Conceptual Water Quality Management Plan (WQMP)

Project Name:

Tract Map No. 14749 Lot 4
PA22-0015

Prepared for:

The Oaks at Trabuco, LLC

10866 Wilshire Blvd. 11th Floor

Los Angeles, CA 90024

(351) 441-8411

Prepared by:

JLC Engineering and Consulting, Inc.

Engineer: Joseph L. Castaneda

Registration No. 59835

41660 Ivy Street, Suite A

Murrieta, CA 92562

(951) 304-9552

Engineer's Seal

REGISTERED PROFESSIONAL ENGINEER
JOSEPH L. CASTANEDA
NO. 59835
EXP. 12/31/23
CIVIL
STATE OF CALIFORNIA

Prepared on:

January 21, 2021 (Revised June 16, 2022)

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Project Owner's Certification			
Permit/Application No.	PA22-0015	Grading Permit No.	TBD
Tract/Parcel Map No.	14749 Lot 4	Building Permit No.	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			856-171-03

This Water Quality Management Plan (WQMP) has been prepared for The Oaks at Trabuco LLC by JLC Engineering and Consulting, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the San Diego Region (South Orange County). Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Bruce Goren			
Title	Managing Member		
Company	The Oaks at Trabuco, LLC		
Address	16854 Mooncrest Drive, Encino, CA 91436		
Email	bggoren@picoainc.com		
Telephone #	310-920-5102		
Signature		Date	June 16, 2022

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Section 1 Discretionary Permit(s) and Water Quality Conditions

Project Infomation			
Permit/Application No.	PA22-0015	Site Address or Tract/Parcel Map No.	19942 Summit Trail Road Trabuco Canyon, CA
Additional Information/ Comments:	This project is planning to develop a residential unit on Lot 4 of Tract 14749. As part of the entitlement review the project will provide a Conceptual WQMP to demonstrate how the project will be compliant with the WQMP guidelines and requirements.		
Water Quality Conditions			
Water Quality Conditions from prior approvals or applicable watershed-based plans	This project does not have any prior approvals.		

Section 2 Project Description

2.1 General Description

Description of Proposed Project				
Site Location	***19942 Summit Trail Road*** ***Trabuco Canyon, CA*** ***APN 856-171-03***			
Project Area (ft²): 16,596	Number of Dwelling Units: _____**1**_____		SIC Code: N/A	
Narrative Project Description:	*Tract 14749 is an existing residential tract that currently consists of three residential homes. This WQMP is in support of the construction of a home on Lot 4. The lot will consist of three bioretention basins that will treat the required water quality volume and address hydromodifications. Flows discharging from the lot will be conveyed into the existing downstream flow path, which is Summit Trail Road.*			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	17,388	100%	0	0%
Post-Project Conditions	8,691	50%	8,698	50%

2.2 Post Development Drainage Characteristics

The current site currently drains from east to west and discharges into Summit Trail Road, and then into Lot 5. Lot 5 includes a storm drain that collects flows and discharges back into the natural flow path. The post-project condition will mimic these flow patterns. Flows will enter the site from the east, will be conveyed through the series of bioretention basins, and discharge into Summit Trail Road, and ultimately into the existing storm drain system in Lot 5.

2.3 Property Ownership/Management

The lot will be owned and maintained by the future property owner.

Section 3 Site & Watershed Characterization

3.1 Site Conditions

3.1.1 Existing Site Conditions

The project site is currently undeveloped, with no existing impervious surfaces. There is no drainage infrastructure, utilities or roads onsite, with the exception of the existing Summit Trail Road that provides access to the site. An existing residential home is constructed on the opposite side of Summit Trail Road which includes drainage infrastructure that collects flows emanating from Lot 4.

The site slopes at approximately 9% in the existing condition, with elevations raging from 1268 to 1236. The existing drainage flows from east to west and discharges into existing Summit Trail Road.

Existing Land Uses				
Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Undeveloped	0.39	0	0.39	0%
Total	0.39	0	0.39	0%

3.1.2 Infiltration-Related Characteristics

3.1.2.1 Hydrogeologic Conditions

Groundwater was not encountered during the subsurface investigation at the site at least to the maximum depth explored (12.5 feet) and no signs of groundwater seepage were observed within the test pits. In addition, Leighton & Associates did not report groundwater or seepage during previous rough grading of the subject tract. Due to the granular nature of the fill, native soils, and bedrock beneath the site, shallow static groundwater is not expected to be a significant factor with respect to the proposed grading.

3.1.2.2 Soil and Geologic Infiltration Characteristics

An exhibit from the NCRS Websoil Survey has been provided in Attachment G. Infiltration testing will be done during final engineering, however, based upon the NCRS Websoil Survey, the hydrologic soil types are Soil Type D, and infiltration rates are not expected to be high or provide rates feasible for water quality treatment.

3.1.2.3 Geotechnical Conditions

The onsite soil and bedrock formations can be classified as having a low to medium expansion potential based on the assessment of the soil classifications provided by the logs and the results of the expansion index tests. Geotechnical report does not discuss collapsible soils, steep slopes, or liquefaction potential.

3.1.2.4 Summary of Infiltration Opportunities and Constraints of Existing Site

Due to the hydrologic soil type being soil type "D", the infiltration potential is expected to be low. Infiltration testing will be performed during final engineering.

3.2 Proposed Site Development Activities

3.2.1 Overview of Site Development Activities

The project site will develop a residential home, as well as landscaping, a pool and other features typical of a residential home. The existing lot is designated as residential land use in the general land use plan, therefore the project will be consistent with the intended land use.

3.2.2 Project Attributes Influencing Stormwater Management

The project site is a single family residential home. Due to the sloped terrain surrounding the residential home, infiltration based BMPs were not feasible since the location of these BMPs will be close to the building. Therefore bioretention based BMPs will be utilized to treat the water quality volume and to address hydromodifications. The site reduce the slopes to less than 5% through the majority of the site. Flows from the offsite areas will be conveyed around the project site and will discharge into Summit Trail Road, which is the existing terminus for the tributary flows. The landscaping onsite will be consistent with residential landscaping. Wastes generate will be typical of a residential home, and generally limited to just trash.

Proposed Land Uses

Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Building/Roof	0.11	0.11	0	100%
Concrete/Hardscape	0.04	0.04	0	100%
Landscape/Lawn	0.17	0	0.17	0%
Paver Area	0.05	0.035	0.015	70%
Pool Area	0.01	0.01	0	100%
Gravel Area	0.01	0	0.01	0%
Total	0.39	0.195	0.195	50%

3.2.3 Effects on Infiltration and Harvest and Use Feasibility

The proposed project site is hydrologic soil type "D", which is known for low infiltration rates. Additionally, the proximity of some of the BMPs to buildings can cause adverse impacts with soils known for low infiltration.

3.3 Receiving Waterbodies

The project site flows are conveyed to an existing storm drain within Lot 5 across Summit Trail Road. Flows are then discharged back into the natural stream, and are conveyed through natural flow paths to Arroyo Trabuco Creek. Flows are then tributary to San Juan Creek, and then discharge into the Pacific Ocean.

3.4 Stormwater Pollutants or Conditions of Concern

Pollutants or Conditions of Concern				
Pollutant	Expected from Proposed Land Uses/Activities (Yes or No)	Receiving Waterbody Impaired (Yes or No)	Priority Pollutant from WQIP or other Water Quality Condition? (Yes or No)	**Pollutant of Concern (Primary, Other, or No)**
Suspended-Solids	Y	N	No	No
Nutrients	Y	Y	No	Primary
Heavy Metals	N	Y	No	No
Bacteria/Virus/Pathogens	Y	Y	Yes	Primary
Pesticides	Y	Y	No	Primary
Oil and Grease	Y	N	No	No
Toxic Organic Compounds	N	N	No	No
Trash and Debris	Y	N	No	No
Dry Weather Runoff	Y	N	Yes	Primary

3.5 Hydrologic Conditions of Concern

Does a hydrologic condition of concern exist for this project?

☐ No – An HCOC does not exist for this receiving water because:

☐ Project discharges directly to a protected conveyance (bed and bank are concrete lined the entire way from the point(s) of discharge to a receiving lake, reservoir, embayment, or the Ocean

☐ Project discharges directly to storm drains which discharge directly to a reservoir, lake, embayment, ocean or protected conveyance (as described above)

☐ The project discharges to an area identified in the WMAA as exempt from hydromodification concerns

☒ Yes – An HCOC does exist for this receiving water because none of the above are applicable.

Repeat this checklist for each different receiving water to which the project would discharge.

3.6 Critical Course Sediment Yield Areas

(NOTE: Only complete this section if hydromodification criteria apply to the site, otherwise note this section as "not applicable.")

Per the map from Appendix N.8 of the Technical Guidance Document, the project site is located in a Potential Coarse Sediment area. However, the project site will be constructing channels that surround the residential home and direct offsite runoff to the natural downstream terminus. Therefore the project will not adversely impact the current sediment tributary to Arroyo Trabuco Creek. Additionally, the actual disturbed area is 0.39 acres, and will not have an adverse impact on the tributary sediment.

Section 4 Site Plan and Drainage Plan

4.1 Drainage Management Area Delineation

The project site consists of three drainage management areas, and were delineated based upon the downstream bioretention basin in which the DMA is tributary to. The BMPs have been located in landscaped areas throughout the site based upon the grading, site design, and overall layout of the site. Flows will enter the BMPs, and will discharge via a series of storm drain systems, which will discharge back into Summit Trail Road.

4.2 Overall Site Design BMPs

Minimize Impervious Area *The project site uses the minimum amount of impervious surfaces in order to construct the proposed residential home within the lot. The entirely of Lot 4 is not being developed, and therefore leaves large amounts of undeveloped, pervious area.*

Maximize Natural Infiltration Capacity *A natural infiltration capacity was maximized in using the bioretention basins. Additionally, flows are routed through the landscaped area which will also promote infiltration.*

Preserve Existing Drainage Patterns and Time of Concentration *the project site will mimic the existing drainage patterns (from east to west) and discharge into Summit Trail Road, which is the existing downstream terminus for the project site.*

Disconnect Impervious Areas *The project site will convey impervious areas through landscaped, pervious areas prior to discharging into the bioretention basins, where feasible. Additionally, the project divided the watershed area into three DMAs in order to disperse the runoff throughout the impervious areas.*

Protect Existing Vegetation and Sensitive Areas *Existing vegetation within the grading limits of the site was not preserved, however, the remainder of the lot (approximately 4 acres) is left undeveloped with natural vegetation.*

Revegetate Disturbed Areas *Portions of the disturbed area will be revegetated with residential landscaping.*

Soil Stockpiling and Site Generated Organics *Any soils that are stock piled will be utilized and redistributed throughout the site.*

Firescaping *Due to the location of the project adjacent to undeveloped area surrounding the project, landscape plant selection and design for the bioretention BMPs shall be compliant with the requirements of the project's zone.*

Water Efficient Landscaping *The landscaped areas shall utilize water efficient landscaping.*

Slopes and Channel Buffers *The project site does not include channel areas. Disturbed or constructed slopes shall be vegetated with native or drought tolerant species.*

4.3 DMA Characteristics and Site Design BMPs

4.3.1 DMA A

DMA A is located along the north westerly portion of the project site and is 0.05 acres. DMA consists of roof and landscaped area, with a small portion of hardscaped area. Flows are conveyed from the east to the west and ultimately into Bioretention Basin A. The flows will be collected and treated, and will discharge through a riser with orifice holes and an underdrain system. HSC's were not utilized since the DMA area is only 2,158 sq. ft. Flows will discharge into Summit Trail Road.

4.3.2 DMA B

DMA B is located at the south westerly portion of the project site and is 0.11 acres. The majority of the DMA area is roof area and pavers, with some landscaped area, which drains to the bioretention basin located at the west end of the DMA. The paver area is assumed to be 70% impervious as it will be large paver blocks with grass strips separating the paver blocks. The flows will be collected and treated, and will discharge through a riser with orifice holes and an underdrain system. Flows will ultimately discharge into Summit Trail Road.

4.3.3 DMA C

DMA C is located in the easterly and central portion of the project site and is 0.23 acres. This DMA consists of mostly landscaped area, however, does include roof, pool and other hardscaped areas. The DMA includes significant landscaped area that is utilized as impervious area dispersion. The flows will be collected and treated, and will discharge through a riser with orifice holes and an underdrain system. Flows from the bioretention basin will discharge into Summit Trail Road.

4.3.4 DMA Summary

Drainage Management Areas				
DMA (Number/Description)	Total Area (acres)	Imperviousness (%)	Infiltration Feasibility Category (Full, Partial, or No Infiltration)	Hydrologic Source Controls Used
A	0.05	46%	Partial Infiltration	N/A
B	0.11	60%	Partial Infiltration	N/A
C	0.23	23%	Partial Infiltration	Impervious area dispersion

4.4 Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**Reason Source Control is Not Applicable**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Project does not include hazardous waste
N6	Local Industrial Permit Compliance	☐	☒	Project is not an industrial project
N7	Spill Contingency Plan	☐	☒	Project does not include activities that would result in spills
N8	Underground Storage Tank Compliance	☐	☒	Project does not include underground storage tanks of hazardous materials
N9	Hazardous Materials Disclosure Compliance	☐	☒	Project does not include hazardous waste
N10	Uniform Fire Code Implementation	☐	☒	Project does not include hazardous waste
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☐	☒	Project is a residential home and does not include employees
N13	Housekeeping of Loading Docks	☐	☒	Project does not include loading docks
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☐	☒	Project does not include streets or parking lots
N16	Retail Gasoline Outlets	☐	☒	Project does not include gasoline

Structural Source Control BMPs

Identifier	Name	Check One		Reason Source Control is Not Applicable
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	Project does not include outdoor material storage areas
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	Project does not include dock areas
S7	Maintenance bays	☐	☒	Project does not include maintenance bays
S8	Vehicle wash areas	☐	☒	Project does not include vehicle wash areas
S9	Outdoor processing areas	☐	☒	Project does not include outdoor processing areas
S10	Equipment wash areas	☐	☒	equipment wash areas
S11	Fueling areas	☐	☒	Project does not include fueling areas
S12	Hillside landscaping	☒	☐	
S13	Wash water control for food preparation areas	☐	☒	Project does not include food preparation areas
S14	Community car wash racks	☐	☒	Project does not include community car wash areas

Section 5 Low Impact Development BMPs

5.1 LID BMPs in DMA A

5.1.1 Hydrologic Source Controls for DMA A

Due to the size of DMA A, HSCs were not utilized.

5.1.2 Structural LID BMP for DMA A

DMA A will utilize a bioretention basin to treat the required water quality volume, and is designated as Bioretention Basin A. The bioretention basin was sized using Worksheet 8. The design capture storm depth obtain from the rainfall zones is 1.05 inches. The impervious area for DMA A is 46%, with a tributary area of 0.05 acres, resulting in a DCV of 94.3 cu. ft. The minimum area required for the BMP from section E.4.1 of the Technical Guidance Document is 2.8%, which corresponds to the vegetated surface BMP for Urban Mix land cover with no significant open space with no pre-treatment approach. The minimum required area for the BMP from section E.4.2 of the Technical Guidance Document is approximately 2.7% for 1.1″ Design Storm at 50% Imperviousness of Contributing Area. The effective BMP footprint as percent of tributary impervious area is 23.9%, since the contributing impervious area is 1,002.47 sq. ft. and the BMP bottom area is 240 sq. ft. Based upon these parameters, The $V_{biofilter\_storage}$ *is 237.2 cu. ft., which is more than the* $V_{biofilter\_storage\_req.}$ *of -85.4 cu. ft. The basin will be a total of 1.5 feet deep, with a riser that extends 1′ above the top of the soil media, and includes three orifice holes. Two 4.5″ holes at 0.5 feet above the top of the soil media, and one 4.5″ hole at 0.75′ above the top of the soil media. A 6″ underdrain will also be utilized that includes a 1.5″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.*

5.2 LID BMPs in DMA B

5.1.1 Hydrologic Source Controls for DMA B

DMA B includes paver area instead of hardscaped area in order to reduce the imperviousness of the DMA. The pavers are assumed to be 70% impervious, but are not considered a HSC BMP per the OC Technical Guidance Document.

5.1.2 Structural LID BMP for DMA B

DMA B will utilize a bioretention basin to treat the required water quality volume, and is designated as Bioretention Basin A. The bioretention basin was sized using Worksheet 7. The design capture storm depth obtain from the rainfall zones is 1.05 inches. The impervious area for DMA A is 60%, with a tributary area of 0.11 acres, resulting in a DCV of 257.8 cu. ft. The minimum area required for the BMP from section E.4.1 of the Technical Guidance Document is 2.8%, which corresponds to the vegetated surface BMP for Urban Mix land cover with no significant open space with no pre-treatment approach. The minimum required area for the BMP from section E.4.2 of the Technical Guidance Document is approximately 2.5% for 1.1″ Design

Storm at 62% Imperviousness of Contributing Area. The effective BMP footprint as percent of tributary impervious area is 6.22%, since the contributing impervious area is 4,114 sq. ft. and the BMP bottom area is 256 sq. ft. Based upon these parameters, The $V_{treated}$ *is 289.3 cu. ft., which is more than the* $V_{treated\_req}$ *of 207.9 cu. ft. The basin will be a total of 2.0 feet deep, with a riser that extends 1.5′ above the top of the soil media, and includes one orifice hole that is 0.5 feet above the top of the basin and has a diameter of 0.375″. The riser will also include a notch that is 0.25 feet high by 0.67 feet wide. A 6″ underdrain will be utilized that includes a 0.43″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.*

5.3 LID BMPs in DMA C

5.1.1 Hydrologic Source Controls for DMA C

DMA C will impervious area dispersion for HSCs. The impervious area dispersion is a total of 1,224 sq. ft. of area, with a tributary impervious area of 1,764, resulting in a ratio of 0.69. Using the impervious area dispersion chart in the TGD, the resulting d_{HSC} *is 0.35 inches. Since there is only one dispersion area, the resulting* d_{HSC} *total is 0.35 inches, and was utilized in the sizing for the bioretention basin (discussed below).*

5.1.2 Structural LID BMP for DMA C

DMA C will utilize a bioretention basin to treat the required water quality volume, and is designated as Bioretention Basin C. The bioretention basin was sized using Worksheet 8. The design capture storm depth obtain from the rainfall zones is 1.05 inches, and the d_{HSC} *is 0.30 inches, resulting in a* $d_{remainder}$ *of 0.70 inches. The impervious area for DMA A is 37%, with a tributary area of 0.23 acres, resulting in a DCV of 249.8 cu. ft. The minimum area required for the BMP from section E.4.1 of the Technical Guidance Document is 2.8%, which corresponds to the vegetated surface BMP for Urban Mix land cover with no significant open space with no pre-treatment approach. The minimum required area for the BMP from section E.4.2 of the Technical Guidance Document is approximately 2.8% for 1.1″ Design Storm at 40% Imperviousness of Contributing Area. The effective BMP footprint as percent of tributary impervious area is 7.7%, since the contributing impervious area is 3,740.11 sq. ft. and the BMP bottom area is 288.8 sq. ft. Based upon these parameters, The* $V_{biofilter\_storage}$ *is 347.2 cu. ft., which is more than the* $V_{biofilter\_storage\_req.}$ *of -58.7 cu. ft. The basin will be a total of 1.5′ deep, with a riser that extends 1.0′ above the top of the soil media, and includes three orifice holes. Two 0.375″ diameter holes will be at 0.5′ above the top of the soil media, and one 0.375″ diameter hole will be at 0.75′ above the soil media. The riser will also include a notch that is 0.25 feet high by 0.67 feet wide. A 6″ underdrain will also be utilized that includes a 0.125″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.*

5.4 Summary of LID BMPs

DMA	BMP	DCV (cu. ft.)	BMP Bottom Area (sq. ft.)	Tributary Impervious Area (sq. ft.)	Effective Footprint of BMP (%)	$V_{biofilter\_storage}$ or $V_{treated}$ (ft^3)	$V_{biofilter\_Storage\_req}$ or $V_{treated\_req}$ (ft^3)
A	Bioretention Basin	94.3	240	1,002	23.9	234.2	-113.9
B	Bioretention Basin	248.9	256	3,967	6.45	139.1	124.8
C	Bioretention Basin	224.9	289	3,740	7.70	347.2	-83.7

Section 6 Hydromodification BMPs

6.1 Points of Compliance

The points of compliance are the BMPs (Bioretention Basin A, Bioretention Basin B, and Bioretention Basin C) as these are the points that the DMAs are tributary to, and where the compliance for HCOCs occurs. The POCs were determined based upon the tributary DMA areas and the downstream BMP.

6.2 Pre-Development (Natural) Conditions

The pre-developed land cover consists of natural, undeveloped open brush land cover over hydrologic soil types D.

6.3 Post-Development Conditions and Hydromodification BMPs

The post-developed conditions are consistent with a residential development, including roof/building area, concrete/hardscape, porous pavers and landscaping.

DMA A was analyzed using impervious area tributary to urban pervious area, and then to the bioretention basin. The bioretention area was not reduced from the pervious area, even though this essentially counts the area for the bioretention basin twice within the DMA (once in the pervious area and once as a basin), because the bioretention basin assumes that rainfall is contributing to the area in addition to the area tributary to the bioretention basin.

DMA B was analyzed using impervious area for the roofs and concrete, which flow to the porous paver area. The porous pavers and landscaping then discharge into the bioretention basin. Just as with DMA A, the bioretention basin was also accounted for in the tributary landscape area, which is conservative.

DMA C was analyzed using impervious area for the roofs, concrete, and pool, as well as gravel area and urban landscape area. The DMA discharges directly into the bioretention basin, and as DMAs A and B, DMA C accounts for the bioretention area within the pervious urban landscape, which is conservative.

Bioretention Basin B has a bottom surface area of 106.5 sq. ft. An 8″ diameter riser that extends 1.5 feet above the basin bottom will incorporate one 0.5″ diameter orifice hole at 0.5 feet above the soil media, one 0.5″ diameter orifice hole at 0.75 feet above the soil media, and one 0.5″ diameter orifice hole at 1.0 feet above the bottom of the soil media. A 6″ underdrain will be utilized that includes a 0.25″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.

Bioretention Basin B has a bottom surface area of 256 sq. ft. An 8″ diameter riser that extends 1.5 feet above the basin bottom will incorporate one 0.375″ diameter orifice hole at 0.5 feet above the soil media, and a notch that is 0.25 feet high by 0.67 feet wide. 6″ underdrain will be utilized that includes a 0.43″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.

Bioretention Basin C has a bottom surface area of 288.8 sq. ft. An 8″ diameter riser that extends 1.0 feet above the basin bottom will incorporate two 0.375″ diameter orifice holes at 0.5 feet above the soil media, and one 0.375″ diameter orifice hole at 0.75′ above the soil media surface. A notch will be included that is 0.25 feet *high by 0.67 feet wide. A 6″ underdrain will be utilized that includes a 1.5″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.*

6.4 Measures for Avoidance of Critical Coarse Sediment Yield Areas

The project site is located within a Potential Coarse Sediment Area (per the map included in Attachment E). However, the project site is 0.39 acres, and includes channels that will allow for the offsite to be diverted around the residence, and therefore will not impact the tributary coarse sediment to downstream waterbodies.

6.5 Hydrologic Modeling and Hydromodification Compliance

The pre-developed conditions all utilized open brush (soil D). The post-developed conditions utilized impervious cover, gravel, and urban landscape as the land covers.

Bioretention Basin B has a bottom surface area of 256 sq. ft. An 8″ diameter riser that extends 1.0 feet above the basin bottom will incorporate two 4.5″ diameter orifice holes at 0.5 feet above the soil media, and one 4.5″ diameter orifice hole at 0.75′ above the soil media surface. A 6″ underdrain will be utilized that includes a 1.5″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.

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Bioretention Basin C has a bottom surface area of 288.8 sq. ft. An 8″ diameter riser that extends 1.0 feet above the basin bottom will incorporate two 0.375″ diameter orifice holes at 0.5 feet above the soil media, and one 0.375″ diameter orifice hole at 0.75′ above the soil media surface. A notch will be included that is 0.25 feet high by 0.67 feet wide. A 6″ underdrain will be utilized that includes a 1.5″ orifice, as well as 24″ of soil media and a minimum of 18″ of gravel below the soil media that will encompass the underdrains.

