of curbs tends to weather and fade.

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

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.