Drawdown times for all three basins are less than 1 day per the SOHM drawdown analysis.

Section 7 Educational Materials Index

Educational Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☒
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Compliance BMPs for Mobile Businesses	☐
Proper Disposal of Household Hazardous Waste	☐	**Other Material**	**Check If Attached**
Recycle at Your Local Used Oil Collection Center (North County)	☐		
Recycle at Your Local Used Oil Collection Center (Central County)	☐	Tips for Pool Maintenance	☒
Recycle at Your Local Used Oil Collection Center (South County)	☒	Children's Brochure	☒
Tips for Maintaining a Septic Tank System	☒	Tips for Protecting you Watershed	☒
Responsible Pest Control	☒	Tips for Residential Pool, Landscape and Hardscape Drains	☒
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☒		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Projects Using Paint	☒		☐

Attachment A: Educational Materials

Attachment B: Operations and Maintenance Plan

Attachment C: Water Quality Calculations

Worksheet 4 – Hydrologic Source Control Calculation Form

Worksheet 4: Hydrologic Source Control Calculation Form

DMA C

Drainage area ID	B
Total drainage area	0.11 acres
Total drainage area Impervious Area (IA_{total})	0.09 acres

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in **relevant fact sheet (Appendix G.1)** (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
C-1	Impervious Area Dispersion	0.35	0.0405	0.01
Box 1:			$\sum d_i \times IA_i$ =	0.01
Box 2:			IA_{total} =	0.0405
[Box 1]/[Box 2]:			$d_{HSC\ total}$ =	0.35
			Percent Capture Provided by HSCs (Table E-2)	50%

1 – None of the values in this column may be larger than the design storm depth for the project

Perv	Imperv	
1513	1764	0.85771
	0.040496	

Mountainous regions, page 274 of TGD

Worksheet 7 – Biofiltration Routing Method

Worksheet 7: Biofiltration Routing Method for Sizing Bioretention BMPs with Underdrains
DMA B

Part 1: Calculate Design Storm Volume

1	Enter design capture storm depth, *d* (inches)	d=	1.05	inches
2a	Enter the combined effect of provided HSCs, d_{HSC} (inches) (based on Worksheet 4)	d_{HSC}=	0	inches
2b	Calculate the remainder of the design capture storm depth, $d_{remainder}$ = d - d_{HSC}	$d_{remainder}$=	1.05	inches
3a	Enter DMA area tributary to BMP(s), *A* (acres) excluding any self-retaining areas	A=	0.11	acres
3b	Enter DMA Imperviousness, imp (unitless) after removal of self-retaining areas	imp=	0.62	
3c	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.615	
3d	Calculate runoff volume, *DCV = (C x $d_{remainder}$ x A x 43560 x (1/12)) (See Section E.2.2)*	DCV=	257.8	cu-ft

Part 2: Select Initial BMP Effective Footprint Area (can be iterative)

4a	Calculate minimum area required for BMP to avoid premature clogging from Section E.4.1 (as percent of impervious tributary area)	$\%A_{min,clog}$=	2.8	%
4b	Calculate minimum area required for BMP to meet volume reduction requirements (Partial Infiltration category only) using Section E.4.2	$\%A_{min,vol}$=	2.5	%
4c	Effective footprint of BMP as percent of tributary impervious area, must be equal to or greater than both $\%A_{min,clos}$ and $\%A_{min,vol}$ (as applicable)	$\%A_{BMP\_EFF}$	6.22	%
4d	Effective footprint of BMP ($\%A_{BMP\_EFF}$ * A * imp)	A_{BMP_EFF}	149.0	sq-ft

Part 3: Calculate Retention Volume in BMP

5a	Determine gravel layer depth (18 inches or an alternative depth that will infiltrate within 48 hours)	D_{gravel}	18	inches
5b	Calculate effective retention storage depth of gravel layer $D_{eff,gravel}$ = 0.4 porosity * D_{gravel} (Partial Infiltration Category only)	$D_{eff,gravel}$	7.2	inches
6	Calculate volume retained in gravel layer (Partial Infiltration Category only) V_{gravel} = $D_{eff,gravel}$ * A_{BMP_EFF} * (1 ft/12 inches)	V_{gravel_retain}	89.4	cu-ft
7a	Media depth D_{media} (24 inches typical) See BMP fact sheet (Appendix G)	D_{media}	24	inches
8b	Calculate volume retained in soil media layer, V_{media} =0.1*D_{media}*A_{BMP_EFF} * (1 ft/12 inches)	V_{media_retain}	29.8	cu-ft

Part 4: Calculate Required and Provided Biofiltered Volume

9a	Calculate the remaining DCV by subtracting the retained volume in the gravel layer and media layer from the initial design volume, DCV_{remain}= DCV-V_{gravel}-V_{media}	DCV_{remain}	138.6	cu-ft
10	Calculate the required volume to be biofiltered by multiplying the remaining DCV by 1.5, Vtreat_req = 1.5 * DCV_{remain}	V_{treat_req}	207.9	cu-ft
11a	Surface storage ponding depth (6-12 inches typical) See BMP fact sheet (Appendix G)	$D_{ponding}$	6	inches
11b	Calculate effective depth of the biofiltration storage above the underdrain, $D_{effective\_biotreat}$ = 0.2 * D_{media} + $D_{ponding}$	$D_{biofilter\_effective}$	10.8	in
12a	Routing period (5 hours is default, proponent must justify any other value), T_{rout}	T_{rout}	5.0	hours
12b	Media infiltration rate (2.5 inches/hour default, proponent must justify any other value)	K_{media}	2.5	in/hr
12c	Calculate biofiltered volume, $V_{treated}$ = ($D_{biofilter\_effective}$ + K_{media}* T_{rout}) * A_{BMP_EFF} * (1 ft/12 in)	$V_{treated}$	289.3	cu-ft
13	Verify that $V_{treated}$ > V_{treat_req}. If it is not, must revise profile or footprint while conforming to criteria			

Worksheet 8 – Static Volume Method for Bioretention BMPs

Worksheet 8: Static Volume Method for Sizing Bioretention BMPs with Underdrains in SOC
DMA A

Part 1: Calculate Design Storm Volume

1	Enter design capture storm depth, *d* (inches)	d=	1.05	inches
2a	Enter the combined effect of provided HSCs, d_{HSC} (inches) (based on Worksheet 4)	d_{HSC}=	0	inches
2b	Calculate the remainder of the design capture storm depth, $d_{remainder}$ = d - d_{HSC}	$d_{remainder}$=	1.05	inches
3a	Enter DMA area tributary to BMP(s), *A* (acres) excluding any self-retaining areas	A=	0.05	acres
3b	Enter DMA Imperviousness, imp (unitless) after removal of self-retaining areas	imp=	0.46	
3c	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.495	
3d	Calculate runoff volume, *DCV = (C x* $d_{remainder}$ *x A x 43560 x (1/12)) (See Section E.2.2)*	DCV=	94.3	cu-ft

Part 2: Select Initial BMP Effective Footprint Area (can be iterative)

4a	Calculate minimum area required for BMP to avoid premature clogging from Section E.4.1 (as percent of impervious tributary area)	$\%A_{min,clog}$=	2.8	%
4b	Calculate minimum area required for BMP to meet volume reduction requirements (Partial Infiltration category only) using Section E.4.2	$\%A_{min,vol}$=	2.7	%
4c	Effective footprint of BMP as percent of tributary impervious area, must be equal to or greater than both $\%A_{min,clos}$ and $\%A_{min,vol}$ (as applicable)	$\%A_{BMP\_EFF}$	23.9	%
4d	Effective footprint of BMP ($\%A_{BMP\_EFF}$ * A * imp)	A_{BMP_EFF}	260.3	sq-ft

Part 3: Calculate Retention Volume in BMP

5a	Determine gravel layer depth (18 inches or an alternative depth that will infiltrate within 48 hours)	D_{gravel}	18	inches
5b	Calculate effective retention storage depth of gravel layer $D_{eff,gravel}$ = 0.4 porosity * D_{gravel} (Partial Infiltration Category only)	$D_{eff,gravel}$	7.2	inches
6	Calculate volume retained in gravel layer (Partial Infiltration Category only) V_{gravel} = $D_{eff,gravel}$ * A_{BMP_EFF} * (1 ft/12 inches)	V_{gravel_retain}	156.2	cu-ft
7a	Media depth D_{media} (24 inches typical) See BMP fact sheet (Appendix G)	D_{media}	24	inches
8b	Calculate volume retained in soil media layer, V_{media} =0.1*D_{media}*A_{BMP_EFF} * (1 ft/12 inches)	V_{media_retain}	52.1	cu-ft

Part 4: Calculate Required and Provided Biofiltered Volume

9a	Calculate the remaining DCV by subtracting the retained volume in the gravel layer and media layer from the initial design volume, DCV_{remain}= DCV-V_{gravel}-V_{media}	DCV_{remain}	-113.9	cu-ft
9b	Calculate the required static biofiltration volume to be provided in the pores of the media and surface ponded storage above the underdrain, $V_{biofilter\_storage\_req}$ = 0.75 * DCV_{remain}	$V_{biofilter\_ storage\_req}$	-85.4	cu-ft
10a	Surface storage ponding depth (6-12 inches typical) See BMP fact sheet (Appendix G)	$D_{ponding}$	6	inches
10b	Calculate effective depth of the biofiltration storage above the underdrain, $D_{effective\_biotreat}$ = 0.2 * D_{media} + $D_{ponding}$	$D_{effective\_biotreat}$	10.8	in
11	Calculate static biofiltration storage volume provided in pores of media, and surface ponded storage above the underdrain $V_{biofilter\_storage}$ = ($D_{effective\_biotreat}$) * A_{BMP_EFF} * (1 ft/12 in)	$V_{biofilter\_ storage}$	234.2	cu-ft
12	Verify that $V_{biofilter\_storage}$ > $V_{biofilter\_ storage\_req}$. If it is not, must revise profile or footprint.			

Worksheet 8: Static Volume Method for Sizing Bioretention BMPs with Underdrains in SOC
DMA C

Part 1: Calculate Design Storm Volume

1	Enter design capture storm depth, *d* (inches)	d=	1.05	inches
2a	Enter the combined effect of provided HSCs, d_{HSC} (inches) (based on Worksheet 4)	d_{HSC}=	0.35	inches
2b	Calculate the remainder of the design capture storm depth, $d_{remainder}$ = d - d_{HSC}	$d_{remainder}$=	0.7	inches
3a	Enter DMA area tributary to BMP(s), *A* (acres) excluding any self-retaining areas	A=	0.23	acres
3b	Enter DMA Imperviousness, imp (unitless) after removal of self-retaining areas	imp=	0.37	
3c	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.4275	
3d	Calculate runoff volume, *DCV = (C x* $d_{remainder}$ *x A x 43560 x (1/12)) (See Section E.2.2)*	DCV=	249.8	cu-ft

Part 2: Select Initial BMP Effective Footprint Area (can be iterative)

4a	Calculate minimum area required for BMP to avoid premature clogging from Section E.4.1 (as percent of impervious tributary area)	$\%A_{min,clog}$=	2.8	%
4b	Calculate minimum area required for BMP to meet volume reduction requirements (Partial Infiltration category only) using Section E.4.2	$\%A_{min,vol}$=	2.8	%
4c	Effective footprint of BMP as percent of tributary impervious area, must be equal to or greater than both $\%A_{min,clos}$ and $\%A_{min,vol}$ (as applicable)	$\%A_{BMP\_EFF}$	7.7	%
4d	Effective footprint of BMP ($\%A_{BMP\_EFF}$ * A * imp)	A_{BMP_EFF}	385.7	sq-ft

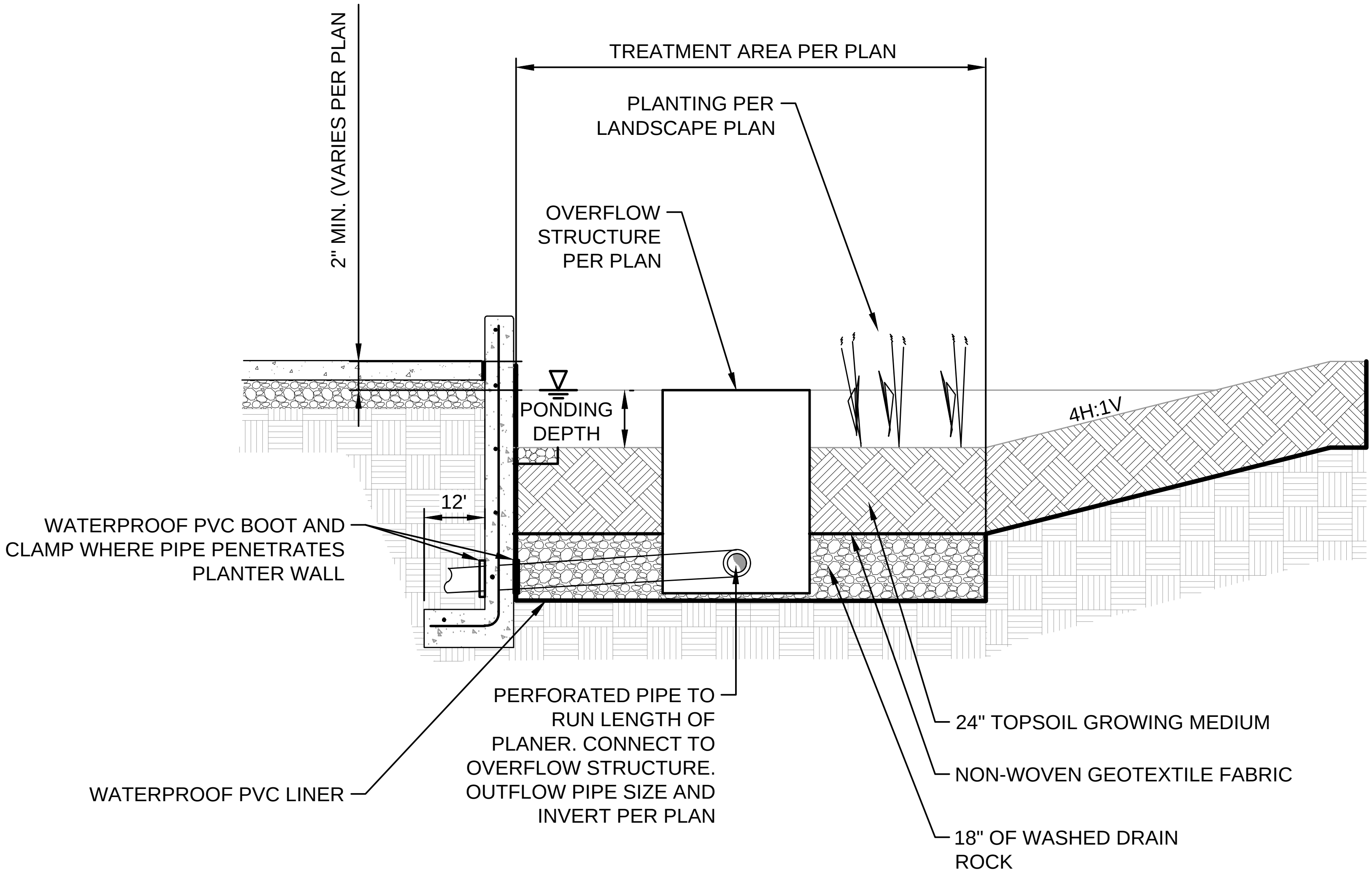
Part 3: Calculate Retention Volume in BMP

5a	Determine gravel layer depth (18 inches or an alternative depth that will infiltrate within 48 hours)	D_{gravel}	18	inches
5b	Calculate effective retention storage depth of gravel layer $D_{eff,gravel}$ = 0.4 porosity * D_{gravel} (Partial Infiltration Category only)	$D_{eff,gravel}$	7.2	inches
6	Calculate volume retained in gravel layer (Partial Infiltration Category only) V_{gravel} = $D_{eff,gravel}$ * A_{BMP_EFF} * (1 ft/12 inches)	V_{gravel_retain}	231.4	cu-ft
7a	Media depth D_{media} (24 inches typical) See BMP fact sheet (Appendix G)	D_{media}	24	inches
8b	Calculate volume retained in soil media layer, V_{media} =0.1*D_{media}*A_{BMP_EFF} * (1 ft/12 inches)	V_{media_retain}	77.1	cu-ft

Part 4: Calculate Required and Provided Biofiltered Volume

9a	Calculate the remaining DCV by subtracting the retained volume in the gravel layer and media layer from the initial design volume, DCV_{remain}= DCV-V_{gravel}-V_{media}	DCV_{remain}	-58.7	cu-ft
9b	Calculate the required static biofiltration volume to be provided in the pores of the media and surface ponded storage above the underdrain, $V_{biofilter\_storage\_req}$ = 0.75 * DCV_{remain}	$V_{biofilter\_storage\_req}$	-44.1	cu-ft
10a	Surface storage ponding depth (6-12 inches typical) See BMP fact sheet (Appendix G)	$D_{ponding}$	6	inches
10b	Calculate effective depth of the biofiltration storage above the underdrain, $D_{effective\_biotreat}$ = 0.2 * D_{media} + $D_{ponding}$	$D_{effective\_biotreat}$	10.8	in
11	Calculate static biofiltration storage volume provided in pores of media, and surface ponded storage above the underdrain $V_{biofilter\_storage}$ = ($D_{effective\_biotreat}$) * A_{BMP_EFF} * (1 ft/12 in)	$V_{biofilter\_storage}$	347.2	cu-ft
12	Verify that $V_{biofilter\_storage}$ > $V_{biofilter\_storage\_req}$. If it is not, must revise profile or footprint.			

Worksheet 8 – Static Volume Method for Bioretention BMPs



1 WATER QUALITY PLANTER - TYPICAL SECTION

SCALE: N.T.S.

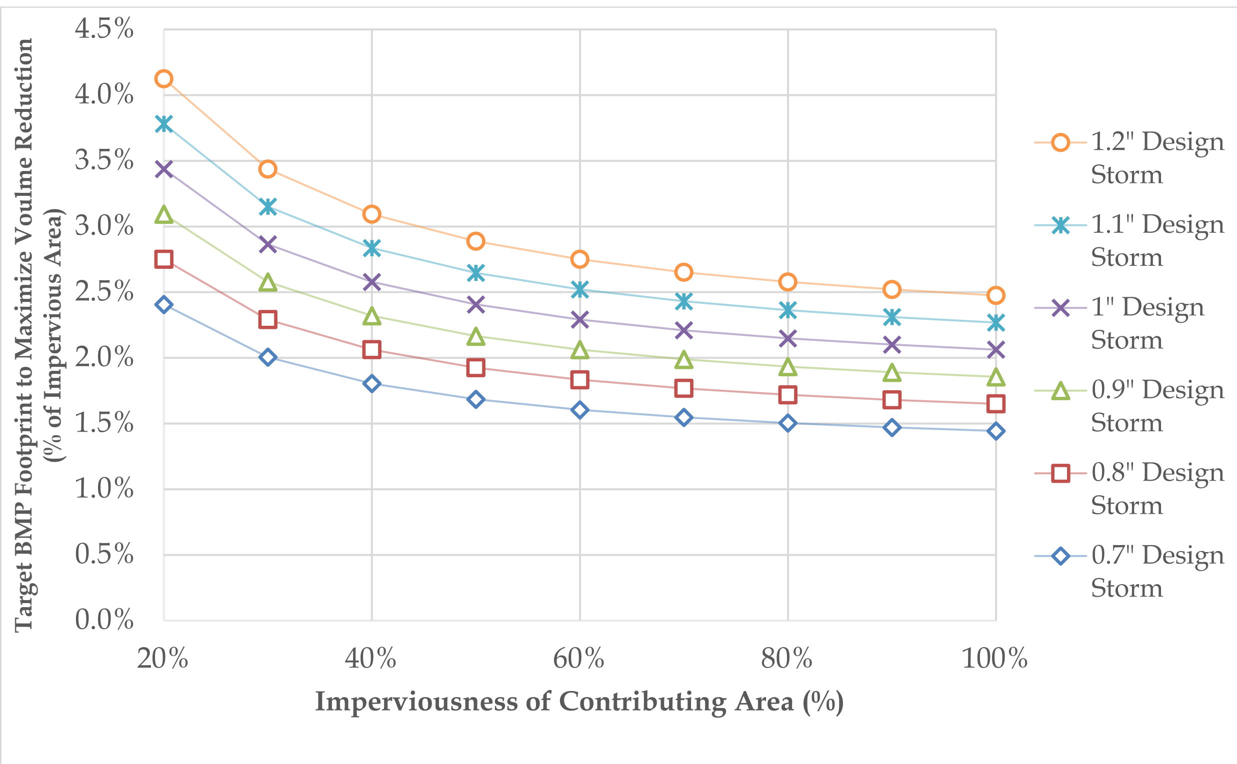
Typical Bioretention Facility Section

E.4.2 Calculating the Target Biofiltration Footprint to Maximize Volume Reduction

This section applies to Biofiltration BMPs within DMAs categorized as "Biotreatment with Partial Infiltration," specifically BIO-1 (Bioretention with Elevated Underdrain Discharge) and BIO-5 (Compact Biofiltration with Supplemental Retention). The footprint of biofiltration BMPs is an important factor in the degree to which incidental volume reduction is expected to occur in these BMPs.

Figure E-9 provides a simple method to determine the target biofiltration BMP footprint to maximize volume reduction. This is expressed as a percent of the tributary impervious area. In some cases, this factor may control the sizing of biofiltration BMPs. It is used as a check in various sizing methods. Based on the design capture storm depth and the DMA imperviousness, the best match from this figure should be used. The presence of documented and supported space constraints (as discussed in **Section 4.2.4** of the TGD) can be considered in establishing a target footprint smaller than the target in **Figure E-9**.

Figure E-9. Target Biofiltration Footprint to Maximize Volume Reduction



E.4.2.1 Basis for Target Footprint for Incidental Volume Reduction

This TGD establishes the goal that BMPs should achieve incidental volume reduction of 40 percent of average annual volume reduction. This is intended to provide equivalent pollutant load reduction in biofiltration BMPs as would be achieved in full infiltration BMPs. This

Calculating HSC Retention Volume

- The retention volume provided by downspout dispersion is a function of the ratio of impervious to pervious area and the condition of soils in the pervious area.
- Determine flow patterns in pervious area and estimate footprint of pervious area receiving dispersed flow. Calculate the ratio of pervious to impervious area.
- Look up the storm retention depth, dHSC from the chart below.
- The max dHSC is equal to the design capture storm depth for the project site.

[1] Pervious area used in calculation should only include the pervious area receiving flow, not pervious area receiving only direct rainfall or upslope pervious drainage.

Chart extends to 0.25, but designs should not go below a minimum value of 0.5 (2 parts impervious to 1 part pervious).

Table E-4. Infiltration Surface Area to Avoid Premature Clogging

DMA Dominant Land Cover Category	Pretreatment Approach	Subsurface BMP (load to clog = 1.0 lb/sq-ft)	Vegetated Surface BMP (load to clog = 2 lb/sq-ft)	Vegetated Surface BMP with High Permeability Media and Outlet Control (load to clog = 3 lb/sq-ft
		Target BMP Infiltrating or Filtering Surface Area as Percent of Tributary Impervious Area		
Urban Mix with Open Space 10 to 25% of Area	None	8.7%	4.3%	2.9%
	Forebay	6.5%	3.3%	2.2%
	Certified Pretreatment	4.3%	2.2%	1.4%
	Certified Treatment	2.2%	1.1%	0.72%
Urban Mix, no significant Open Space	None	5.6%	2.8%	1.9%
	Forebay	4.2%	2.1%	1.4%
	Certified Pretreatment	2.8%	1.4%	0.93%
	Certified Treatment	1.4%	0.7%	0.46%
High Vehicle Intensity (roads, commercial parking lots, light industrial)	None	6.6%	3.3%	2.2%
	Forebay	5.0%	2.5%	1.7%
	Certified Pretreatment	3.3%	1.7%	1.1%
	Certified Treatment	1.6%	0.83%	0.55%
Low Traffic Paths, Streets, Parking Lots (<20% landscaping/ slopes)	None	3.4%	1.7%	1.1%
	Forebay	2.7%	1.4%	0.90%
	Certified Pretreatment	2.0%	1.0%	0.68%
	Certified Treatment	1.4%	0.68%	0.45%
Rooftops and Paths (no landscaping)	None	0.91%	0.45%	0.30%
	Forebay	0.91%	0.45%	0.30%
	Certified Pretreatment	0.91%	0.45%	0.30%
	Certified Treatment	0.65%	0.32%	0.22%
DMA contains disturbed or erodible exposed soils; or open space > 25% of area	Isolate or stabilize sediment sources Route open space separately			

Note: This table only presents a check for premature clogging. Larger footprints may be required to meet DCV capture requirements and volume reduction targets.

Attachment D: Hydromodifications

The SOHC Program was used to assess hydromodification impacts for the project. A total of 3 points of compliance (POC) were defined using three DMA areas. The POC have been identified as follows:

DMA A >>>> Bioretention Basin A >>>>>POC Area A

DMA B >>>> Bioretention Basin B >>>>>POC Area B

DMA C >>>> Bioretention Basin C >>>>>POC Area C

SOHM – DMA A

SOHM

PROJECT REPORT

General Model Information

Project Name:	TRABUCO_HYDROMOD_DMA A
Site Name:	
Site Address:	
City:	
Report Date:	1/17/2022
Gage:	Trabuco Canyon
Data Start:	10/01/1958
Data End:	09/30/2005
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/05/25

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Open Brush,Mod	0.05
Pervious Total	0.05
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.05

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Lateral I Basin 1

Bypass:	No
Impervious Land Use	acre
Impervious,Mod(5-10)	0.023

Element Flows To:

Outlet 1	Outlet 2
Lateral Basin 1	

Lateral Basin 1

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
D,Urban,Flat(0-5%)	.027	

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 1	Surface Bio Swale 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Bio Swale 1

Bottom Length:	21.30 ft.
Bottom Width:	5.00 ft.
Material thickness of first layer:	2
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.2
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	0.842
Total Volume Through Riser (ac-ft.):	0.182
Total Volume Through Facility (ac-ft.):	1.6
Percent Infiltrated:	52.62
Total Precip Applied to Facility:	0.165
Total Evap From Facility:	0.094
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.25
Offset (in.):	2
Flow Through Underdrain (ac-ft.):	0.576
Total Outflow (ac-ft.):	1.6
Percent Through Underdrain:	36

Discharge Structure

Riser Height:	1.5 ft.	
Riser Diameter:	8 in.	
Notch Type:	Rectangular	
Notch Width:	0.667 ft.	
Notch Height:	0.250 ft.	
Orifice 1 Diameter:	0.5 in.	Elevation:0.5 ft.
Orifice 2 Diameter:	0.5 in.	Elevation:0.75 ft.
Orifice 3 Diameter:	0.5 in.	Elevation:1 ft.

Element Flows To:
Outlet 1 Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0024	0.0000	0.0000	0.0000
0.0604	0.0024	0.0001	0.0000	0.0000
0.1209	0.0024	0.0001	0.0000	0.0000
0.1813	0.0024	0.0002	0.0000	0.0000
0.2418	0.0024	0.0002	0.0000	0.0000
0.3022	0.0024	0.0003	0.0000	0.0000
0.3626	0.0024	0.0003	0.0000	0.0000
0.4231	0.0024	0.0004	0.0000	0.0000
0.4835	0.0024	0.0005	0.0000	0.0000
0.5440	0.0024	0.0005	0.0000	0.0000
0.6044	0.0024	0.0006	0.0000	0.0004
0.6648	0.0024	0.0006	0.0000	0.0005
0.7253	0.0024	0.0007	0.0000	0.0005
0.7857	0.0024	0.0007	0.0000	0.0005

0.8462	0.0024	0.0008	0.0000	0.0005
0.9066	0.0024	0.0009	0.0001	0.0005
0.9670	0.0024	0.0009	0.0002	0.0005
1.0275	0.0024	0.0010	0.0003	0.0005
1.0879	0.0024	0.0010	0.0003	0.0005
1.1484	0.0024	0.0011	0.0004	0.0005
1.2088	0.0024	0.0012	0.0005	0.0005
1.2692	0.0024	0.0012	0.0005	0.0005
1.3297	0.0024	0.0013	0.0006	0.0005
1.3901	0.0024	0.0013	0.0007	0.0005
1.4505	0.0024	0.0014	0.0007	0.0005
1.5110	0.0024	0.0014	0.0008	0.0005
1.5714	0.0024	0.0015	0.0009	0.0005
1.6319	0.0024	0.0016	0.0010	0.0005
1.6923	0.0024	0.0016	0.0011	0.0005
1.7527	0.0024	0.0017	0.0011	0.0005
1.8132	0.0024	0.0017	0.0012	0.0005
1.8736	0.0024	0.0018	0.0012	0.0005
1.9341	0.0024	0.0018	0.0012	0.0005
1.9945	0.0024	0.0019	0.0013	0.0005
2.0549	0.0024	0.0020	0.0013	0.0005
2.1154	0.0024	0.0020	0.0013	0.0005
2.1758	0.0024	0.0021	0.0014	0.0005
2.2363	0.0024	0.0021	0.0014	0.0005
2.2967	0.0024	0.0022	0.0014	0.0005
2.3571	0.0024	0.0023	0.0015	0.0005
2.4176	0.0024	0.0023	0.0015	0.0005
2.4780	0.0024	0.0024	0.0015	0.0005
2.5385	0.0024	0.0025	0.0015	0.0005
2.5989	0.0024	0.0025	0.0016	0.0005
2.6593	0.0024	0.0026	0.0016	0.0005
2.7198	0.0024	0.0026	0.0016	0.0005
2.7802	0.0024	0.0027	0.0017	0.0005
2.8407	0.0024	0.0028	0.0017	0.0005
2.9011	0.0024	0.0028	0.0017	0.0005
2.9615	0.0024	0.0029	0.0017	0.0005
3.0220	0.0024	0.0029	0.0018	0.0005
3.0824	0.0024	0.0030	0.0018	0.0005
3.1429	0.0024	0.0031	0.0018	0.0005
3.2033	0.0024	0.0031	0.0018	0.0005
3.2637	0.0024	0.0032	0.0019	0.0005
3.3242	0.0024	0.0033	0.0019	0.0005
3.3846	0.0024	0.0033	0.0019	0.0005
3.4451	0.0024	0.0034	0.0019	0.0005
3.5000	0.0024	0.0034	0.0020	0.0005

Landscape Swale Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
3.5000	0.0024	0.0034	0.0000	0.0063	0.0000
3.5604	0.0024	0.0036	0.0000	0.0063	0.0000
3.6209	0.0024	0.0037	0.0000	0.0067	0.0000
3.6813	0.0024	0.0039	0.0000	0.0069	0.0000
3.7418	0.0024	0.0040	0.0000	0.0071	0.0000
3.8022	0.0024	0.0042	0.0000	0.0073	0.0000
3.8626	0.0024	0.0043	0.0000	0.0075	0.0000
3.9231	0.0024	0.0045	0.0000	0.0076	0.0000
3.9835	0.0024	0.0046	0.0000	0.0078	0.0000
4.0440	0.0024	0.0048	0.0014	0.0080	0.0000

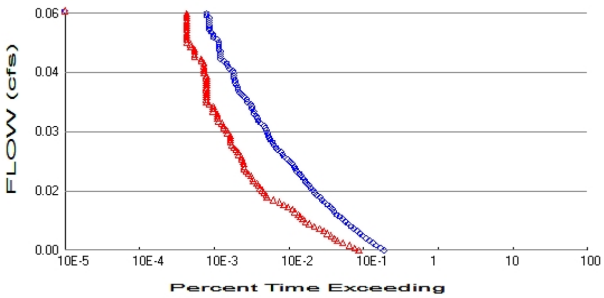
4.1044	0.0024	0.0049	0.0022	0.0082	0.0000
4.1648	0.0024	0.0051	0.0028	0.0084	0.0000
4.2253	0.0024	0.0052	0.0032	0.0086	0.0000
4.2857	0.0024	0.0054	0.0049	0.0088	0.0000
4.3462	0.0024	0.0055	0.0061	0.0090	0.0000
4.4066	0.0024	0.0056	0.0070	0.0092	0.0000
4.4670	0.0024	0.0058	0.0078	0.0094	0.0000
4.5275	0.0024	0.0059	0.0096	0.0095	0.0000
4.5879	0.0024	0.0061	0.0112	0.0097	0.0000
4.6484	0.0024	0.0062	0.0124	0.0099	0.0000
4.7088	0.0024	0.0064	0.0134	0.0101	0.0000
4.7692	0.0024	0.0065	0.0203	0.0103	0.0000
4.8297	0.0024	0.0067	0.0652	0.0105	0.0000
4.8901	0.0024	0.0068	0.1325	0.0107	0.0000
4.9505	0.0024	0.0070	0.2162	0.0109	0.0000
5.0110	0.0024	0.0071	0.3032	0.0111	0.0000
5.0714	0.0024	0.0073	0.4299	0.0113	0.0000
5.1319	0.0024	0.0074	0.6209	0.0115	0.0000
5.1923	0.0024	0.0076	0.8215	0.0116	0.0000
5.2527	0.0024	0.0077	0.9816	0.0118	0.0000
5.3132	0.0024	0.0079	1.0767	0.0120	0.0000
5.3736	0.0024	0.0080	1.1546	0.0122	0.0000
5.4341	0.0024	0.0082	1.2218	0.0124	0.0000
5.4945	0.0024	0.0083	1.2845	0.0126	0.0000
5.5000	0.0024	0.0083	1.3435	0.0126	0.0000

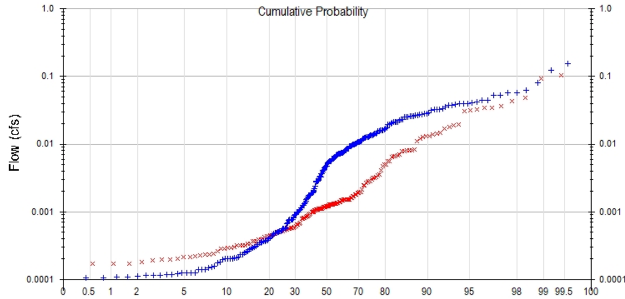
Surface Bio Swale 1

Element Flows To:

Outlet 1	Outlet 2
	Bio Swale 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.05
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.027
Total Impervious Area: 0.023

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.031678
5 year	0.044688
10 year	0.057839
25 year	0.106753

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.008202
5 year	0.030713
10 year	0.036473
25 year	0.075493

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0032	3121	1425	45	Pass
0.0037	2767	1253	45	Pass
0.0043	2446	1063	43	Pass
0.0048	2180	867	39	Pass
0.0054	1961	724	36	Pass
0.0059	1768	669	37	Pass
0.0065	1609	603	37	Pass
0.0070	1461	542	37	Pass
0.0076	1332	479	35	Pass
0.0081	1222	422	34	Pass
0.0087	1116	360	32	Pass
0.0092	1023	312	30	Pass
0.0098	939	274	29	Pass
0.0103	858	251	29	Pass
0.0109	785	233	29	Pass
0.0115	712	220	30	Pass
0.0120	665	198	29	Pass
0.0126	627	182	29	Pass
0.0131	584	159	27	Pass
0.0137	542	140	25	Pass
0.0142	500	123	24	Pass
0.0148	453	102	22	Pass
0.0153	427	84	19	Pass
0.0159	390	82	21	Pass
0.0164	365	76	20	Pass
0.0170	347	72	20	Pass
0.0175	321	68	21	Pass
0.0181	304	64	21	Pass
0.0186	285	61	21	Pass
0.0192	270	55	20	Pass
0.0197	255	54	21	Pass
0.0203	241	51	21	Pass
0.0208	227	47	20	Pass
0.0214	207	44	21	Pass
0.0219	202	42	20	Pass
0.0225	195	41	21	Pass
0.0230	180	41	22	Pass
0.0236	169	40	23	Pass
0.0242	158	38	24	Pass
0.0247	144	38	26	Pass
0.0253	135	35	25	Pass
0.0258	129	34	26	Pass
0.0264	115	32	27	Pass
0.0269	110	30	27	Pass
0.0275	103	28	27	Pass
0.0280	99	27	27	Pass
0.0286	93	27	29	Pass
0.0291	90	27	30	Pass
0.0297	86	27	31	Pass
0.0302	85	25	29	Pass
0.0308	82	24	29	Pass
0.0313	80	22	27	Pass
0.0319	76	22	28	Pass

0.0324	69	21	30	Pass
0.0330	65	19	29	Pass
0.0335	62	18	29	Pass
0.0341	60	18	30	Pass
0.0346	56	18	32	Pass
0.0352	56	16	28	Pass
0.0357	53	16	30	Pass
0.0363	53	16	30	Pass
0.0369	51	14	27	Pass
0.0374	46	13	28	Pass
0.0380	45	13	28	Pass
0.0385	41	13	31	Pass
0.0391	38	13	34	Pass
0.0396	36	13	36	Pass
0.0402	34	13	38	Pass
0.0407	34	13	38	Pass
0.0413	32	13	40	Pass
0.0418	31	13	41	Pass
0.0424	31	13	41	Pass
0.0429	30	13	43	Pass
0.0435	30	13	43	Pass
0.0440	30	12	40	Pass
0.0446	29	12	41	Pass
0.0451	26	12	46	Pass
0.0457	25	12	48	Pass
0.0462	24	12	50	Pass
0.0468	22	11	50	Pass
0.0473	20	11	55	Pass
0.0479	20	9	45	Pass
0.0485	20	9	45	Pass
0.0490	20	9	45	Pass
0.0496	19	9	47	Pass
0.0501	19	8	42	Pass
0.0507	19	8	42	Pass
0.0512	19	7	36	Pass
0.0518	18	7	38	Pass
0.0523	16	7	43	Pass
0.0529	16	7	43	Pass
0.0534	15	7	46	Pass
0.0540	14	7	50	Pass
0.0545	14	7	50	Pass
0.0551	14	7	50	Pass
0.0556	14	7	50	Pass
0.0562	14	7	50	Pass
0.0567	14	7	50	Pass
0.0573	13	7	53	Pass
0.0578	13	7	53	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

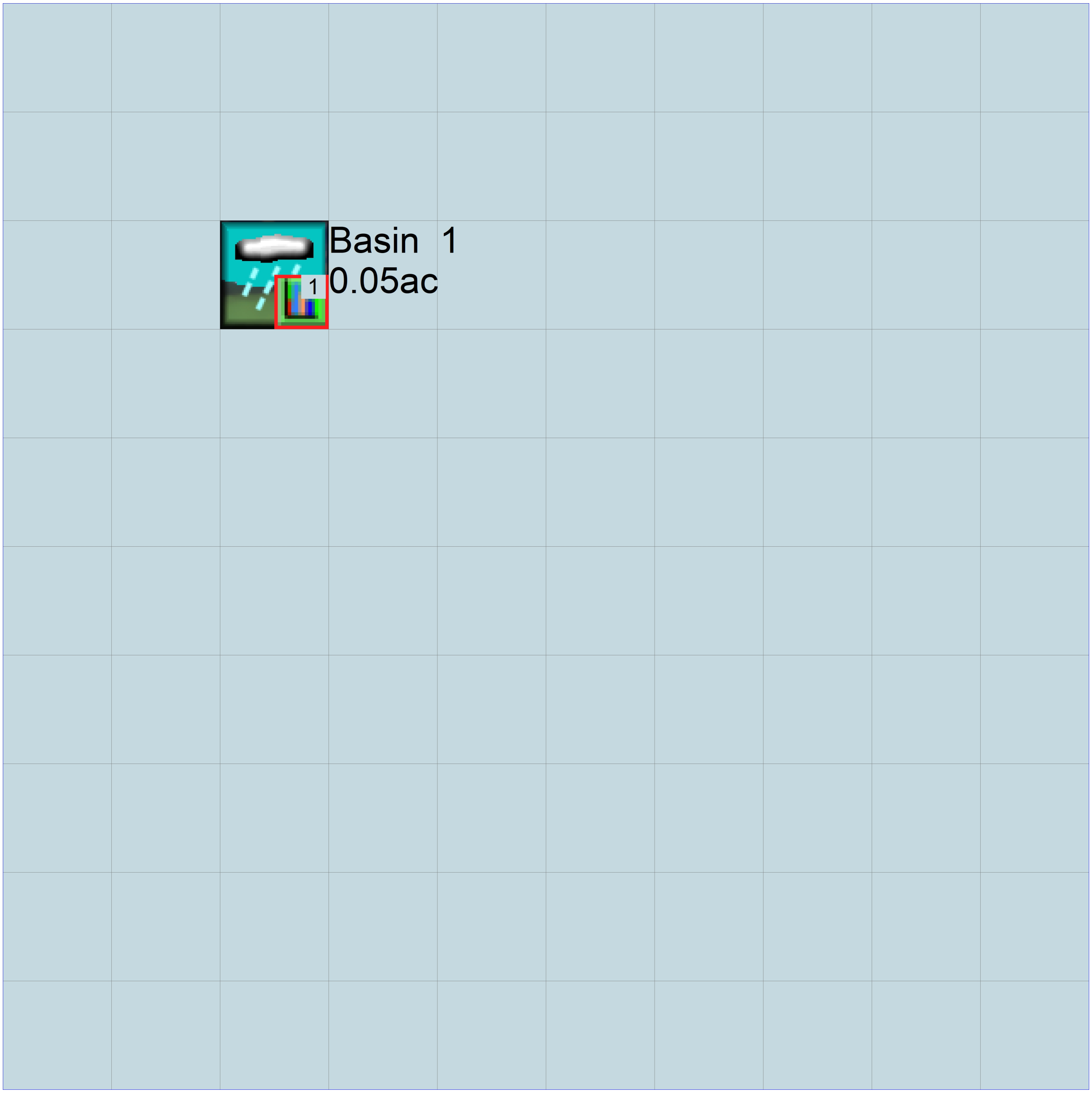
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1958 10 01        END    2005 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   TRABUCO_HYDROMOD_DMA A.wdm
MESSU      25   MitTRABUCO_HYDROMOD_DMA A.MES
           27   MitTRABUCO_HYDROMOD_DMA A.L61
           28   MitTRABUCO_HYDROMOD_DMA A.L62
           30   POCTRABUCO_HYDROMOD_DMA A1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      IMPLND       6
      PERLND      66
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Bio Swale  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   66     D,Urban,Flat(0-5%)      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   66         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   66         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   66         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   66              0       4.4      0.04       400      0.05       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   66             40        35         4         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   66              0       0.7      0.25         3       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   66       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   66      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   66              0         0      0.07         0      0.88       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                    User  t-series Engl Metr ***
                                     in  out           ***
    6     Impervious,Mod(5-10)    1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    6         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    6         0    0    4    0    0    0    1    9
  END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    6        0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    6            100       0.1       0.1      0.09
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    6             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    6             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Lateral I Basin  1***
IMPLND   6                      0.8519     PERLND  66     50
Lateral Basin  1***
PERLND  66                       0.027     RCHRES   1      2
PERLND  66                       0.027     RCHRES   1      3

******Routing******
PERLND  66                       0.027     COPY     1     12
PERLND  66                       0.027     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     17
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                             ***
    1     Surface Bio Swal-007    2    1    1    1   28    0    1
    2     Bio Swale  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1        1    0    0    0    0    0    0    0    0    0
    2        1    0    0    0    0    0    0    0    0    0
```

```
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.01       0.0       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                       <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  151.61
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2            =  vpo2
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   59    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
```

0.000000	0.002445	0.000000	0.000000	0.000000
0.060440	0.002445	0.000058	0.000000	0.000000
0.120879	0.002445	0.000115	0.000000	0.000000
0.181319	0.002445	0.000173	0.000000	0.000000
0.241758	0.002445	0.000231	0.000000	0.000000
0.302198	0.002445	0.000288	0.000000	0.000000
0.362637	0.002445	0.000346	0.000000	0.000000
0.423077	0.002445	0.000403	0.000000	0.000000
0.483516	0.002445	0.000461	0.000000	0.000000
0.543956	0.002445	0.000519	0.000000	0.000000
0.604396	0.002445	0.000576	0.000000	0.000439
0.664835	0.002445	0.000634	0.000000	0.000493
0.725275	0.002445	0.000692	0.000000	0.000493
0.785714	0.002445	0.000749	0.000000	0.000493
0.846154	0.002445	0.000807	0.000000	0.000493
0.906593	0.002445	0.000864	0.000115	0.000493
0.967033	0.002445	0.000922	0.000223	0.000493
1.027473	0.002445	0.000980	0.000276	0.000493
1.087912	0.002445	0.001037	0.000332	0.000493
1.148352	0.002445	0.001095	0.000392	0.000493
1.208791	0.002445	0.001153	0.000456	0.000493
1.269231	0.002445	0.001210	0.000524	0.000493
1.329670	0.002445	0.001268	0.000595	0.000493
1.390110	0.002445	0.001325	0.000670	0.000493
1.450549	0.002445	0.001383	0.000749	0.000493
1.510989	0.002445	0.001441	0.000831	0.000493
1.571429	0.002445	0.001498	0.000918	0.000493
1.631868	0.002445	0.001556	0.001009	0.000493
1.692308	0.002445	0.001614	0.001077	0.000493
1.752747	0.002445	0.001671	0.001117	0.000493
1.813187	0.002445	0.001729	0.001155	0.000493
1.873626	0.002445	0.001787	0.001193	0.000493
1.934066	0.002445	0.001844	0.001229	0.000493
1.994505	0.002445	0.001902	0.001264	0.000493
2.054945	0.002445	0.001963	0.001298	0.000493
2.115385	0.002445	0.002024	0.001332	0.000493
2.175824	0.002445	0.002086	0.001364	0.000493
2.236264	0.002445	0.002147	0.001396	0.000493
2.296703	0.002445	0.002208	0.001427	0.000493
2.357143	0.002445	0.002270	0.001458	0.000493
2.417582	0.002445	0.002331	0.001487	0.000493
2.478022	0.002445	0.002392	0.001517	0.000493
2.538462	0.002445	0.002454	0.001545	0.000493
2.598901	0.002445	0.002515	0.001573	0.000493
2.659341	0.002445	0.002576	0.001601	0.000493
2.719780	0.002445	0.002638	0.001628	0.000493
2.780220	0.002445	0.002699	0.001655	0.000493
2.840659	0.002445	0.002760	0.001681	0.000493
2.901099	0.002445	0.002822	0.001707	0.000493
2.961538	0.002445	0.002883	0.001733	0.000493
3.021978	0.002445	0.002944	0.001758	0.000493
3.082418	0.002445	0.003006	0.001783	0.000493
3.142857	0.002445	0.003067	0.001808	0.000493
3.203297	0.002445	0.003128	0.001832	0.000493
3.263736	0.002445	0.003190	0.001856	0.000493
3.324176	0.002445	0.003251	0.001880	0.000493
3.384615	0.002445	0.003312	0.001904	0.000493
3.445055	0.002445	0.003374	0.001928	0.000493
3.500000	0.002445	0.003480	0.001979	0.000493

END FTABLE 2
FTABLE 1
35 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.002445	0.000000	0.000000	0.000000		
0.060440	0.002445	0.000148	0.000000	0.006309		
0.120879	0.002445	0.000296	0.000000	0.006690		
0.181319	0.002445	0.000443	0.000000	0.006881		
0.241758	0.002445	0.000591	0.000000	0.007071		
0.302198	0.002445	0.000739	0.000000	0.007262		

```
    0.362637  0.002445  0.000887  0.000000  0.007453
    0.423077  0.002445  0.001034  0.000000  0.007643
    0.483516  0.002445  0.001182  0.000000  0.007834
    0.543956  0.002445  0.001330  0.001422  0.008025
    0.604396  0.002445  0.001478  0.002192  0.008215
    0.664835  0.002445  0.001625  0.002754  0.008406
    0.725275  0.002445  0.001773  0.003220  0.008597
    0.785714  0.002445  0.001921  0.004908  0.008787
    0.846154  0.002445  0.002069  0.006095  0.008978
    0.906593  0.002445  0.002217  0.007011  0.009169
    0.967033  0.002445  0.002364  0.007797  0.009359
    1.027473  0.002445  0.002512  0.009625  0.009550
    1.087912  0.002445  0.002660  0.011157  0.009740
    1.148352  0.002445  0.002808  0.012358  0.009931
    1.208791  0.002445  0.002955  0.013407  0.010122
    1.269231  0.002445  0.003103  0.020279  0.010312
    1.329670  0.002445  0.003251  0.065163  0.010503
    1.390110  0.002445  0.003399  0.132493  0.010694
    1.450549  0.002445  0.003546  0.216228  0.010884
    1.510989  0.002445  0.003694  0.303239  0.011075
    1.571429  0.002445  0.003842  0.429860  0.011266
    1.631868  0.002445  0.003990  0.620914  0.011456
    1.692308  0.002445  0.004138  0.821535  0.011647
    1.752747  0.002445  0.004285  0.981628  0.011838
    1.813187  0.002445  0.004433  1.076704  0.012028
    1.873626  0.002445  0.004581  1.154633  0.012219
    1.934066  0.002445  0.004729  1.221826  0.012410
    1.994505  0.002445  0.004876  1.284507  0.012600
    2.000000  0.002445  0.004890  1.343480  0.012618
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        8
```

```
RCHRES     OFLOW  OVOL   2                  RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                  COPY           INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       50
IMPLND     IWATER SURO                      PERLND         EXTNL  SURLI
  END MASS-LINK   50

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1958/11/30 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-5.834E-01	0.00000	0.0000E+00	0.00000	4.2630E-12

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1959/11/30 24: 0

RCHRES : 1

RELERR	STORS	STOR	MATIN	MATDIF
-7.784E-01	0.00000	0.0000E+00	0.00000	1.0174E-11

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:

DATE/TIME: 1960/10/31 24: 0

RCHRES :   1

```
RELERR       STORS        STOR       MATIN      MATDIF
-1.000E+00     0.00000  0.0000E+00     0.00000  9.3133E-13
```

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1963/ 1/31 24: 0

RCHRES :   1

```
RELERR       STORS        STOR       MATIN      MATDIF
-1.467E-01     0.00000  0.0000E+00     0.00000  1.0018E-11
```

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or reach/reservior) at the end of the present interval.
STORS is the storage of material in the pu at the start of the present printout reporting period.
MATIN is the total inflow of material to the pu during the present printout reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the present printout reporting period.

ERROR/WARNING ID: 238   1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1964/ 5/31 24: 0

RCHRES :   1

```
RELERR       STORS        STOR       MATIN      MATDIF
-1.092E-02     0.00000  0.0000E+00     0.00000  8.7123E-12
```

Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR is (STOR-STORS) - MATDIF.

```
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

The count for the WARNING printed above has reached its maximum.

If the condition is encountered again the message will not be repeated.

Disclaimer

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SOHM – DMA B

SOHM

PROJECT REPORT

General Model Information

Project Name:	TRABUCO_HYDROMOD_DMA B
Site Name:	
Site Address:	
City:	
Report Date:	1/21/2022
Gage:	Trabuco Canyon
Data Start:	10/01/1958
Data End:	09/30/2005
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/05/25

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

 # Landuse Basin Data
Predeveloped Land Use

DMA C

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Open Brush,Mod	0.11
Pervious Total	0.11
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.11

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat(0-5%)	0.008
Pervious Total	0.008
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.008

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 1	Surface Bio Swale 1	

Lateral I Basin 1

Bypass:	No
Impervious Land Use	acre
Impervious,Flat(0-5)	0.056

Element Flows To:

Outlet 1	Outlet 2
Porous Pavement 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Bio Swale 1

Bottom Length:	28.00 ft.
Bottom Width:	9.14 ft.
Material thickness of first layer:	2
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.2
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	0.558
Total Volume Through Riser (ac-ft.):	0.084
Total Volume Through Facility (ac-ft.):	1.222
Percent Infiltrated:	45.66
Total Precip Applied to Facility:	0.422
Total Evap From Facility:	0.223
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.433
Offset (in.):	2
Flow Through Underdrain (ac-ft.):	0.58
Total Outflow (ac-ft.):	1.222
Percent Through Underdrain:	47.46

Discharge Structure

Riser Height:	1.5 ft.
Riser Diameter:	8 in.
Notch Type:	Rectangular
Notch Width:	0.667 ft.
Notch Height:	0.250 ft.
Orifice 1 Diameter:	0.375 in. Elevation:0.5 ft.

Element Flows To:

Outlet 1 Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0059	0.0000	0.0000	0.0000
0.0604	0.0059	0.0001	0.0000	0.0000
0.1209	0.0059	0.0003	0.0000	0.0000
0.1813	0.0059	0.0004	0.0000	0.0000
0.2418	0.0059	0.0006	0.0000	0.0000
0.3022	0.0059	0.0007	0.0000	0.0000
0.3626	0.0059	0.0008	0.0000	0.0000
0.4231	0.0059	0.0010	0.0000	0.0000
0.4835	0.0059	0.0011	0.0000	0.0000
0.5440	0.0059	0.0012	0.0000	0.0000
0.6044	0.0059	0.0014	0.0000	0.0011
0.6648	0.0059	0.0015	0.0000	0.0012
0.7253	0.0059	0.0017	0.0000	0.0012
0.7857	0.0059	0.0018	0.0000	0.0012
0.8462	0.0059	0.0019	0.0000	0.0012
0.9066	0.0059	0.0021	0.0003	0.0012

0.9670	0.0059	0.0022	0.0005	0.0012
1.0275	0.0059	0.0024	0.0007	0.0012
1.0879	0.0059	0.0025	0.0008	0.0012
1.1484	0.0059	0.0026	0.0009	0.0012
1.2088	0.0059	0.0028	0.0011	0.0012
1.2692	0.0059	0.0029	0.0013	0.0012
1.3297	0.0059	0.0030	0.0014	0.0012
1.3901	0.0059	0.0032	0.0016	0.0012
1.4505	0.0059	0.0033	0.0018	0.0012
1.5110	0.0059	0.0035	0.0020	0.0012
1.5714	0.0059	0.0036	0.0022	0.0012
1.6319	0.0059	0.0037	0.0024	0.0012
1.6923	0.0059	0.0039	0.0027	0.0012
1.7527	0.0059	0.0040	0.0029	0.0012
1.8132	0.0059	0.0042	0.0031	0.0012
1.8736	0.0059	0.0043	0.0034	0.0012
1.9341	0.0059	0.0044	0.0037	0.0012
1.9945	0.0059	0.0046	0.0038	0.0012
2.0549	0.0059	0.0047	0.0039	0.0012
2.1154	0.0059	0.0049	0.0040	0.0012
2.1758	0.0059	0.0050	0.0041	0.0012
2.2363	0.0059	0.0052	0.0042	0.0012
2.2967	0.0059	0.0053	0.0043	0.0012
2.3571	0.0059	0.0055	0.0044	0.0012
2.4176	0.0059	0.0056	0.0045	0.0012
2.4780	0.0059	0.0057	0.0045	0.0012
2.5385	0.0059	0.0059	0.0046	0.0012
2.5989	0.0059	0.0060	0.0047	0.0012
2.6593	0.0059	0.0062	0.0048	0.0012
2.7198	0.0059	0.0063	0.0049	0.0012
2.7802	0.0059	0.0065	0.0050	0.0012
2.8407	0.0059	0.0066	0.0050	0.0012
2.9011	0.0059	0.0068	0.0051	0.0012
2.9615	0.0059	0.0069	0.0052	0.0012
3.0220	0.0059	0.0071	0.0053	0.0012
3.0824	0.0059	0.0072	0.0053	0.0012
3.1429	0.0059	0.0074	0.0054	0.0012
3.2033	0.0059	0.0075	0.0055	0.0012
3.2637	0.0059	0.0077	0.0056	0.0012
3.3242	0.0059	0.0078	0.0056	0.0012
3.3846	0.0059	0.0080	0.0057	0.0012
3.4451	0.0059	0.0081	0.0058	0.0012
3.5000	0.0059	0.0082	0.0059	0.0012

Landscape Swale Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
3.5000	0.0059	0.0082	0.0000	0.0152	0.0000
3.5604	0.0059	0.0086	0.0000	0.0152	0.0000
3.6209	0.0059	0.0090	0.0000	0.0161	0.0000
3.6813	0.0059	0.0093	0.0000	0.0165	0.0000
3.7418	0.0059	0.0097	0.0000	0.0170	0.0000
3.8022	0.0059	0.0100	0.0000	0.0175	0.0000
3.8626	0.0059	0.0104	0.0000	0.0179	0.0000
3.9231	0.0059	0.0107	0.0000	0.0184	0.0000
3.9835	0.0059	0.0111	0.0000	0.0188	0.0000
4.0440	0.0059	0.0114	0.0008	0.0193	0.0000
4.1044	0.0059	0.0118	0.0012	0.0197	0.0000
4.1648	0.0059	0.0121	0.0015	0.0202	0.0000

4.2253	0.0059	0.0125	0.0018	0.0207	0.0000
4.2857	0.0059	0.0129	0.0020	0.0211	0.0000
4.3462	0.0059	0.0132	0.0022	0.0216	0.0000
4.4066	0.0059	0.0136	0.0024	0.0220	0.0000
4.4670	0.0059	0.0139	0.0026	0.0225	0.0000
4.5275	0.0059	0.0143	0.0028	0.0229	0.0000
4.5879	0.0059	0.0146	0.0029	0.0234	0.0000
4.6484	0.0059	0.0150	0.0031	0.0239	0.0000
4.7088	0.0059	0.0153	0.0032	0.0243	0.0000
4.7692	0.0059	0.0157	0.0093	0.0248	0.0000
4.8297	0.0059	0.0161	0.0534	0.0252	0.0000
4.8901	0.0059	0.0164	0.1200	0.0257	0.0000
4.9505	0.0059	0.0168	0.2031	0.0262	0.0000
5.0110	0.0059	0.0171	0.2895	0.0266	0.0000
5.0714	0.0059	0.0175	0.4155	0.0271	0.0000
5.1319	0.0059	0.0178	0.6060	0.0275	0.0000
5.1923	0.0059	0.0182	0.8061	0.0280	0.0000
5.2527	0.0059	0.0185	0.9656	0.0284	0.0000
5.3132	0.0059	0.0189	1.0602	0.0289	0.0000
5.3736	0.0059	0.0192	1.1376	0.0294	0.0000
5.4341	0.0059	0.0196	1.2043	0.0298	0.0000
5.4945	0.0059	0.0200	1.2665	0.0303	0.0000
5.5000	0.0059	0.0200	1.3251	0.0303	0.0000

Surface Bio Swale 1

Element Flows To:

Outlet 1	Outlet 2
	Bio Swale 1

Porous Pavement 1

Pavement Area:0.0508 acre.Pavement Length:67.08 ft.
Pavement Width: 32.99 ft.
Pavement slope 1:0 To 1
Pavement thickness: 0.33
Pour Space of Pavement: 0.4
Material thickness of second layer: 2.5
Pour Space of material for second layer: 0.4
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 0.2
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 5.733
Total Volume Through Riser (ac-ft.): 0.821
Total Volume Through Facility (ac-ft.): 6.555
Percent Infiltrated: 87.46
Total Precip Applied to Facility: 0
Total Evap From Facility: 0.13
Element Flows To:
Outlet 1 Outlet 2
Surface Bio Swale 1

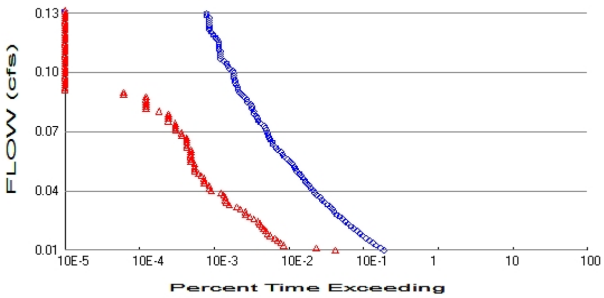
Porous Pavement Hydraulic Table

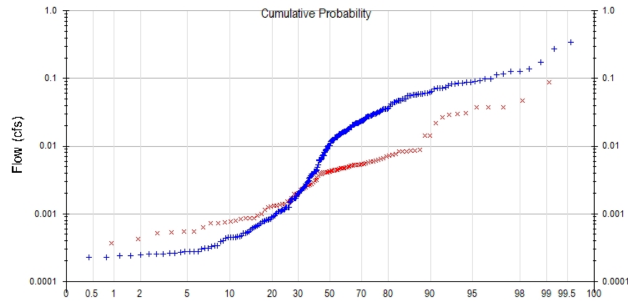
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.050	0.000	0.000	0.000
0.0278	0.050	0.000	0.000	0.010
0.0556	0.050	0.001	0.000	0.010
0.0833	0.050	0.001	0.000	0.010
0.1111	0.050	0.002	0.000	0.010
0.1389	0.050	0.002	0.000	0.010
0.1667	0.050	0.003	0.000	0.010
0.1944	0.050	0.004	0.000	0.010
0.2222	0.050	0.004	0.000	0.010
0.2500	0.050	0.005	0.000	0.010
0.2778	0.050	0.005	0.018	0.010
0.3056	0.050	0.006	0.025	0.010
0.3333	0.050	0.006	0.031	0.010
0.3611	0.050	0.007	0.036	0.010
0.3889	0.050	0.007	0.040	0.010
0.4167	0.050	0.008	0.044	0.010
0.4444	0.050	0.009	0.047	0.010
0.4722	0.050	0.009	0.051	0.010
0.5000	0.050	0.010	0.054	0.010
0.5278	0.050	0.010	0.057	0.010
0.5556	0.050	0.011	0.060	0.010
0.5833	0.050	0.011	0.062	0.010
0.6111	0.050	0.012	0.065	0.010
0.6389	0.050	0.013	0.067	0.010
0.6667	0.050	0.013	0.070	0.010
0.6944	0.050	0.014	0.072	0.010
0.7222	0.050	0.014	0.074	0.010
0.7500	0.050	0.015	0.076	0.010
0.7778	0.050	0.015	0.078	0.010
0.8056	0.050	0.016	0.080	0.010
0.8333	0.050	0.016	0.082	0.010

0.8611	0.050	0.017	0.084	0.010
0.8889	0.050	0.018	0.086	0.010
0.9167	0.050	0.018	0.088	0.010
0.9444	0.050	0.019	0.090	0.010
0.9722	0.050	0.019	0.092	0.010
1.0000	0.050	0.020	0.094	0.010
1.0278	0.050	0.020	0.095	0.010
1.0556	0.050	0.021	0.097	0.010
1.0833	0.050	0.022	0.099	0.010
1.1111	0.050	0.022	0.100	0.010
1.1389	0.050	0.023	0.102	0.010
1.1667	0.050	0.023	0.103	0.010
1.1944	0.050	0.024	0.105	0.010
1.2222	0.050	0.024	0.107	0.010
1.2500	0.050	0.025	0.108	0.010
1.2778	0.050	0.026	0.110	0.010
1.3056	0.050	0.026	0.111	0.010
1.3333	0.050	0.027	0.113	0.010
1.3611	0.050	0.027	0.114	0.010
1.3889	0.050	0.028	0.115	0.010
1.4167	0.050	0.028	0.117	0.010
1.4444	0.050	0.029	0.118	0.010
1.4722	0.050	0.029	0.120	0.010
1.5000	0.050	0.030	0.121	0.010
1.5278	0.050	0.031	0.122	0.010
1.5556	0.050	0.031	0.124	0.010
1.5833	0.050	0.032	0.125	0.010
1.6111	0.050	0.032	0.126	0.010
1.6389	0.050	0.033	0.127	0.010
1.6667	0.050	0.033	0.129	0.010
1.6944	0.050	0.034	0.130	0.010
1.7222	0.050	0.035	0.131	0.010
1.7500	0.050	0.035	0.132	0.010
1.7778	0.050	0.036	0.134	0.010
1.8056	0.050	0.036	0.135	0.010
1.8333	0.050	0.037	0.136	0.010
1.8611	0.050	0.037	0.137	0.010
1.8889	0.050	0.038	0.139	0.010
1.9167	0.050	0.038	0.140	0.010
1.9444	0.050	0.039	0.141	0.010
1.9722	0.050	0.040	0.142	0.010
2.0000	0.050	0.040	0.143	0.010
2.0278	0.050	0.041	0.144	0.010
2.0556	0.050	0.041	0.145	0.010
2.0833	0.050	0.042	0.147	0.010
2.1111	0.050	0.042	0.148	0.010
2.1389	0.050	0.043	0.149	0.010
2.1667	0.050	0.044	0.150	0.010
2.1944	0.050	0.044	0.151	0.010
2.2222	0.050	0.045	0.152	0.010
2.2500	0.050	0.045	0.153	0.010
2.2778	0.050	0.046	0.154	0.010
2.3056	0.050	0.046	0.155	0.010
2.3333	0.050	0.047	0.156	0.010
2.3611	0.050	0.048	0.157	0.010
2.3889	0.050	0.048	0.158	0.010
2.4167	0.050	0.049	0.159	0.010
2.4444	0.050	0.049	0.160	0.010

2.4722	0.050	0.050	0.161	0.010
2.5000	0.050	0.050	0.162	0.010

Analysis Results
POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.11
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.008
Total Impervious Area: 0.106803

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.069691
5 year	0.098314
10 year	0.127247
25 year	0.234857

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.006452
5 year	0.022642
10 year	0.036072
25 year	0.043095

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0070	3121	686	21	Pass
0.0082	2767	381	13	Pass
0.0094	2446	141	5	Pass
0.0106	2180	128	5	Pass
0.0118	1963	116	5	Pass
0.0130	1768	106	5	Pass
0.0143	1609	93	5	Pass
0.0155	1461	85	5	Pass
0.0167	1333	81	6	Pass
0.0179	1222	75	6	Pass
0.0191	1118	71	6	Pass
0.0203	1023	68	6	Pass
0.0215	939	64	6	Pass
0.0228	858	56	6	Pass
0.0240	785	49	6	Pass
0.0252	712	43	6	Pass
0.0264	665	43	6	Pass
0.0276	627	37	5	Pass
0.0288	584	33	5	Pass
0.0301	542	26	4	Pass
0.0313	500	24	4	Pass
0.0325	453	23	5	Pass
0.0337	427	23	5	Pass
0.0349	390	22	5	Pass
0.0361	365	20	5	Pass
0.0373	347	15	4	Pass
0.0386	321	14	4	Pass
0.0398	304	14	4	Pass
0.0410	286	12	4	Pass
0.0422	270	12	4	Pass
0.0434	255	12	4	Pass
0.0446	241	11	4	Pass
0.0458	227	10	4	Pass
0.0471	207	9	4	Pass
0.0483	202	9	4	Pass
0.0495	195	9	4	Pass
0.0507	180	9	5	Pass
0.0519	169	8	4	Pass
0.0531	158	8	5	Pass
0.0544	144	8	5	Pass
0.0556	135	8	5	Pass
0.0568	129	8	6	Pass
0.0580	115	8	6	Pass
0.0592	110	7	6	Pass
0.0604	102	7	6	Pass
0.0616	99	7	7	Pass
0.0629	93	7	7	Pass
0.0641	90	7	7	Pass
0.0653	86	6	6	Pass
0.0665	85	6	7	Pass
0.0677	82	5	6	Pass
0.0689	80	5	6	Pass
0.0701	76	5	6	Pass

0.0714	69	5	7	Pass
0.0726	65	4	6	Pass
0.0738	62	4	6	Pass
0.0750	60	4	6	Pass
0.0762	56	4	7	Pass
0.0774	56	3	5	Pass
0.0786	53	2	3	Pass
0.0799	53	2	3	Pass
0.0811	51	2	3	Pass
0.0823	46	2	4	Pass
0.0835	45	2	4	Pass
0.0847	41	2	4	Pass
0.0859	38	1	2	Pass
0.0872	36	1	2	Pass
0.0884	34	0	0	Pass
0.0896	34	0	0	Pass
0.0908	32	0	0	Pass
0.0920	31	0	0	Pass
0.0932	31	0	0	Pass
0.0944	30	0	0	Pass
0.0957	30	0	0	Pass
0.0969	30	0	0	Pass
0.0981	29	0	0	Pass
0.0993	26	0	0	Pass
0.1005	25	0	0	Pass
0.1017	24	0	0	Pass
0.1029	22	0	0	Pass
0.1042	20	0	0	Pass
0.1054	20	0	0	Pass
0.1066	20	0	0	Pass
0.1078	20	0	0	Pass
0.1090	19	0	0	Pass
0.1102	19	0	0	Pass
0.1115	19	0	0	Pass
0.1127	19	0	0	Pass
0.1139	18	0	0	Pass
0.1151	17	0	0	Pass
0.1163	16	0	0	Pass
0.1175	15	0	0	Pass
0.1187	14	0	0	Pass
0.1200	14	0	0	Pass
0.1212	14	0	0	Pass
0.1224	14	0	0	Pass
0.1236	14	0	0	Pass
0.1248	14	0	0	Pass
0.1260	13	0	0	Pass
0.1272	13	0	0	Pass

Water Quality

Drawdown Time Results

Pond: Surface Bio Swale 1

Days	Stage(feet)	Percent of Total Run Time
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A

Maximum Stage: 1.428 Drawdown Time: Less than 1 day

Pond: Bio Swale 1

Days	Stage(feet)	Percent of Total Run Time
1	1.221	39.632
2	1.300	38.591
3	1.388	37.561
4	1.483	36.550
5	1.584	35.531

Maximum Stage: 3.500 Drawdown Time: 05 00:00:10

Model Default Modifications

Total of 0 changes have been made.

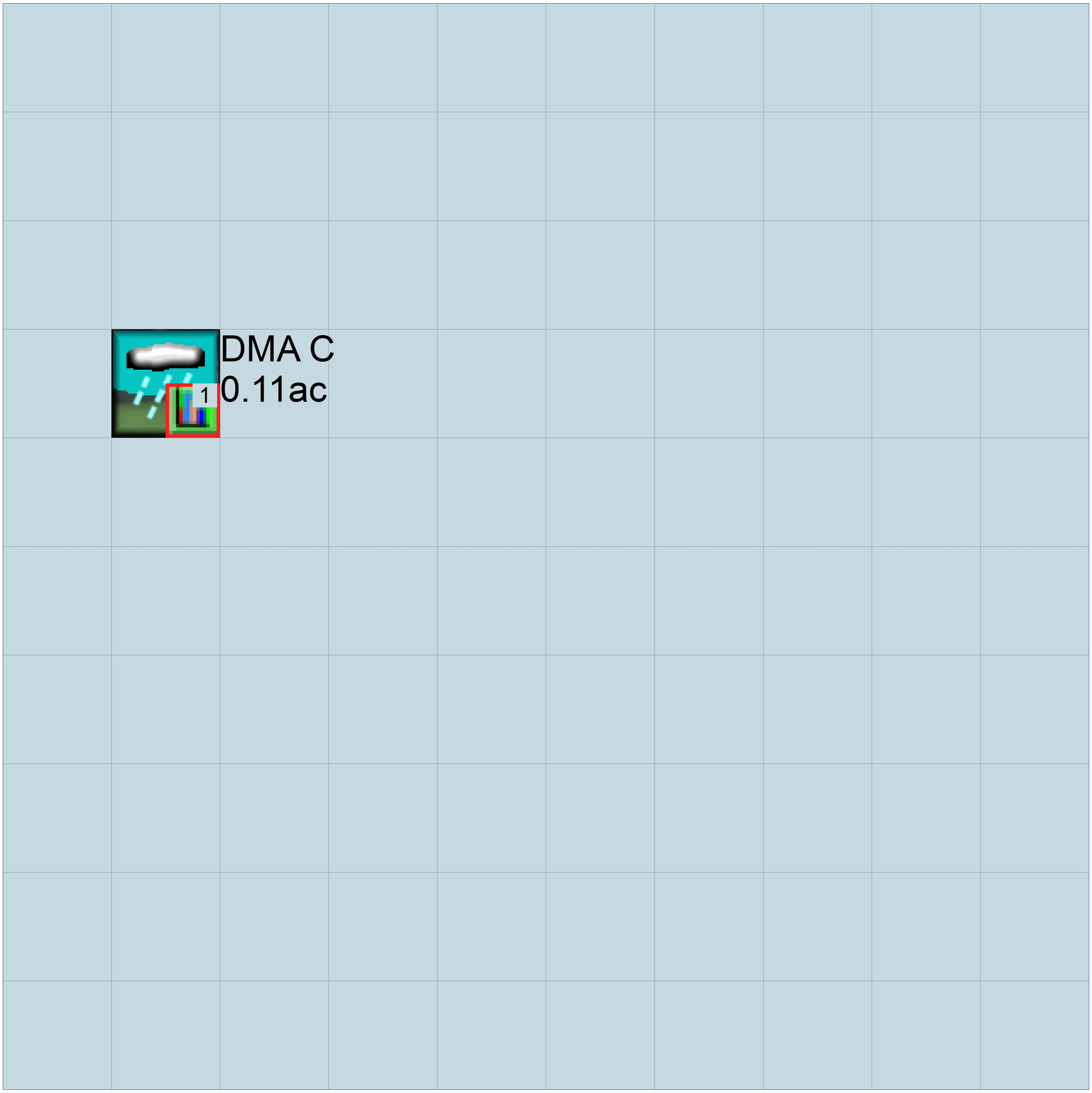
PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1958 10 01        END    2005 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   TRABUCO_HYDROMOD_DMA B.wdm
MESSU      25   PreTRABUCO_HYDROMOD_DMA B.MES
           27   PreTRABUCO_HYDROMOD_DMA B.L61
           28   PreTRABUCO_HYDROMOD_DMA B.L62
           30   POCTRABUCO_HYDROMOD_DMA B1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      42
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        DMA C                      MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   42     D,Open Brush,Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   42         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   42         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   42         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   42              0       4.3     0.035       350       0.1       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   42             40        35         4         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                   ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   42              0      0.65      0.25       0.8      0.45         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   42       0.4  0.4  0.4  0.5 0.55 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   42      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   42              0         0     0.065         0      0.86       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out            ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA C***
PERLND  42                        0.11     COPY   501     12
PERLND  42                        0.11     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *     *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES
```

```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1958 10 01        END    2005 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   TRABUCO_HYDROMOD_DMA B.wdm
MESSU      25   MitTRABUCO_HYDROMOD_DMA B.MES
           27   MitTRABUCO_HYDROMOD_DMA B.L61
           28   MitTRABUCO_HYDROMOD_DMA B.L62
           30   POCTRABUCO_HYDROMOD_DMA B1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      61
      IMPLND       8
      IMPLND       7
      RCHRES       1
      GENER        3
      RCHRES       2
      RCHRES       3
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Bio Swale  1        MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1        1    1
  501        1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    3        24
  END OPCODE
  PARM
    #    #         K ***
    3             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   61     D,Urban,Flat(0-5%)      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
  61         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
  61         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
  61         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
  61              0       4.4      0.04       400      0.05       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
  61             40        35         4         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
  61              0       0.7      0.25         3       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
  61       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
  61      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
  61              0         0      0.07         0      0.88       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    8     Impervious,Flat(0-5)    1    1    1   27    0
    7     Porous Pavement         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    8         0    0    1    0    0    0
    7         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
```

```
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    8         0    0    4    0    0    0    1    9
    7         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    8         0    0    0    0    0
    7         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    8            100      0.05       0.1       0.1
    7            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    8              0         0
    7              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    8              0         0
    7              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  61                       0.008     RCHRES   2      2
PERLND  61                       0.008     RCHRES   2      3
IMPLND   7                      0.0508     RCHRES   1      5
Lateral I Basin  1***
IMPLND   8                      1.1023     IMPLND   7     53

******Routing******
PERLND  61                       0.008     COPY     1     12
PERLND  61                       0.008     COPY     1     13
RCHRES   2                           1     RCHRES   3      8
RCHRES   1                           1     RCHRES   2      7
RCHRES   1                                 COPY     1     17
RCHRES   3                           1     COPY   501     17
RCHRES   2                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    3 OUTPUT TIMSER      .0011111     RCHRES   2     EXTNL  OUTDGT 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
```

```
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                             ***
    1     Porous Pavement -012    2    1    1    1   28    0    1
    2     Surface Bio Swal-006    2    1    1    1   28    0    1
    3     Bio Swale  1            2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    3        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1             1      0.01       0.0       0.0       0.5       0.0
    2             2      0.01       0.0       0.0       0.0       0.0
    3             3      0.01       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol3   RCHRES   3 VOL              4
  UVQUAN v2m3   GLOBAL     WORKSP  2        3
  UVQUAN vpo3   GLOBAL     WORKSP  3        3
  UVQUAN v2d3   GENER    3 K       1        3
*** User-Defined Target Variable Names
***                  addr or                              addr or
***                 <------>                             <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m3    1 WORKSP  2         1.0 QUAN
  UVNAME  vpo3    1 WORKSP  3         1.0 QUAN
  UVNAME  v2d3    1 K       1         1.0 QUAN
```

```
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   3                               v2m3            =  365.37
*** Compute remaining available pore space
  GENER   3                               vpo3            =  v2m3
  GENER   3                               vpo3           -=  vol3
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo3 < 0.0) THEN
  GENER   3                               vpo3            =  0.0
END IF
*** Infiltration volume
  GENER   3                               v2d3            =  vpo3
END SPEC-ACTIONS
FTABLES
  FTABLE      3
   59    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.005875  0.000000  0.000000  0.000000
  0.060440  0.005875  0.000138  0.000000  0.000000
  0.120879  0.005875  0.000277  0.000000  0.000000
  0.181319  0.005875  0.000415  0.000000  0.000000
  0.241758  0.005875  0.000554  0.000000  0.000000
  0.302198  0.005875  0.000692  0.000000  0.000000
  0.362637  0.005875  0.000831  0.000000  0.000000
  0.423077  0.005875  0.000969  0.000000  0.000000
  0.483516  0.005875  0.001108  0.000000  0.000000
  0.543956  0.005875  0.001246  0.000000  0.000000
  0.604396  0.005875  0.001385  0.000000  0.001055
  0.664835  0.005875  0.001523  0.000000  0.001185
  0.725275  0.005875  0.001662  0.000000  0.001185
  0.785714  0.005875  0.001800  0.000000  0.001185
  0.846154  0.005875  0.001939  0.000000  0.001185
  0.906593  0.005875  0.002077  0.000344  0.001185
  0.967033  0.005875  0.002216  0.000535  0.001185
  1.027473  0.005875  0.002354  0.000662  0.001185
  1.087912  0.005875  0.002493  0.000798  0.001185
  1.148352  0.005875  0.002631  0.000943  0.001185
  1.208791  0.005875  0.002770  0.001096  0.001185
  1.269231  0.005875  0.002908  0.001259  0.001185
  1.329670  0.005875  0.003047  0.001430  0.001185
  1.390110  0.005875  0.003185  0.001610  0.001185
  1.450549  0.005875  0.003324  0.001799  0.001185
  1.510989  0.005875  0.003462  0.001998  0.001185
  1.571429  0.005875  0.003601  0.002206  0.001185
  1.631868  0.005875  0.003739  0.002423  0.001185
  1.692308  0.005875  0.003878  0.002651  0.001185
  1.752747  0.005875  0.004016  0.002888  0.001185
  1.813187  0.005875  0.004155  0.003135  0.001185
  1.873626  0.005875  0.004293  0.003391  0.001185
  1.934066  0.005875  0.004432  0.003658  0.001185
  1.994505  0.005875  0.004570  0.003792  0.001185
  2.054945  0.005875  0.004717  0.003895  0.001185
  2.115385  0.005875  0.004865  0.003995  0.001185
  2.175824  0.005875  0.005012  0.004093  0.001185
  2.236264  0.005875  0.005159  0.004188  0.001185
  2.296703  0.005875  0.005307  0.004281  0.001185
  2.357143  0.005875  0.005454  0.004372  0.001185
  2.417582  0.005875  0.005602  0.004462  0.001185
  2.478022  0.005875  0.005749  0.004549  0.001185
  2.538462  0.005875  0.005896  0.004635  0.001185
  2.598901  0.005875  0.006044  0.004720  0.001185
  2.659341  0.005875  0.006191  0.004803  0.001185
  2.719780  0.005875  0.006338  0.004884  0.001185
  2.780220  0.005875  0.006486  0.004965  0.001185
  2.840659  0.005875  0.006633  0.005044  0.001185
  2.901099  0.005875  0.006780  0.005122  0.001185
  2.961538  0.005875  0.006928  0.005198  0.001185
  3.021978  0.005875  0.007075  0.005274  0.001185
  3.082418  0.005875  0.007223  0.005349  0.001185
```

3.142857	0.005875	0.007370	0.005423	0.001185
3.203297	0.005875	0.007517	0.005496	0.001185
3.263736	0.005875	0.007665	0.005568	0.001185
3.324176	0.005875	0.007812	0.005640	0.001185
3.384615	0.005875	0.007959	0.005712	0.001185
3.445055	0.005875	0.008107	0.005785	0.001185
3.500000	0.005875	0.008388	0.005935	0.001185

END FTABLE 3

FTABLE 2

35 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.005875	0.000000	0.000000	0.000000		
0.060440	0.005875	0.000355	0.000000	0.015160		
0.120879	0.005875	0.000710	0.000000	0.016076		
0.181319	0.005875	0.001065	0.000000	0.016534		
0.241758	0.005875	0.001420	0.000000	0.016993		
0.302198	0.005875	0.001775	0.000000	0.017451		
0.362637	0.005875	0.002131	0.000000	0.017909		
0.423077	0.005875	0.002486	0.000000	0.018367		
0.483516	0.005875	0.002841	0.000000	0.018825		
0.543956	0.005875	0.003196	0.000800	0.019283		
0.604396	0.005875	0.003551	0.001233	0.019741		
0.664835	0.005875	0.003906	0.001549	0.020200		
0.725275	0.005875	0.004261	0.001811	0.020658		
0.785714	0.005875	0.004616	0.002040	0.021116		
0.846154	0.005875	0.004971	0.002245	0.021574		
0.906593	0.005875	0.005326	0.002433	0.022032		
0.967033	0.005875	0.005681	0.002608	0.022490		
1.027473	0.005875	0.006037	0.002772	0.022948		
1.087912	0.005875	0.006392	0.002926	0.023406		
1.148352	0.005875	0.006747	0.003073	0.023865		
1.208791	0.005875	0.007102	0.003213	0.024323		
1.269231	0.005875	0.007457	0.009267	0.024781		
1.329670	0.005875	0.007812	0.053399	0.025239		
1.390110	0.005875	0.008167	0.120028	0.025697		
1.450549	0.005875	0.008522	0.203102	0.026155		
1.510989	0.005875	0.008877	0.289487	0.026613		
1.571429	0.005875	0.009232	0.415510	0.027072		
1.631868	0.005875	0.009587	0.605993	0.027530		
1.692308	0.005875	0.009943	0.806063	0.027988		
1.752747	0.005875	0.010298	0.965626	0.028446		
1.813187	0.005875	0.010653	1.060190	0.028904		
1.873626	0.005875	0.011008	1.137622	0.029362		
1.934066	0.005875	0.011363	1.204333	0.029820		
1.994505	0.005875	0.011718	1.266545	0.030278		
2.000000	0.005875	0.011750	1.325061	0.030320		

END FTABLE 2

FTABLE 1

91 5

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Outflow2 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.050803	0.000000	0.000000	0.000000		
0.027778	0.050803	0.000564	0.000000	0.010245		
0.055556	0.050803	0.001129	0.000000	0.010245		
0.083333	0.050803	0.001693	0.000000	0.010245		
0.111111	0.050803	0.002258	0.000000	0.010245		
0.138889	0.050803	0.002822	0.000000	0.010245		
0.166667	0.050803	0.003387	0.000000	0.010245		
0.194444	0.050803	0.003951	0.000000	0.010245		
0.222222	0.050803	0.004516	0.000000	0.010245		
0.250000	0.050803	0.005080	0.000000	0.010245		
0.277778	0.050803	0.005645	0.018091	0.010245		
0.305556	0.050803	0.006209	0.025585	0.010245		
0.333333	0.050803	0.006774	0.031335	0.010245		
0.361111	0.050803	0.007338	0.036182	0.010245		
0.388889	0.050803	0.007903	0.040453	0.010245		
0.416667	0.050803	0.008467	0.044314	0.010245		
0.444444	0.050803	0.009032	0.047865	0.010245		
0.472222	0.050803	0.009596	0.051170	0.010245		

0.500000	0.050803	0.010161	0.054274	0.010245
0.527778	0.050803	0.010725	0.057209	0.010245
0.555556	0.050803	0.011290	0.060002	0.010245
0.583333	0.050803	0.011854	0.062670	0.010245
0.611111	0.050803	0.012418	0.065229	0.010245
0.638889	0.050803	0.012983	0.067691	0.010245
0.666667	0.050803	0.013547	0.070067	0.010245
0.694444	0.050803	0.014112	0.072365	0.010245
0.722222	0.050803	0.014676	0.074592	0.010245
0.750000	0.050803	0.015241	0.076754	0.010245
0.777778	0.050803	0.015805	0.078858	0.010245
0.805556	0.050803	0.016370	0.080906	0.010245
0.833333	0.050803	0.016934	0.082904	0.010245
0.861111	0.050803	0.017499	0.084855	0.010245
0.888889	0.050803	0.018063	0.086762	0.010245
0.916667	0.050803	0.018628	0.088628	0.010245
0.944444	0.050803	0.019192	0.090456	0.010245
0.972222	0.050803	0.019757	0.092247	0.010245
1.000000	0.050803	0.020321	0.094005	0.010245
1.027778	0.050803	0.020886	0.095730	0.010245
1.055556	0.050803	0.021450	0.097424	0.010245
1.083333	0.050803	0.022015	0.099090	0.010245
1.111111	0.050803	0.022579	0.100728	0.010245
1.138889	0.050803	0.023143	0.102339	0.010245
1.166667	0.050803	0.023708	0.103926	0.010245
1.194444	0.050803	0.024272	0.105489	0.010245
1.222222	0.050803	0.024837	0.107029	0.010245
1.250000	0.050803	0.025401	0.108547	0.010245
1.277778	0.050803	0.025966	0.110044	0.010245
1.305556	0.050803	0.026530	0.111522	0.010245
1.333333	0.050803	0.027095	0.112980	0.010245
1.361111	0.050803	0.027659	0.114419	0.010245
1.388889	0.050803	0.028224	0.115840	0.010245
1.416667	0.050803	0.028788	0.117244	0.010245
1.444444	0.050803	0.029353	0.118632	0.010245
1.472222	0.050803	0.029917	0.120003	0.010245
1.500000	0.050803	0.030482	0.121359	0.010245
1.527778	0.050803	0.031046	0.122701	0.010245
1.555556	0.050803	0.031611	0.124027	0.010245
1.583333	0.050803	0.032175	0.125340	0.010245
1.611111	0.050803	0.032740	0.126638	0.010245
1.638889	0.050803	0.033304	0.127924	0.010245
1.666667	0.050803	0.033869	0.129197	0.010245
1.694444	0.050803	0.034433	0.130458	0.010245
1.722222	0.050803	0.034997	0.131706	0.010245
1.750000	0.050803	0.035562	0.132943	0.010245
1.777778	0.050803	0.036126	0.134168	0.010245
1.805556	0.050803	0.036691	0.135382	0.010245
1.833333	0.050803	0.037255	0.136586	0.010245
1.861111	0.050803	0.037820	0.137779	0.010245
1.888889	0.050803	0.038384	0.138961	0.010245
1.916667	0.050803	0.038949	0.140134	0.010245
1.944444	0.050803	0.039513	0.141297	0.010245
1.972222	0.050803	0.040078	0.142450	0.010245
2.000000	0.050803	0.040642	0.143594	0.010245
2.027778	0.050803	0.041207	0.144730	0.010245
2.055556	0.050803	0.041771	0.145856	0.010245
2.083333	0.050803	0.042336	0.146974	0.010245
2.111111	0.050803	0.042900	0.148083	0.010245
2.138889	0.050803	0.043465	0.149184	0.010245
2.166667	0.050803	0.044029	0.150277	0.010245
2.194444	0.050803	0.044594	0.151362	0.010245
2.222222	0.050803	0.045158	0.152439	0.010245
2.250000	0.050803	0.045723	0.153509	0.010245
2.277778	0.050803	0.046287	0.154571	0.010245
2.305556	0.050803	0.046851	0.155626	0.010245
2.333333	0.050803	0.047416	0.156674	0.010245
2.361111	0.050803	0.047980	0.157715	0.010245
2.388889	0.050803	0.048545	0.158750	0.010245
2.416667	0.050803	0.049109	0.159777	0.010245

```
  2.444444  0.050803  0.049674  0.160798  0.010245
  2.472222  0.050803  0.050238  0.161813  0.010245
  2.500000  0.050803  0.050803  0.162821  0.010245
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  61     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   2     EXTNL  PREC
WDM      1 EVAP     ENGL    1              RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5            RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   3     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   3 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   3 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   3 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1004 STAG     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17

  MASS-LINK       53
```

```
IMPLND     IWATER SURO                          IMPLND          EXTNL  SURLI
  END MASS-LINK   53

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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SOHM – DMA C

SOHM

PROJECT REPORT

General Model Information

Project Name:	TRABUCO_HYDROMOD_DMA C
Site Name:	
Site Address:	
City:	
Report Date:	1/21/2022
Gage:	Trabuco Canyon
Data Start:	10/01/1958
Data End:	09/30/2005
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/05/25

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Open Brush,Flat	0.23
Pervious Total	0.23
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.23

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

+.012

Bypass:	No	
GroundWater:	No	
Pervious Land Use	acre	
C,Gravel,Flat(0-5%)	0.011	
D,Urban,Flat(0-5%)	0.133	
Pervious Total	0.144	
Impervious Land Use	acre	
Impervious,Flat(0-5)	0.086	
Impervious Total	0.086	
Basin Total	0.23	

Element Flows To:

Surface	Interflow	Groundwater
Surface DMA C - 1	Surface DMA C - 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

DMA C - 1

Bottom Length:	32.09 ft.
Bottom Width:	9.00 ft.
Material thickness of first layer:	2
Material type for first layer:	Amended 2.5 in/hr
Material thickness of second layer:	1.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.2
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	5.856
Total Volume Through Riser (ac-ft.):	2.547
Total Volume Through Facility (ac-ft.):	9.673
Percent Infiltrated:	60.54
Total Precip Applied to Facility:	1.034
Total Evap From Facility:	0.64
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	0.125
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	1.27
Total Outflow (ac-ft.):	9.673
Percent Through Underdrain:	13.13

Discharge Structure

Riser Height:	1 ft.
Riser Diameter:	8 in.
Notch Type:	Rectangular
Notch Width:	0.667 ft.
Notch Height:	0.250 ft.
Orifice 1 Diameter:	0.375 in. Elevation:0.5 ft.
Orifice 2 Diameter:	0.375 in. Elevation:0.5 ft.
Orifice 3 Diameter:	0.375 in. Elevation:0.75 ft.

Element Flows To:
Outlet 1 Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0169	0.0000	0.0000	0.0000
0.0549	0.0168	0.0001	0.0000	0.0000
0.1099	0.0167	0.0003	0.0000	0.0000
0.1648	0.0165	0.0004	0.0000	0.0000
0.2198	0.0163	0.0006	0.0000	0.0000
0.2747	0.0162	0.0008	0.0000	0.0000
0.3297	0.0160	0.0009	0.0000	0.0000
0.3846	0.0159	0.0011	0.0000	0.0000
0.4396	0.0157	0.0012	0.0000	0.0000
0.4945	0.0155	0.0014	0.0000	0.0000
0.5495	0.0154	0.0016	0.0000	0.0000
0.6044	0.0152	0.0018	0.0000	0.0012
0.6593	0.0150	0.0020	0.0000	0.0013
0.7143	0.0149	0.0021	0.0000	0.0013

0.7692	0.0147	0.0023	0.0000	0.0013
0.8242	0.0146	0.0025	0.0000	0.0013
0.8791	0.0144	0.0027	0.0000	0.0013
0.9341	0.0142	0.0029	0.0000	0.0013
0.9890	0.0141	0.0031	0.0000	0.0013
1.0440	0.0139	0.0033	0.0000	0.0013
1.0989	0.0138	0.0035	0.0000	0.0013
1.1538	0.0136	0.0037	0.0001	0.0013
1.2088	0.0134	0.0040	0.0001	0.0013
1.2637	0.0133	0.0042	0.0001	0.0013
1.3187	0.0131	0.0044	0.0002	0.0013
1.3736	0.0129	0.0046	0.0002	0.0013
1.4286	0.0128	0.0049	0.0002	0.0013
1.4835	0.0126	0.0051	0.0002	0.0013
1.5385	0.0125	0.0053	0.0002	0.0013
1.5934	0.0123	0.0056	0.0002	0.0013
1.6484	0.0121	0.0058	0.0002	0.0013
1.7033	0.0120	0.0061	0.0002	0.0013
1.7582	0.0118	0.0063	0.0002	0.0013
1.8132	0.0116	0.0066	0.0003	0.0013
1.8681	0.0115	0.0068	0.0003	0.0013
1.9231	0.0113	0.0071	0.0003	0.0013
1.9780	0.0112	0.0074	0.0003	0.0013
2.0330	0.0110	0.0076	0.0003	0.0013
2.0879	0.0108	0.0079	0.0003	0.0013
2.1429	0.0107	0.0082	0.0003	0.0013
2.1978	0.0105	0.0085	0.0003	0.0013
2.2527	0.0104	0.0088	0.0003	0.0013
2.3077	0.0102	0.0091	0.0003	0.0013
2.3626	0.0100	0.0094	0.0003	0.0013
2.4176	0.0099	0.0098	0.0003	0.0013
2.4725	0.0097	0.0101	0.0004	0.0013
2.5275	0.0095	0.0104	0.0004	0.0013
2.5824	0.0094	0.0107	0.0004	0.0013
2.6374	0.0092	0.0110	0.0004	0.0013
2.6923	0.0091	0.0114	0.0004	0.0013
2.7473	0.0089	0.0117	0.0004	0.0013
2.8022	0.0087	0.0120	0.0004	0.0013
2.8571	0.0086	0.0124	0.0004	0.0013
2.9121	0.0084	0.0127	0.0004	0.0013
2.9670	0.0082	0.0131	0.0004	0.0013
3.0220	0.0081	0.0134	0.0004	0.0013
3.0769	0.0079	0.0138	0.0004	0.0013
3.1319	0.0078	0.0141	0.0004	0.0013
3.1868	0.0076	0.0145	0.0004	0.0013
3.2418	0.0074	0.0149	0.0004	0.0013
3.2967	0.0073	0.0152	0.0004	0.0013
3.3516	0.0071	0.0156	0.0005	0.0013
3.4066	0.0070	0.0160	0.0005	0.0013
3.4615	0.0068	0.0164	0.0005	0.0013
3.5000	0.0066	0.0166	0.0005	0.0013

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.5000	0.0169	0.0166	0.0000	0.0171	0.0000
3.5549	0.0171	0.0176	0.0000	0.0171	0.0000
3.6099	0.0173	0.0185	0.0000	0.0180	0.0000
3.6648	0.0174	0.0195	0.0000	0.0185	0.0000

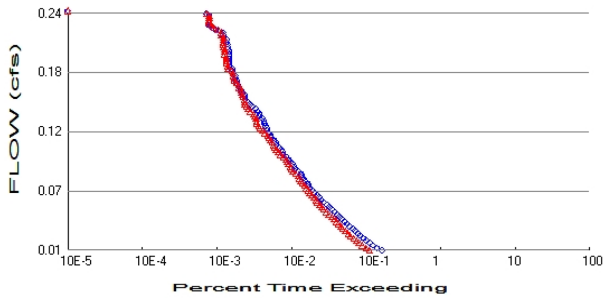
3.7198	0.0176	0.0204	0.0000	0.0190	0.0000
3.7747	0.0178	0.0214	0.0000	0.0195	0.0000
3.8297	0.0179	0.0224	0.0000	0.0199	0.0000
3.8846	0.0181	0.0234	0.0000	0.0204	0.0000
3.9396	0.0182	0.0244	0.0000	0.0209	0.0000
3.9945	0.0184	0.0254	0.0000	0.0213	0.0000
4.0495	0.0186	0.0264	0.0017	0.0218	0.0000
4.1044	0.0187	0.0274	0.0025	0.0223	0.0000
4.1593	0.0189	0.0285	0.0030	0.0227	0.0000
4.2143	0.0190	0.0295	0.0035	0.0232	0.0000
4.2692	0.0192	0.0306	0.0104	0.0237	0.0000
4.3242	0.0194	0.0316	0.0502	0.0242	0.0000
4.3791	0.0195	0.0327	0.1091	0.0246	0.0000
4.4341	0.0197	0.0338	0.1820	0.0251	0.0000
4.4890	0.0199	0.0348	0.2666	0.0256	0.0000
4.5440	0.0200	0.0359	0.3502	0.0260	0.0000
4.5989	0.0202	0.0370	0.5017	0.0265	0.0000
4.6538	0.0203	0.0382	0.6850	0.0270	0.0000
4.7088	0.0205	0.0393	0.8602	0.0274	0.0000
4.7637	0.0207	0.0404	0.9927	0.0279	0.0000
4.8187	0.0208	0.0416	1.0716	0.0284	0.0000
4.8736	0.0210	0.0427	1.1433	0.0289	0.0000
4.9286	0.0212	0.0439	1.2044	0.0293	0.0000
4.9835	0.0213	0.0450	1.2617	0.0298	0.0000
5.0000	0.0214	0.0454	1.3159	0.0299	0.0000

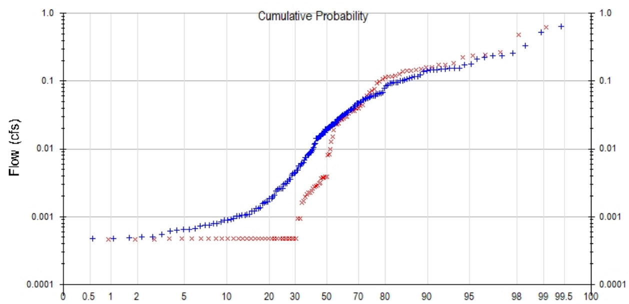
Surface DMA C - 1

Element Flows To:

Outlet 1	Outlet 2
	DMA C - 1

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.23
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.144
Total Impervious Area: 0.086

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.114195
5 year	0.174805
10 year	0.237113
25 year	0.448262

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.092528
5 year	0.160558
10 year	0.236368
25 year	0.395292

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0114	2667	1834	68	Pass
0.0137	2307	1644	71	Pass
0.0160	2040	1470	72	Pass
0.0183	1838	1327	72	Pass
0.0205	1655	1217	73	Pass
0.0228	1520	1124	73	Pass
0.0251	1376	1017	73	Pass
0.0274	1274	944	74	Pass
0.0297	1182	868	73	Pass
0.0319	1089	802	73	Pass
0.0342	998	765	76	Pass
0.0365	923	709	76	Pass
0.0388	847	654	77	Pass
0.0411	780	617	79	Pass
0.0433	725	570	78	Pass
0.0456	677	520	76	Pass
0.0479	624	482	77	Pass
0.0502	571	445	77	Pass
0.0525	533	419	78	Pass
0.0547	494	397	80	Pass
0.0570	448	368	82	Pass
0.0593	420	352	83	Pass
0.0616	389	331	85	Pass
0.0639	363	306	84	Pass
0.0661	331	290	87	Pass
0.0684	316	276	87	Pass
0.0707	298	262	87	Pass
0.0730	280	247	88	Pass
0.0753	269	230	85	Pass
0.0775	249	219	87	Pass
0.0798	239	212	88	Pass
0.0821	228	204	89	Pass
0.0844	220	188	85	Pass
0.0867	202	171	84	Pass
0.0889	188	163	86	Pass
0.0912	179	159	88	Pass
0.0935	169	151	89	Pass
0.0958	160	144	90	Pass
0.0980	150	139	92	Pass
0.1003	141	130	92	Pass
0.1026	127	117	92	Pass
0.1049	125	110	88	Pass
0.1072	119	103	86	Pass
0.1094	111	97	87	Pass
0.1117	104	94	90	Pass
0.1140	102	91	89	Pass
0.1163	96	86	89	Pass
0.1186	88	82	93	Pass
0.1208	86	79	91	Pass
0.1231	82	72	87	Pass
0.1254	77	67	87	Pass
0.1277	76	62	81	Pass
0.1300	74	60	81	Pass

0.1322	72	56	77	Pass
0.1345	70	56	80	Pass
0.1368	67	55	82	Pass
0.1391	61	53	86	Pass
0.1414	61	51	83	Pass
0.1436	58	46	79	Pass
0.1459	54	43	79	Pass
0.1482	49	41	83	Pass
0.1505	46	39	84	Pass
0.1528	43	39	90	Pass
0.1550	40	38	95	Pass
0.1573	39	37	94	Pass
0.1596	38	36	94	Pass
0.1619	36	35	97	Pass
0.1642	35	35	100	Pass
0.1664	33	33	100	Pass
0.1687	31	32	103	Pass
0.1710	30	30	100	Pass
0.1733	30	28	93	Pass
0.1756	29	28	96	Pass
0.1778	29	27	93	Pass
0.1801	27	27	100	Pass
0.1824	26	26	100	Pass
0.1847	26	23	88	Pass
0.1870	24	23	95	Pass
0.1892	24	22	91	Pass
0.1915	24	22	91	Pass
0.1938	24	22	91	Pass
0.1961	24	22	91	Pass
0.1984	24	21	87	Pass
0.2006	24	21	87	Pass
0.2029	23	21	91	Pass
0.2052	23	20	86	Pass
0.2075	23	20	86	Pass
0.2098	22	20	90	Pass
0.2120	22	20	90	Pass
0.2143	20	20	100	Pass
0.2166	20	19	95	Pass
0.2189	20	19	95	Pass
0.2212	16	17	106	Pass
0.2234	14	15	107	Pass
0.2257	13	14	107	Pass
0.2280	13	13	100	Pass
0.2303	13	13	100	Pass
0.2326	13	13	100	Pass
0.2348	13	13	100	Pass
0.2371	12	12	100	Pass

Water Quality

Drawdown Time Results

Pond: Surface DMA C - 1

Days	Stage(feet)	Percent of Total Run Time
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A

Maximum Stage: 1.428 Drawdown Time: Less than 1 day

Model Default Modifications

Total of 0 changes have been made.

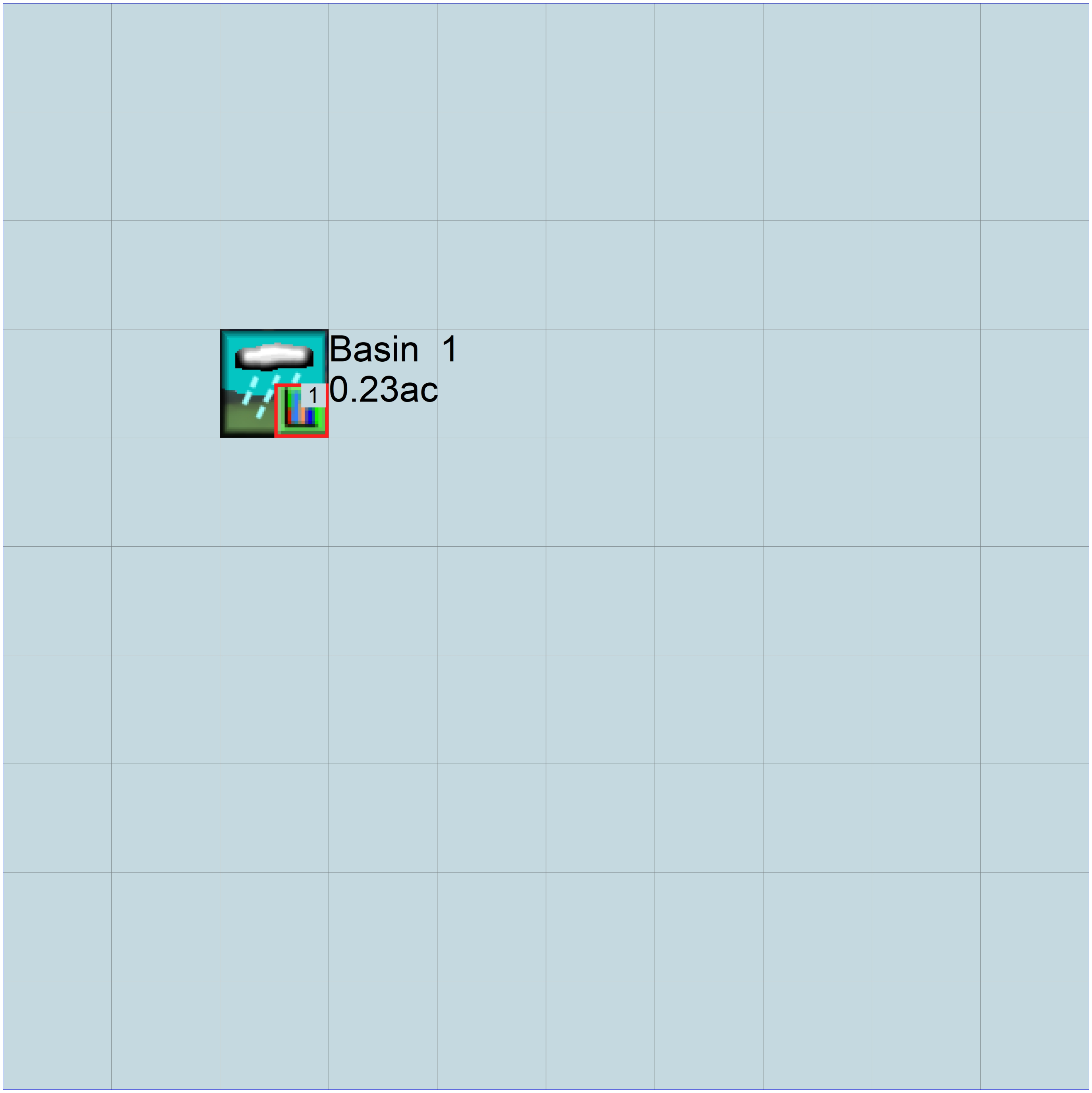
PERLND Changes

No PERLND changes have been made.

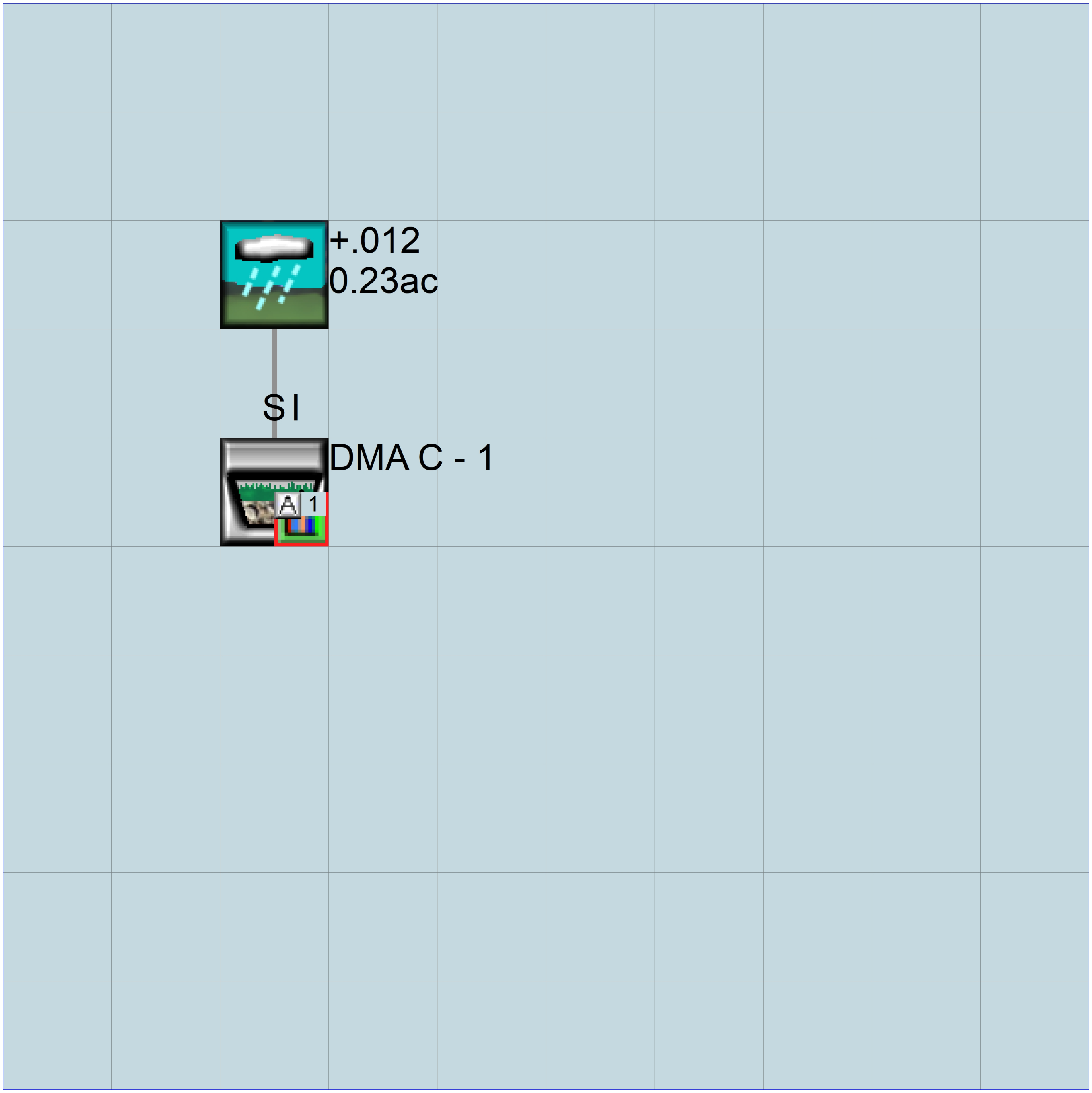
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1958 10 01        END    2005 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                             ***
WDM        26   TRABUCO_HYDROMOD_DMA C.wdm
MESSU      25   PreTRABUCO_HYDROMOD_DMA C.MES
           27   PreTRABUCO_HYDROMOD_DMA C.L61
           28   PreTRABUCO_HYDROMOD_DMA C.L62
           30   POCTRABUCO_HYDROMOD_DMA C1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      41
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                            User  t-series Engl Metr ***
                                            in  out           ***
   41     D,Open Brush,Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   41         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   41         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   41         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   41             0       4.6      0.04       400      0.05       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   41            40        35         4         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                     ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   41             0       0.8      0.25         1       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   41       0.4  0.4  0.4  0.5 0.55 0.55 0.55 0.55 0.55 0.55 0.45  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   41      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   41             0         0      0.08         0      0.92       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  41                        0.23     COPY   501     12
PERLND  41                        0.23     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *     *  *  *  *  *       *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES
```

```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1958 10 01        END    2005 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   TRABUCO_HYDROMOD_DMA C.wdm
MESSU      25   MitTRABUCO_HYDROMOD_DMA C.MES
           27   MitTRABUCO_HYDROMOD_DMA C.L61
           28   MitTRABUCO_HYDROMOD_DMA C.L62
           30   POCTRABUCO_HYDROMOD_DMA C1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      33
      PERLND      61
      IMPLND       1
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface DMA C - 1           MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                           in  out           ***
   33     C,Gravel,Flat(0-5%)     1    1    1    1   27    0
   61     D,Urban,Flat(0-5%)      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
   33         0    0    1    0    0    0    0    0    0    0    0    0
   61         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   33         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   61         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   33         0    0    0    1    0    0    0    0    1    0    0
   61         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   33              0       2.4     0.022       400      0.05       0.8     0.955
   61              0       4.4      0.04       400      0.05       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   33             40        35         3         2         0      0.03         0
   61             40        35         4         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   33              0       0.6       0.2       1.3       0.7         0
   61              0       0.7      0.25         3       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   33       0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3  0.3
   61       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   33      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
   61      0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   33              0         0      0.06         0      0.48       0.3      0.01
   61              0         0      0.07         0      0.88       0.3      0.01
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------->   Unit-systems   Printer ***
    # -  #                      User  t-series Engl Metr ***
                                       in  out           ***
    1     Impervious,Flat(0-5)    1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
```

```
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
+.012***
PERLND  33                       0.011     RCHRES   1      2
PERLND  33                       0.011     RCHRES   1      3
PERLND  61                       0.133     RCHRES   1      2
PERLND  61                       0.133     RCHRES   1      3
IMPLND   1                       0.086     RCHRES   1      5

******Routing******
PERLND  33                       0.011     COPY     1     12
PERLND  61                       0.133     COPY     1     12
IMPLND   1                       0.086     COPY     1     15
PERLND  33                       0.011     COPY     1     13
PERLND  61                       0.133     COPY     1     13
RCHRES   1                           1     RCHRES   2      8
RCHRES   2                           1     COPY   501     17
RCHRES   1                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK
```

```
RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                           in  out                          ***
    1     Surface DMA C - -006    2    1    1    1   28    0    1
    2     DMA C - 1               2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                     ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    2        0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50      ***
  <------><--------><--------><--------><--------><--------><-------->      ***
    1             1      0.01       0.0       0.0       0.0       0.0
    2             2      0.01       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0          4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                        <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
***                  addr or                        addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  726.85
```

```
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2            =  vpo2
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   65    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.016944  0.000000  0.000000  0.000000
  0.054945  0.016830  0.000144  0.000000  0.000000
  0.109890  0.016669  0.000291  0.000000  0.000000
  0.164835  0.016507  0.000442  0.000000  0.000000
  0.219780  0.016345  0.000596  0.000000  0.000000
  0.274725  0.016183  0.000754  0.000000  0.000000
  0.329670  0.016021  0.000915  0.000000  0.000000
  0.384615  0.015859  0.001080  0.000000  0.000000
  0.439560  0.015697  0.001248  0.000000  0.000000
  0.494505  0.015535  0.001419  0.000000  0.000000
  0.549451  0.015373  0.001594  0.000000  0.000000
  0.604396  0.015211  0.001773  0.000000  0.001205
  0.659341  0.015049  0.001955  0.000000  0.001337
  0.714286  0.014888  0.002140  0.000000  0.001337
  0.769231  0.014726  0.002329  0.000000  0.001337
  0.824176  0.014564  0.002521  0.000000  0.001337
  0.879121  0.014402  0.002717  0.000000  0.001337
  0.934066  0.014240  0.002917  0.000000  0.001337
  0.989011  0.014078  0.003119  0.000000  0.001337
  1.043956  0.013916  0.003326  0.000000  0.001337
  1.098901  0.013754  0.003535  0.000050  0.001337
  1.153846  0.013592  0.003749  0.000087  0.001337
  1.208791  0.013430  0.003965  0.000112  0.001337
  1.263736  0.013268  0.004185  0.000132  0.001337
  1.318681  0.013107  0.004409  0.000150  0.001337
  1.373626  0.012945  0.004636  0.000166  0.001337
  1.428571  0.012783  0.004867  0.000180  0.001337
  1.483516  0.012621  0.005101  0.000194  0.001337
  1.538462  0.012459  0.005338  0.000206  0.001337
  1.593407  0.012297  0.005579  0.000218  0.001337
  1.648352  0.012135  0.005824  0.000229  0.001337
  1.703297  0.011973  0.006071  0.000240  0.001337
  1.758242  0.011811  0.006323  0.000250  0.001337
  1.813187  0.011649  0.006578  0.000260  0.001337
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  2.197802  0.010516  0.008529  0.000320  0.001337
  2.252747  0.010354  0.008830  0.000328  0.001337
  2.307692  0.010192  0.009134  0.000335  0.001337
  2.362637  0.010030  0.009442  0.000342  0.001337
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  2.472527  0.009706  0.010069  0.000357  0.001337
  2.527473  0.009545  0.010388  0.000364  0.001337
  2.582418  0.009383  0.010711  0.000370  0.001337
  2.637363  0.009221  0.011038  0.000377  0.001337
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  2.747253  0.008897  0.011702  0.000390  0.001337
  2.802198  0.008735  0.012040  0.000396  0.001337
  2.857143  0.008573  0.012381  0.000403  0.001337
  2.912088  0.008411  0.012726  0.000409  0.001337
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```

```
  3.021978  0.008087  0.013427  0.000421  0.001337
  3.076923  0.007925  0.013783  0.000427  0.001337
  3.131868  0.007764  0.014143  0.000433  0.001337
  3.186813  0.007602  0.014506  0.000438  0.001337
  3.241758  0.007440  0.014873  0.000444  0.001337
  3.296703  0.007278  0.015244  0.000450  0.001337
  3.351648  0.007116  0.015619  0.000455  0.001337
  3.406593  0.006954  0.015997  0.000461  0.001337
  3.461538  0.006792  0.016379  0.000468  0.001337
  3.500000  0.006630  0.016686  0.000478  0.001337
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  FTABLE      1
   29    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
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  0.000000  0.006630  0.000000  0.000000  0.000000
  0.054945  0.017106  0.000935  0.000000  0.017108
  0.109890  0.017268  0.001880  0.000000  0.018048
  0.164835  0.017429  0.002833  0.000000  0.018518
  0.219780  0.017591  0.003795  0.000000  0.018988
  0.274725  0.017753  0.004766  0.000000  0.019458
  0.329670  0.017915  0.005746  0.000000  0.019928
  0.384615  0.018077  0.006735  0.000000  0.020398
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  0.714286  0.019049  0.012854  0.003533  0.023218
  0.769231  0.019210  0.013905  0.010410  0.023689
  0.824176  0.019372  0.014965  0.050233  0.024159
  0.879121  0.019534  0.016034  0.109073  0.024629
  0.934066  0.019696  0.017112  0.181978  0.025099
  0.989011  0.019858  0.018199  0.266609  0.025569
  1.043956  0.020020  0.019294  0.350245  0.026039
  1.098901  0.020182  0.020399  0.501654  0.026509
  1.153846  0.020344  0.021512  0.684962  0.026979
  1.208791  0.020506  0.022634  0.860187  0.027449
  1.263736  0.020668  0.023765  0.992714  0.027919
  1.318681  0.020830  0.024905  1.071623  0.028389
  1.373626  0.020991  0.026054  1.143297  0.028859
  1.428571  0.021153  0.027212  1.204406  0.029329
  1.483516  0.021315  0.028379  1.261718  0.029799
  1.500000  0.021364  0.028731  1.315865  0.029940
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END FTABLES

EXT SOURCES
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<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC      ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC      ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP      ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP      ENGL    1             IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG      ENGL    0.7       SAME PERLND  61     EXTNL  SURLI
WDM      2 PREC      ENGL    1             RCHRES   1     EXTNL  PREC
WDM      1 EVAP      ENGL    0.5           RCHRES   1     EXTNL  POTEV
WDM      1 EVAP      ENGL    0.7           RCHRES   2     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1002 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1003 FLOW     ENGL      REPL
```

```
COPY     1 OUTPUT MEAN   1 1     48.4       WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4       WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
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<Name>            <Name> # #<-factor->     <Name>               <Name> # #***
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PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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Local (360)943-0304

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Attachment E: Potential Coarse Sediment

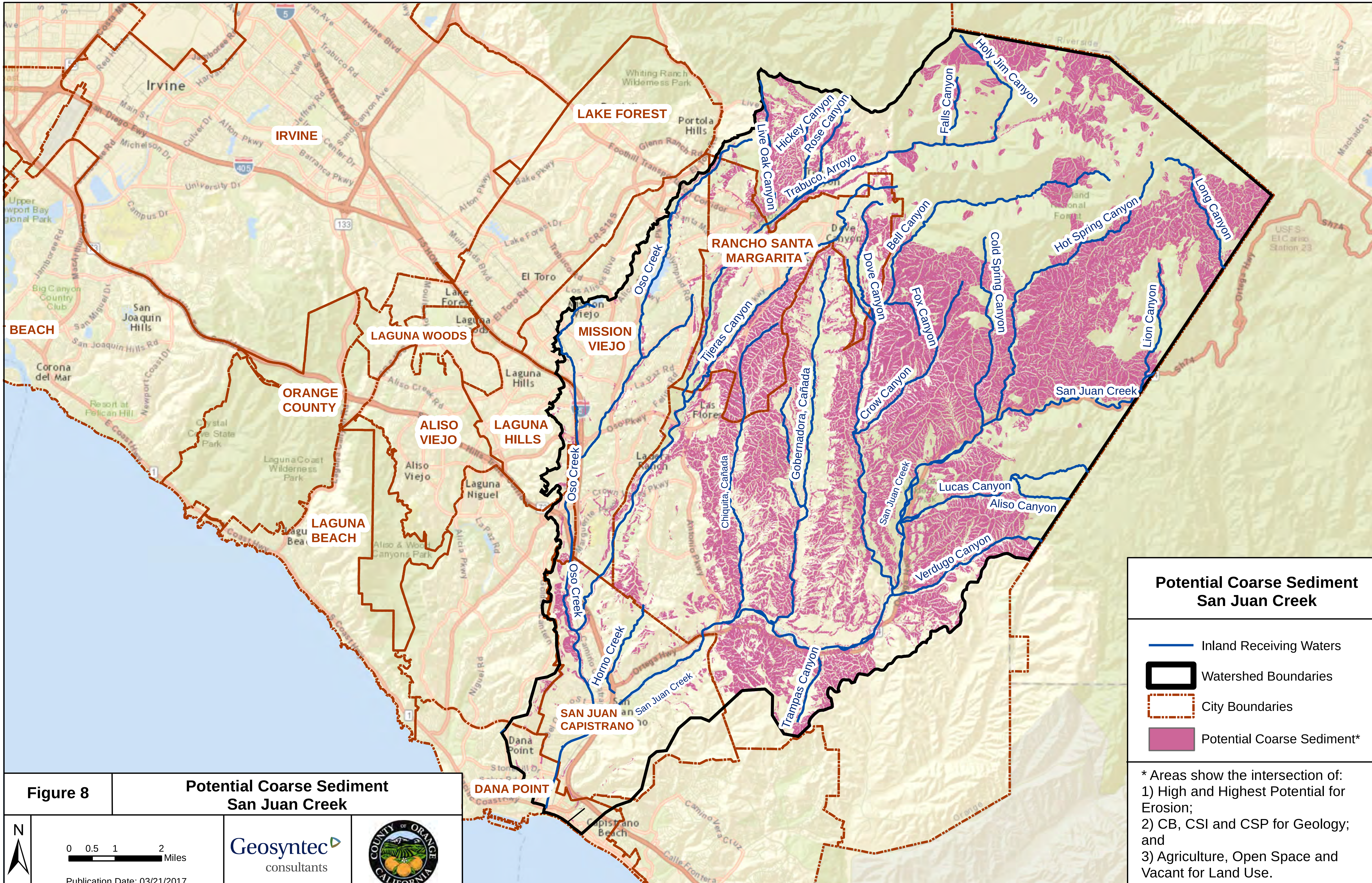
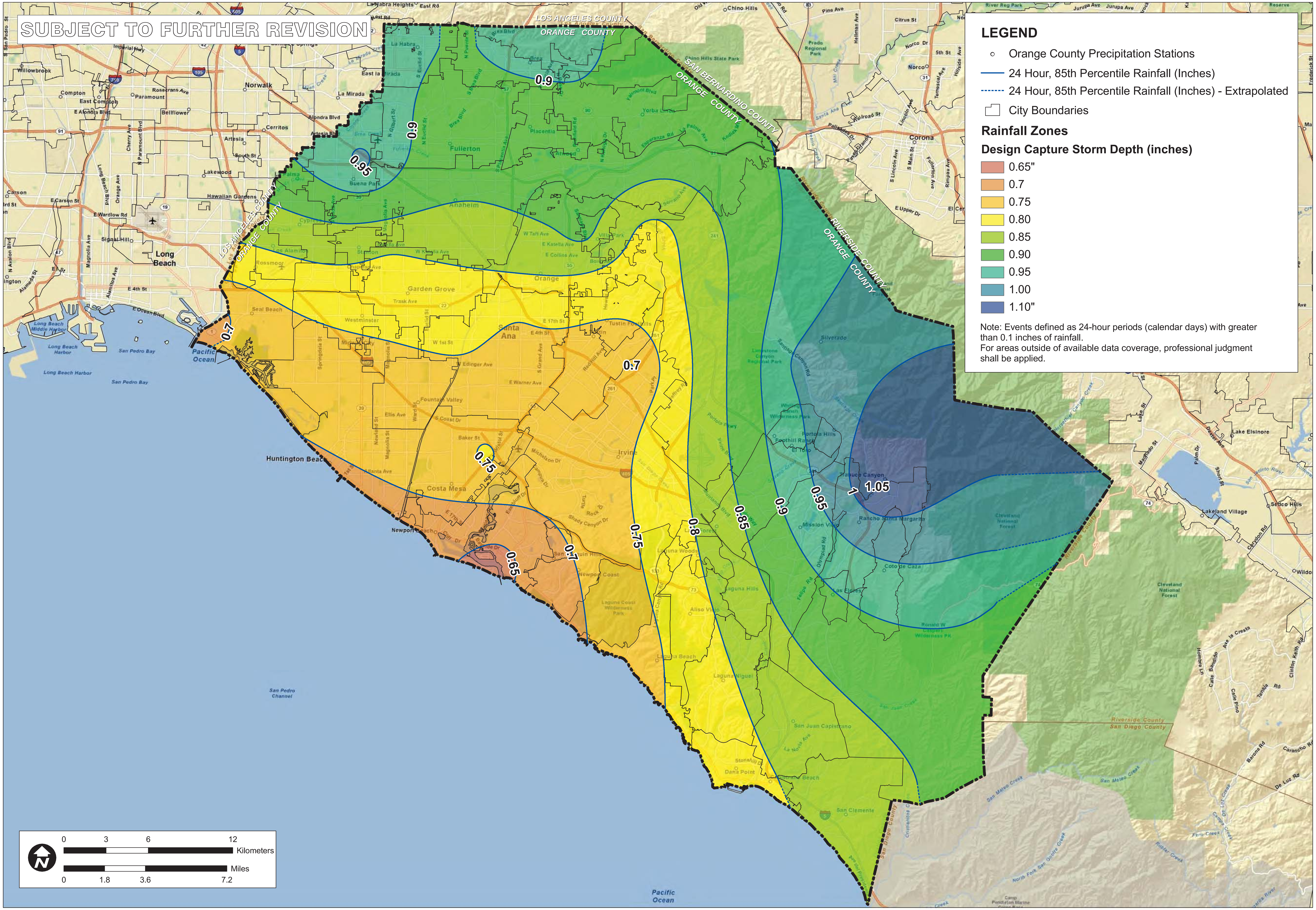


Figure 8 Potential Coarse Sediment San Juan Creek

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Attachment F: Rainfall Zones



TITLE

RAINFALL ZONES

JOB

ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT

ORANGE CO. CA

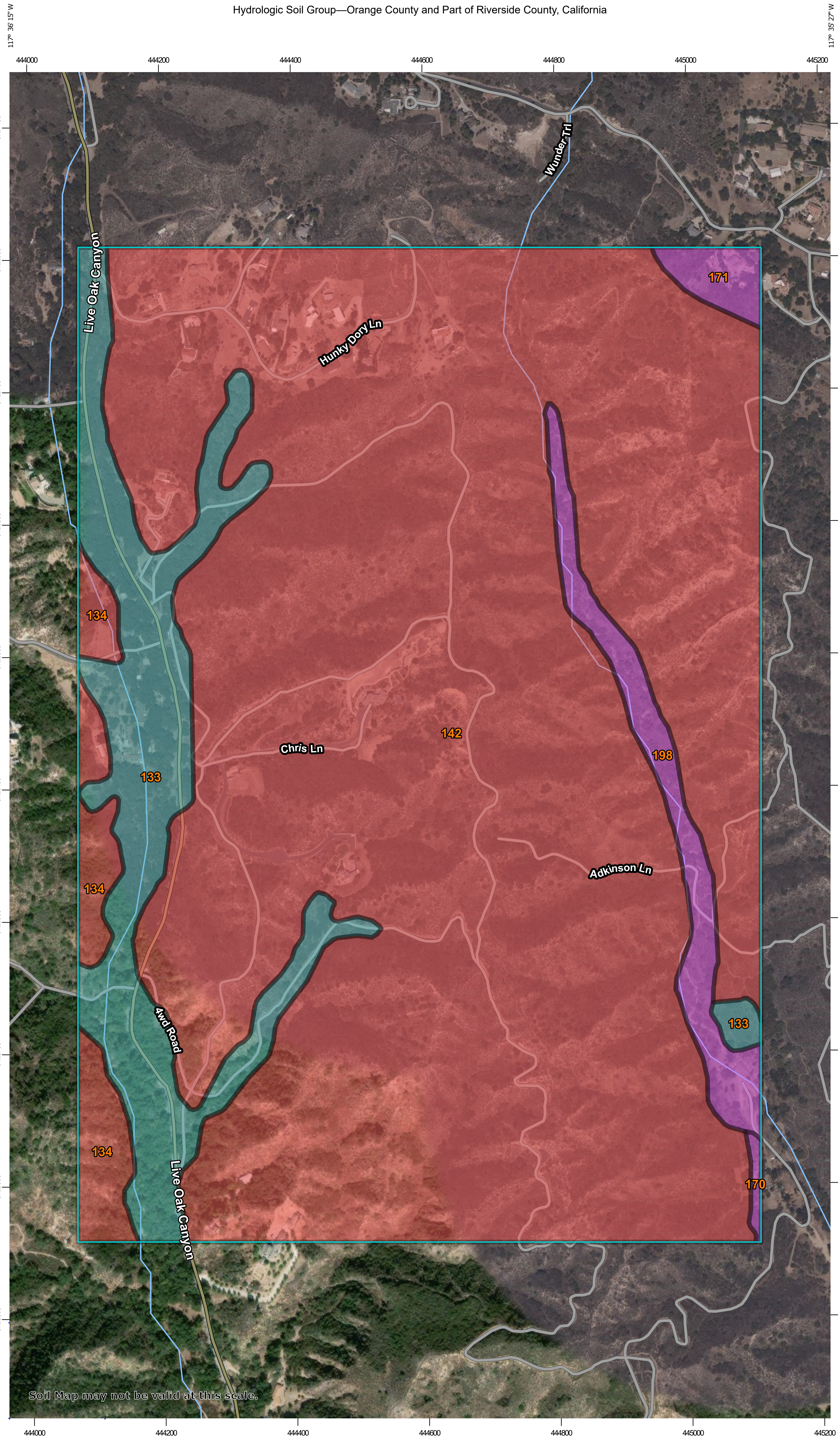
SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE

XVI-1

Attachment G: Geotechnical Report



Map Scale: 1:5,700 if printed on B portrait (11" x 17") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

N

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 15, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Aug 31, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
133	Botella clay loam, 9 to 15 percent slopes	C	41.8	10.8%
134	Calleguas clay loam, 50 to 75 percent slopes, eroded	D	12.0	3.1%
142	Cieneba sandy loam, 30 to 75 percent slopes, eroded	D	316.7	82.0%
170	Modjeska gravelly loam, 9 to 15 percent slopes	A	0.6	0.2%
171	Modjeska gravelly loam, 15 to 30 percent slopes	A	3.2	0.8%
198	Soboba cobbly loamy sand, 0 to 15 percent slopes	A	12.0	3.1%
Totals for Area of Interest			**386.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Geotechnical Investigation and Review of Rough Grading Plans, The Oaks at Trabuco Canyon, Lots 3, 4, 6, 7 and 8, Tract 14749, 30502 Shelter Canyon Road, Trabuco Canyon, County of Orange, California

Prepared For

THE OAKS AT TRABUCO, LLC

December 31, 2021

GMU Project No. 21-170-00

23241 Arroyo Vista
Rancho Santa Margarita | CA 92688
949.888.6513 | FX: 949.888.1380 | www.gmugeo.com

December 31, 2021

Mr. Bruce Goren
THE OAKS AT TRABUCO, LLC
10866 Wilshire Boulevard, 11th Floor
Los Angeles, CA 90024

GMU Project 21-170-00

Subject: Geotechnical Investigation and Review of Rough Grading Plans, The Oaks at Trabuco Canyon, Lots 3, 4, 6, 7 and 8, Tract 14749, 30502 Shelter Canyon Road, Trabuco Canyon, County of Orange, California.

Dear Mr. Goren:

GMU is pleased to present this geotechnical report for the subject site, which summarizes our subsurface exploration and accumulated geotechnical data and provides our conclusions and recommendations regarding proposed rough grading within the site.

Please note that this report has not been prepared for the use by other parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

We appreciate the opportunity to work on this project. Please do not hesitate to contact the undersigned if you have any questions regarding any aspect of this report.

Respectfully submitted,

David Hansen
Associate Geotechnical Engineer

DISTRIBUTION:

Addressee: (electronic copy)

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Description Page

INTRODUCTION

This report summarizes the results of our geotechnical investigation for the construction of rough graded pads within Lots 3, 4, 6, 7 and 8 of Tract 14749 which is located at 30502 Shelter Canyon Road in the Trabuco Canyon area of the County of Orange. The purposes of this investigation were to determine the nature of subsurface soil and bedrock materials, to evaluate their in-place characteristics, and to then provide geotechnical recommendations with respect to site clearing and remedial grading to construct level pads within each lot for the future construction of single-family residences and associated exterior site improvements. These recommendations are based on the reference (1) rough grading plans prepared by David Evans and Associates.

SITE LOCATION AND DESCRIPTION

The subject lots are located within Tract 14749, which is located at 30502 Shelter Canyon Road in the unincorporated community of Trabuco Canyon in the County of Orange, California. The site is located on the east side of Live Oak Canyon Road approximately two miles east of its intersection with Santiago Canyon Road. The general location of the site is shown on Plate 1.

Tract 14749 consists of nine individual lots situated on a series of moderate to steep ridges separated by natural canyons or drainages that flow into Live Oak Canyon to the west. The site has been previously graded to create Shelter Canyon Road that provides access to Lots 1 through 3 and Summit Trail Road that provides access to Lots 4 through 9. These roads are paved with asphalt. Other existing improvements within the tract include a sewage treatment plant to the southeast of the intersection of Shelter Canyon Road and Summit Trail Road; buried sewer lines, waterlines, electric and telecommunication lines along the access roads; and fire hydrants, concrete curbs and v-ditches, and retaining walls along the sides of the access roads. In addition, building pads and single-family homes have already been constructed within Lots 2, 5 and 9. Lot 1 has not yet been developed and is not included with this report.

Outside of the existing roads and previously graded portions of the lots, the subject residential lots remain primarily in a natural condition. These natural portions of the lots are covered by weeds, grasses, shrubs, cacti and occasional to frequent Oak trees. The topography of each lot is shown on Plates 2 through 5 – Geotechnical Maps which use the rough grading plans as base maps. As shown on the Geotechnical Maps, Lots 3 and 4 are located within roughly east-west trending canyons while Lots 6, 7 and 8 are located along the top of a ridge.

BACKGROUND INFORMATION

As described before, portions of Tract 14749 have been previously graded to create existing Shelter Canyon Road, Summit Trail Road, and a sewage treatment plant. This grading was performed during the period from July through October of 2000 with observation and testing provided by Leighton and Associates Inc. (Leighton, 2002). The grading was performed in accordance with the recommendations of the Preliminary Geotechnical Investigation report prepared for the Tract prepared by Leighton (Leighton, 1985). The grading consisted primarily of the construction of the roads with only minor grading within the individual lots; however, the referenced rough grade report also indicates that:

- Grading was performed within the easterly portion of Lot 3 adjacent to Shelter Canyon Road. This grading involved the removal of unsuitable alluvial/colluvial materials and their replacement as compacted fill. The fill thickness beneath the easterly portion of this lot ranges from approximately 10 to 25 feet.
- Grading was performed within the easterly portion of Lot 4 adjacent to Summit Trail Road. This grading involved the removal of unsuitable alluvial/colluvial materials and their replacement as compacted fill. The fill thickness beneath the easterly portion of this lot ranges from approximately 10 to 25 feet.
- Grading within Lot 6 was limited to minor cuts along the north side of the lot to create the cul-de-sac of Summit Trail Road. These cuts primarily exposed bedrock materials of the Sespe Formation; however, some colluvium was exposed that was removed and replaced with compacted fill.
- Grading within Lot 7 consisted of cuts along the south and east sides of the lot to create Summit Trail Road. These cuts primarily exposed bedrock materials of the Sespe Formation; however, some colluvium was exposed and left in-place along the west side of the lot. In addition, a fill slope supported by a keyway was constructed at the southeast corner of the lot to support the northern side of Summit Trail Road.
- Grading within Lot 8 consisted of cuts along the north side of the lot to create Summit Trail Road. These cuts exposed bedrock materials of the Sespe Formation; however, colluvium was also exposed and left in-place within the east half of this lot.

The referenced as-graded report by Leighton and Associates (Leighton, 2002) indicates that the natural slopes within the subject lots are composed of bedrock materials of the Sespe Formation (Ts). The bedrock generally consists of massive grayish-white to reddish-brown silty sandstone with gravel lenses and occasional sandy siltstone interbeds. Geologic mapping by Leighton during rough grading indicates that bedding within the bedrock dips primarily towards the west at angles of approximately 10 to 30 degrees; however, in local areas bedding was slightly variable within short distances, separated by faint, discontinuous joints and fractures. Joints observed by Leighton during grading had varying strikes with shallow dips (10 to 30 degrees) to near vertical dips.

The bedrock materials that form the natural slopes within the lots are mantled by slopewash that consists of silty clay to sandy silt. The drainage swales located within the eastern portions of Lots 3 and 4 are underlain by native alluvium (Qal) and colluvium (Qcol) which are supported at depth by bedrock. The alluvium and colluvium consists primarily of silty sand and sand with gravel and cobbles.

PROPOSED GRADING AND CONSTRUCTION

The reference (1) rough grading plans indicate that it is proposed to construct level building pads within Lots 3, 4, 6, 7 and 8 for future construction of single-family residences. In addition to the building pads, new access driveways will be constructed between the existing roads and the new building pads. It is expected that the proposed residences will be supported on conventional foundations and will be of wood-frame construction with first floor slabs constructed on-grade.

Based on the rough grading plans, proposed grading and construction within each lot will consist of the following:

- Within Lot 3, rough grading will consist of making cuts and fills of up to approximately 4 and 9 feet, respectively, to reach proposed grades within the lower pad and fills of only a few inches up to approximately 9 feet to reach proposed grades within the upper pad. An approximately 5-foot-high, 2:1 (horizontal to vertical) slope will be constructed along the west side of the lower pad and a temporary 12-foot-high 1:1 (horizontal to vertical) slope will be constructed between the lower and upper pads. During future precise grading, this temporary 1:1 slope will be replaced by a retaining wall.
- Within Lot 4, rough grading will consist of making cuts and fills of up to approximately 10 and 9 feet, respectively, to reach proposed grades within the three proposed pads. It is also proposed to construct retaining walls between the building pads and around the perimeter of the building pads to create a retention basin to the east of the building pads and access roads along the north and south sides of the building pads that will also serve as drainage channels.
- Rough grading within Lot 6 will consist of cuts of only a few inches up to approximately 10 feet within the east and south portions of the lot to reach proposed driveway and pad grades and fills of up to approximately 8 feet along the northwest side of the lot to reach proposed pad grade. In addition, an approximately 18-foot-high, 2:1 (horizontal to vertical) cut slope will be constructed along the south side of the pad while an approximately 10-foot-high temporary 1:1 to 2:1 fill slope will be constructed adjacent to the northwest side of the pad. During future precise grading, the portion of the temporary fill slope steeper than 2:1 will be replaced by a retaining wall.
- Rough grading within Lot 7 will consist of cuts of up to approximately 15 feet and fills of up to approximately 9 feet to reach proposed building pad grades In addition, an

approximately 15-foot-high, 2:1 (horizontal to vertical) cut slope will be constructed along the southwest side of the upper pad, an approximately 6-foot-high 2:1 cut slope will be constructed at the southeast corner of the lower pad and an approximately 8-foot-high 2:1 fill slope will be constructed along the north side of the lower pad. An approximately 12-foot-high retaining wall will be constructed between the upper and lower pads and an approximately 4-foot-high retaining wall will be constructed along the northwestern side of the lower pad.

- Rough grading within Lot 8 will consist of cuts of up to approximately 8 feet within the south portion of the building pad to reach proposed pad grade and fills of up to approximately 10 feet within the north portion of the building pad to reach proposed grades. In addition, an approximately 8-foot-high, 2:1 (horizontal to vertical) fill slope will be constructed along the north side of the pad while an approximately 10-foot-high temporary 1:1 to 2:1 fill slope will be constructed along the southeast side of the pad. During future precise grading, the portion of this temporary slope that is steeper than 2:1 will be replaced by a retaining wall.

Drainage within the rough graded building pads will be controlled by sloped ground surfaces and swales. In addition, a retention basin will be constructed to the east of the building pads within Lot 3 and drainage channels will be constructed to the north and south of the building pads of Lot 3.

The existing natural slopes that will ascend and descend from the rough-graded pads will be left in their natural condition.

SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration for the proposed project consisted of excavating eleven (11) backhoe test pits and one (1) hand-excavated test pit within the areas of proposed rough grading. The locations of the test pits are shown on Plates 2 through 5 – Geotechnical Maps which use the rough grading plans as base maps. The logs of our test pits are included in Appendix A. The test pits were excavated to depths of 4 to 15 feet to: 1) visually observe the condition and depths of the existing fill and native residual soils and bedrock, 2) visually observe and geologically map the bedding structure of the bedrock materials, and 3) collect bulk and undisturbed samples of the fill, residual soils and bedrock for laboratory testing.

Our laboratory testing included the determination of grain size distribution (for soil classification), in-situ moisture content and dry density, optimum moisture content and maximum density, expansion indices, Atterberg limits, soil consolidation characteristics and soil and bedrock shear strength. The results of our laboratory testing are included in Appendix B – Laboratory Testing.

GEOLOGIC FINDINGS

REGIONAL GEOLOGY

Regionally, the subject site is located within the southwestern foothills of the Santa Ana Mountains in eastern Orange County. The subject lots are situated on a series of moderate to steep ridges separated by natural canyons or drainages that flow into Live Oak Canyon to the west. The canyons or drainages are generally filled with colluvium and alluvium while the ridges are underlain by bedrock covered by a thin mantle of slopewash. Bedrock materials in the region can generally be described as a west dipping homocline of thickly to massively bedded sedimentary bedrock strata (Miller and Morton, 1984).

LOCAL GEOLOGY AND SUBSURFACE SOIL CONDITIONS

The soil and rock materials encountered during our investigation of the subject lots are shown on Plates 2 through 5 – Geotechnical Maps and Plates 6 through 8 – Geologic Sections. The predominant geologic materials are discussed in the following sections.

Artificial Fill (Af)

As discussed previously, the grading activities in 2000 resulted in the placement of artificial fill within the areas of the existing access roads (Shelter Canyon Road and Summit Trail Road), within the western portions of Lots 3 and 4, and within the northern portion of Lot 8. The artificial fill is documented in the as-graded report by Leighton (Leighton, 2002). Based on the referenced report and our recent test pits, the on-site fill materials are typically composed of silty sands and clayey sands. The existing artificial fill materials were found to be predominantly dense; however, the surficial fill materials were observed to be dry, desiccated, porous and medium dense to depths of 24 to 36 inches due to weathering, animal and insect burrowing and root growth since the site was previously graded.

Alluvium (Qal)

Alluvial materials are present within the canyons or drainages of the eastern natural portions of Lots 3 and 4. The alluvial materials were observed to consist of silty sands with varying amounts of gravel and occasional cobbles.

- The alluvial materials within Lot 3 (test pit TP-2) were found to be dry to damp and loose to medium dense with variable amounts of porosity in the upper 9 feet becoming damp and medium dense to dense below. The upper 9 feet of the alluvium within Lot 3 is not considered suitable for fill support or for the support of improvements and will therefore need to be removed and recompacted within areas to receive new fill or improvements.

- The alluvial materials within Lot 4 (test pits TP-6 and TP-11) were found to be dry to damp and loose to medium dense with variable amounts of porosity down to the underlying bedrock. These alluvial materials are not considered suitable for fill support or for the support of improvements and will therefore need to be removed to bedrock (to depths of 6.5 to 7 feet) and then replaced as properly compacted fill.

Colluvium (Qcol)

Colluvial materials were encountered below the fill materials within the northern portion of Lot 8 (test pit TP-9) and along the upper portion of the cut slope that descends from the western side of Lot 7 (test pit TP-12). Thin amounts of colluvium (commonly identified as slopewash when less than 2 to 3 feet thick) also mantle the bedrock materials that comprise the natural slopes within the lots. These colluvial materials developed due to the downslope transport of soil material that has weathered and eroded from the underlying bedrock.

The colluvial materials were observed to consist of clayey sands with varying amounts of gravel. The colluvial materials encountered below the fill materials within test pit TP-9 were found to be damp and dense while the colluvial materials encountered within test pit TP-12 were found to be dry to damp and medium dense with roots and variable amounts of porosity. The colluvium within test pit TP-9 is considered suitable for the support of proposed improvements; however, the colluvium encountered within test pit TP-12 is not considered suitable and will therefore need to be removed and recompacted. As an alternative, the foundations of proposed improvements may extend through these colluvial materials and into competent bedrock.

Sespe Formation Bedrock (Ts)

Bedrock materials of the Sespe Formation underlie the subject lots. These bedrock materials were observed to consist of white gray to brownish yellow to light reddish brown to dark reddish gray, moderately cemented, fine- to coarse-grained silty sandstone. These materials are predominantly massive to poorly bedded, dry to damp, and moderately hard to hard.

GEOLOGIC STRUCTURE

As described previously, the site is underlain by bedrock materials of the Sespe Formation that (based on mapping by Leighton during grading) dip at moderate angles (approximately 10 to 30 degrees) to the west; however, in local areas bedding was slightly variable within short distances, separated by faint, discontinuous joints and fractures. Bedding measured in some of our test pits (test pits TP-3 and TP-5) dips towards the west at angles of 12 to 16 degrees, which agrees with the bedding attitudes mapped by Leighton.

Joints observed by Leighton during grading had varying strikes with shallow dips (10 to 30 degrees) to near vertical dips. Joint attitudes measured in some of our test pits (test pits TP-3 and TP-7) dips towards the east at angles of 18 to 38 degrees.

The structural data as mapped by Leighton during grading and by GMU within our recent test pits is shown graphically on Plates 2 through 5 - Geologic Maps and in Plates 6 through 8 – Geologic Sections.

GROUNDWATER AND SEEPAGE

Groundwater was not encountered during our subsurface investigation at the site at least to the maximum depth explored (12.5 feet) and no signs of groundwater seepage were observed within our test pits. In addition, Leighton & Associates did not report groundwater or seepage during previous rough grading of the subject tract. Due to the granular nature of the fill, native soils, and bedrock beneath the site, shallow static groundwater is not expected to be a significant factor with respect to the proposed grading.

FAULTING AND SEISMICITY

The site is not located within an Alquist-Priolo Earthquake Fault Zone, and no known active faults are shown on published geologic maps as crossing the site. The nearest known active fault is the San Joaquin Hills Blind Thrust, which is located approximately 6.8 miles from the site and is capable of generating a maximum earthquake magnitude (M_w) of 7.1. The site is also located within 8.9 miles of the Elsinore fault, which is capable of generating a maximum earthquake magnitude (M_w) of 7.9. Given the proximity of the site to these and numerous other active and potentially active faults, the site will likely be subject to earthquake ground motions in the future.

SEISMIC HAZARD ZONES

Through the Seismic Hazards Mapping Act, the California Geological Survey (formerly the California Division of Mines and Geology) has established Seismic Hazard Zones that depict areas considered susceptible to earthquake-induced liquefaction and landsliding within the more densely populated areas of southern and northern California. According to the Seismic Hazard Zone map for the Santiago Peak 7.5-minute quadrangle (CGS, 2000), the subject site does not lie within a zone that is susceptible to earthquake-induced liquefaction. Furthermore, liquefaction potential is considered negligible based on the presence of bedrock at relatively shallow depths and the absence of a shallow static groundwater table.

However, portions of the natural slopes that ascend from the eastern sides of Lots 3 and 4 and descend from the western side of Lot 8 have been mapped as zones that are susceptible to earthquake-induced landsliding. Therefore, the stability of these slopes has been addressed in subsequent sections of this report..

GEOTECHNICAL ENGINEERING FINDINGS

Rippability and Oversize Rock

The surficial geologic materials present at the site (i.e., artificial fill, alluvium and colluvium) are expected to be easily excavated with small dozers, loaders, excavators, and backhoes. Dozers, loaders, excavators and/or backhoes may have some difficulty in excavating layers of the bedrock that are locally hard or cemented. Moderate to occasionally heavy ripping of bedrock excavations should be expected.

Although some gravel and occasional cobbles were encountered during our investigation, rock clasts or boulders in excess of 12 inches in diameter were not encountered. Depending on the excavation method, there is a slight possibility that cuts within the bedrock could generate oversized (i.e., > 8 inches) fragments of cemented sandstone that would require export, crushing, or placement within approved fill areas.

Volume Change

Corrective grading removals that are recommended to support the designed grading will typically involve removal and recompaction of low-density, compressible materials such as existing surficial fill, colluvium, and highly weathered bedrock. The corrective grading removals are therefore anticipated to shrink in volume between 5% and 10%. The designed cuts in addition to over-excavations will be founded in both existing fill, colluvium and bedrock. Design cuts and over-excavations within bedrock can be expected to bulk about 4% to 7%. Consequently, the overall volume change for the design and corrective grading on the project is anticipated to be negligible (i.e., ± 5%).

Trenching

Easy to moderate trenching within the surficial materials (i.e. fill, colluvium, alluvium, etc.) is expected to be accomplished with backhoes and excavators. However, as described above, excavators and/or backhoes may experience difficulty excavating local hard or cemented bedrock layers. Trench support requirements are expected to consist of those required by safety laws and/or government regulations.

Soil and Rock Moisture Conditions

Observation of the on-site soil and bedrock materials, in addition to the moisture and density data included in Appendix B, indicates that the soil and bedrock materials to be handled during grading are typically below optimum moisture content. Therefore, moisture conditioning for fill placement and/or blending should be anticipated.

Soil and Bedrock Expansion

The onsite soil and bedrock materials can be classified as having a low to medium expansion potential based on our assessment of the soil classifications provided on the logs in Appendix A and the results of expansion index tests contained in Appendix B.

It is assumed that the onsite soil and bedrock materials will be mixed and blended during grading; therefore, a medium expansion potential should be assumed for design purposes. However, additional expansion index testing is recommended below proposed improvements upon completion of rough grading and prior to construction. Care should be taken during grading to verify that low to medium expansion materials are used for near-surface fills in the vicinity of structural improvements and hardscape areas.

Soil and Bedrock Corrosivity

To evaluate the corrosion potential of the on-site soils to both ferrous metals and concrete, representative samples were tested for pH, minimum resistivity, soluble chlorides, and soluble sulfates. The results are contained in Appendix B and indicate that the on-site soil and bedrock materials possess:

- A negligible sulfate exposure to concrete per the ACI 318 Table 4.3.1.
- Slightly elevated chloride contents (corrosive to ferrous metals).
- A very low to low minimum resistivity (severely corrosive to ferrous metals).

CONCLUSIONS AND RECOMMENDATIONS

DEVELOPMENT FEASIBILITY

Based on the geologic and geotechnical findings, it is our opinion that the proposed grading shown on the reference (1) rough grading plan is feasible and practical from a geotechnical standpoint if accomplished in accordance with the County of Orange grading requirements and the recommendations presented herein.

It is also the opinion of GMU Geotechnical that all slopes impacting the site are considered stable and the proposed grading and construction will not adversely affect the geologic stability of adjoining properties provided grading and construction are performed in accordance with the recommendations provided in this report.

SITE PREPARATION AND GRADING

General

The subject site should be graded in accordance with the applicable provisions of the Grading and Excavation Code and the Grading Manual of the County of Orange (and all other applicable codes and ordinances) and the recommendations as outlined in the following sections of this report. The geotechnical aspects of future grading plans and improvement plans should be reviewed by GMU Geotechnical prior to grading and construction. Particular care should be taken to confirm that all project plans conform to the recommendations provided in this report. All planned and corrective grading should also be monitored by GMU Geotechnical to verify general compliance with the recommendations outlined in this report.

Clearing and Grubbing

Prior to commencement of grading, all significant organic materials such as weeds, brush, cacti, trees, roots, construction debris, or other decomposable materials should be removed from areas to be graded.

Cavities and excavations created to expose existing utility line stubouts should be cleared of loose soil, shaped to provide access for backfilling and compaction equipment, and then backfilled with properly compacted fill.

GMU should provide periodic observation and testing services during clearing operations to document compliance with the above recommendations. In addition, should unusual or adverse soil conditions or buried structures be encountered during grading that are not described herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations.

Corrective Grading – Existing Graded Areas

The existing fill materials within the westerly portions of Lots 3 and 4 and the northerly portion of Lot 8 are desiccated and loose to medium dense in the upper 2 to 3 feet due to weathering and plant root growth during the 21 years since the fill materials were originally placed. Therefore, the existing ground surfaces within the previously graded portions of Lots 3, 4 and 8 should be over-excavated to a minimum depth of 3 feet below the existing grades and the excavated materials then replaced as properly compacted fill.

This procedure should be followed in all areas to remain at existing grades and in shallow cut areas where the depth of cut is less than 3 feet. If, during grading, the depth of surficial desiccation is found to be greater than 3 feet, then the depth of over-excavation should be increased accordingly.

Corrective Grading - Existing Natural Areas

All existing low density surficial deposits of alluvium/colluvium and highly weathered bedrock within proposed building pad areas and within other areas to receive new fill will require removal to underlying competent alluvium/colluvium or bedrock and replacement as properly compacted fill. Competent alluvium/colluvium is defined as undisturbed alluvium/colluvium possessing either an in-place relative compaction of at least 90 percent or an in-place relative compaction of at least 85 percent along with an in-place degree of saturation of 85 percent.

Based on conditions exposed in our test pits, removals of 1 to 9 feet are expected to be required throughout the various areas of the subject lots; however, it must be emphasized that these removal depths are estimates only and are based on conditions observed at our test pit locations. Subsurface conditions can, and usually do, vary between points of exploration and actual removal depths may vary based on observations of geologic materials encountered during grading. The bottom of all corrective grading removals shall be observed by a GMU representative to verify the suitability of in-place soils prior to fill placement.

Where existing low-density deposits of alluvium, colluvium, or highly weathered bedrock are not removed in their entirety in cut areas, these unsuitable materials should be over-excavated to competent native soils or bedrock and replaced as properly compacted fill in a manner as described previously for building areas and new fill areas.

Processing of Exposed Bottom Surfaces

Before replacing the excavated materials as properly compacted fill, the exposed bottom surfaces should be:

- Cleared of all loose materials.
- Where alluvium/colluvium is exposed, these materials should be tested to confirm that the exposed alluvium/colluvium has a suitable relative compaction and degree of saturation.

- Moisture conditioned (as necessary) to at least 2 percentage points above the optimum moisture content (i.e., if the optimum moisture content is 10%, the compacted fill's moisture content shall be at least 12%).

Over-Excavation of Building Pads

Proposed building pads with transitions between fill and bedrock or with transitions between deep fill and shallow fill should be over-excavated in order to provide a more uniform fill blanket and minimize differential settlement. To accomplish this, those portions of the building pads exposing bedrock or shallow fill should be over-excavated to a depth equal to about one-third of the maximum fill depth below the pad, up to a maximum depth of 10 feet (i.e. if the maximum fill depth is 24 feet then the over-excavation should be at least 8 feet). At a minimum, the pads should be over-excavated to a depth of 3 feet below proposed pad grade or 1.5 feet below the bottoms of the proposed building footings, whichever is deeper.

Horizontal Limits of Over-excavation and Recompaction

To provide proper support of the buildings and exterior improvements, the recommended over-excavation and re-compaction should extend to a horizontal distance of at least 3 feet beyond the perimeter edges of the improvements. However, consideration should be given to the protection of any adjacent onsite existing structures such as the asphalt pavement and concrete curbs of existing Shelter Canyon Road and Summit Trail Road and the existing concrete v-ditches and underground utility lines.

In addition, the removals along the toes of adjacent ascending natural slopes should be limited so that proposed toe-of-slope wall footings extend into the underlying bedrock.

FILL MATERIAL AND PLACEMENT

Suitability

All on-site soil material, including that removed by corrective grading, is suitable for use as compacted fill from a geotechnical perspective if care is taken to remove all significant organic and other decomposable debris, and separate and stockpile rock materials larger than 12 inches in maximum diameter.

Compaction Standard and Methodology

All soil material used as compacted fill, processed in-place, or used to backfill walls and trenches, should be:

- Moistened, dried, or blended as necessary to a minimum of 2 percentage points over the optimum moisture content.
- Placed in 6- to 8-inch maximum lifts.
- Compacted to at least 90% relative compaction as determined by ASTM Test Method D 1557.

Benching

Benching (minimum 6 feet in width) should be performed simultaneously with fill placement to remove surficial soil materials and to provide additional level surfaces for fill support where the natural ground surface is 5 horizontal to 1 vertical, or steeper

Material Blending and Moisture Conditioning

Fill materials to be derived from corrective grading in existing artificial fill, alluvium/colluvium and bedrock are expected to be generally below optimum moisture content but may have variable moisture content depending on the season in which work is performed. The majority of the materials to be handled during grading will require some blending and addition of water to meet acceptable moisture ranges for sufficient compaction (i.e., minimum 2% above optimum moisture content).

Use of Oversize Rock

Any existing oversize rock (i.e., rock fragments and cobbles) exceeding 6 inches in diameter cannot be incorporated into any fills and should be removed and hauled from the site. Within the upper 5 feet of the building pads, the maximum rock size may not exceed 4 inches in diameter.

TEMPORARY EXCAVATION STABILITY

During site grading, temporary excavations will be created for remedial removals, pad over-excavations, and during construction of the proposed retaining walls. Trench excavations will also be required for new utility lines, if any. The sidewalls of these temporary excavations are expected to expose new compacted fill materials, existing artificial fill materials, native alluvial and colluvial materials, and bedrock. Based on the anticipated engineering characteristics of these materials, OSHA Type B soil characteristics should be assumed for the new fill, existing fill and alluvial and colluvial materials while the exposed bedrock is expected to be either massive or to have bedding that is favorable with respect to proposed open cuts and may be considered to be “sound” rock. Temporary excavations into the sound bedrock materials may be cut vertically to a height of up to 6 feet subject to approval by the project engineering geologist. Those portions of the excavation sidewalls into bedrock above a height of 6 feet or that expose fill or alluvial/colluvial materials should be laid back at a maximum slope ratio of 1:1, horizontal to vertical. In addition, no surcharge loads should be allowed within 5 feet from the top of cuts.

Our temporary excavation recommendations are provided only as general guidelines and all work associated with temporary excavations should meet the minimal requirements as set forth by CAL-OSHA. Temporary slope and trench excavation construction, maintenance, and safety are the responsibility of the contractor. Other factors that should be considered with respect to the stability of temporary slopes include construction traffic and storage of materials on or near the tops of the slopes, construction scheduling, presence of nearby walls or structures, and weather conditions at the time of construction.

Based on the precise grading plans, there is room within the site to lay back the sidewalls of the excavations at the above configuration without undermining or encroaching into any adjacent properties.

MANUFACTURED SLOPES

Planned Cut and Fill Slopes

Cut slopes are proposed along the south side of Lot 6, the southwest side of Lot 7 and the southeast corner of Lot 7 while fill slopes are proposed along the west side of Lot 3, the east side of Lot 4, the northeast side of Lot 6, the north side of Lot 7 and the north side of Lot 8. The planned cut and fill slopes are illustrated on Plates 2 through 5 – Geotechnical Maps.

Cut Slope Construction

The proposed cut slopes will expose bedrock materials of the Sespe Formation that consist of moderately hard to hard, thickly bedded to massive, moderately cemented silty sandstones. Therefore, these cut slopes are expected to be grossly and surficially stable.

Fill Slope Construction

Fill slopes should be carefully constructed to obtain the specified degree of compaction. These slopes should be overfilled and trimmed back to expose firm, dense fill. "Track walking" is not a recommended means of compacting fill slope surfaces.

Fill Keys and Fill Support Benches

The bottoms of the proposed fill slopes should be supported on keyways that extend at least 2 feet into competent soil or bedrock. The bottoms of the keys should have a minimum width of 15 feet. Further benching (minimum 6 feet in width) should be performed uphill from these keys simultaneously with fill placement to remove unsuitable soils or highly weathered bedrock materials and provide level surfaces for fill support where the natural ground surface is 5 horizontal to 1 vertical, or steeper.

Surficial Stability of Fill Slopes

Fill slopes that are constructed from the on-site materials may be subject to erosion and shallow slumping when saturated. Engineered surface drainage devices designed to control surface runoff, utilized in conjunction with slope landscaping programs specifically designed for the soil and geologic conditions on the slopes, should be sufficient to: (1) reduce the long-term potential for erosion and surficial failures on engineered slopes to acceptable levels, and (2) adequately protect the proposed improvements from off-site hazards.

NATURAL SLOPES

Gross Stability

The natural slopes within the subject lots are underlain by silty sandstone bedrock of the Sespe Formation that is thickly bedded to massive and moderately cemented with only occasional faint bedding. The faint bedding that was observed consisted of gradational contacts between silty sandstone and sandstone layers and were not considered to be planes of weakness. Furthermore, based on our literature review, no landslides exist on or near the site, and no evidence of landsliding was observed during our subsurface exploration and during Leighton's rough grading operations. Based on these conditions, the ascending natural slopes are considered to be grossly stable.

Surficial Stability

The natural slopes have slope ratios that range predominantly from 3:1 to 2:1, horizontal to vertical, with local areas as steep as 1.5:1. The slopes are composed of thickly bedded to massive, moderately cemented, moderately hard to hard sandstone and silty sandstone bedrock that is mantled by approximately one to three feet of slopewash/colluvium. The lower portions of the natural slopes that are presently covered by accumulations of colluvium that are four feet thick or more will be removed during rough grading. The isolated natural slopes that are steeper than 2:1 expose very hard bedrock materials at the surface and are not covered by any significant amounts of slopewash/colluvium. In addition, the natural slopes are also covered by a moderate to thick protective growth of native weeds, grasses, cacti, shrubs and occasional trees. Based on these conditions, it is our opinion that the natural slopes are also surficially stable.

UTILITY TRENCH BACKFILL CONSIDERATIONS

General

New utility line pipelines (greater than 2 feet deep), should be backfilled with both select bedding materials beneath and around the pipes (pipe zone) and compacted soil above the pipe bedding. Recommendations for the types of the materials to be used and the proper placement of these materials are provided in the following sections.

Pipe Zone (Bedding and Shading)

The pipe bedding materials should above the crown of the pipes to a depth sufficient to protect the pipes during compaction of the trench backfill. Pipe bedding should consist of either clean sand with a sand equivalent (SE) of at least 30 or crushed rock. If crushed rock is used, it should consist of ¾-inch crushed rock that conforms to current “Greenbook” standards. Pipe zone material having a sand equivalent of 30 or greater should be properly placed in thicknesses not exceeding 3 feet, and thoroughly jetted in place. The top of the jetted sand should be tamped with hand operated compaction equipment prior to the placement of trench backfill. With proper techniques, jetting is not expected to have an adverse impact on the adjacent site soils.

Pipe bedding should also meet the minimum requirements of the County of Orange. If the requirements of the County are more stringent, they should take precedence over the geotechnical recommendations. Sufficient laboratory testing should be performed to verify the bedding meets the minimum requirements of the current “Greenbook.”

Based on our subsurface exploration, the onsite soils that will be excavated from the pipeline trenches will not meet the recommendations for pipe zone materials; therefore, imported materials will be required for pipe bedding and shading.

Trench Backfill

All existing soil material within the limits of the pipeline alignment are considered suitable for use as trench backfill above the pipe bedding zone if care is taken to remove all significant organic and other decomposable debris and separate and selectively place and/or stockpile any rock, concrete or other inert materials larger than 6 inches in maximum diameter outside of building pad areas or 4 inches within building pad areas.

Imported soils are not anticipated for backfill since the on-site soils are suitable. However, if imported soils are used, the soils should consist of clean materials with physical and chemical characteristics similar to those described herein for on-site soils. Any imported soils to be used as backfill should be evaluated and approved by GMU prior to placement.

Soils to be used as trench backfill should be moistened, dried, or blended as necessary to achieve a minimum of 2 percentage points over optimum moisture content for compaction, placed in loose lifts no greater than 8 inches thick, and mechanically compacted/densified to at least 90% relative compaction as determined by ASTM Test Method D 1557.

Where trenches closely parallel a footing (i.e., for retaining walls) and the trench bottom is located within a 1 horizontal to 1 vertical plane projected downward and outward from any structure footing, concrete slurry backfill should be utilized to backfill the portion of the trench below this plane. The use of concrete slurry is not required for backfill where a narrow trench crosses a footing at about right angles.

SURFACE DRAINAGE

Design of surface drainage is outside GMU's purview and should be designed and confirmed by the project civil engineer to be in accordance with Section 1804.4 of the 20189 CBC.

Surface drainage should be carefully controlled to prevent runoff over graded slope surfaces and ponding of water on flat pad areas. Positive drainage away from graded slopes and pad areas is essential to reduce the potential for erosion or saturation. Maintaining positive drainage of all landscaping areas along with avoiding over-irrigation will help minimize the possibility of "perched" groundwater accumulating slightly below the graded surfaces.

SLOPE LANDSCAPING AND MAINTENANCE

Newly graded slopes within the site should be landscaped and maintained as recommended below:

1. The slopes should be landscaped as soon as practical at the completion of grading. The landscaping should consist of a deep-rooted, drought-resistant and relatively maintenance-

free plant species. If landscaping cannot be provided within a reasonable period of time, jute matting, plastic sheeting, or equivalent, or a spray-on product designed to seal slope surfaces should be considered as a temporary measure to inhibit surface erosion.

2. Irrigation systems should be installed on the slopes and a watering program then implemented which maintains a uniform, near-optimum moisture condition in the soils. Overwatering and subsequent saturation of the slope soils should be avoided. On the other hand, allowing the soils to dry out is also detrimental to slope performance.

3. The irrigation systems should be constructed at the surface only. Construction of sprinkler lines in trenches should be avoided.

4. A permanent slope maintenance program should be initiated. Proper slope maintenance must include the care of drainage and erosion control provisions, rodent control and repair of leaking irrigation systems.

5. The owner is advised that potential problems can develop when drainage on the graded level pad and slopes is altered in any way. Drainage can be altered due to excavations and/or placement of fill, and due to construction of retaining walls.

SOIL MOISTURE CONTROL, IRRIGATION, AND LANDSCAPING

The on-site soils are subject to volume change (both expansion and contraction) in response to changes in moisture. Future planting, irrigation, landscaping, and maintenance should therefore strive to maintain a uniform soil moisture content that is similar to the moisture content at which the fills were placed. Over-irrigation should be avoided; furthermore, the fills should not be allowed to become excessively dry or saturated.

Planter areas placed adjacent to building foundations are not recommended. If planter areas are proposed up against building foundations, irrigation should be carefully controlled. A watering program that maintains a uniform, near optimum moisture condition in the soils should be implemented for the landscape areas. Overwatering and subsequent saturation of the soils will cause excessive soil expansion and heave and, therefore, should be avoided. On the other hand, allowing the soils to dry out will cause excessive soil shrinkage.

As an alternative to a conventional irrigation system, drip irrigation that maintains constant moisture conditions is strongly recommended for all planter areas. The owner is advised that all drainage devices should be properly maintained throughout the lifetime of the development.

Plants known to have excessive root systems should also not be planted near structural improvements as they can cause heave conditions. Conversely, the root systems can also dry out the soils and cause excessive soil shrinkage below adjacent footings or slabs. Drought-resistant and maintenance-free plant species are recommended.

PRELIMINARY GEOTECHNICAL FOUNDATION DESIGN PARAMETERS

General

The following geotechnical foundation design parameters for future residences and associated exterior improvements to be constructed within the subject lots are based on anticipated conditions within the individual building pads at the completion of proposed rough grading.

These recommendations are considered preliminary in nature and may require revisions or additions based on the geotechnical conditions that are actually created during rough grading and based on the actual locations and elevations of the proposed residences and associated exterior improvements as depicted on future precise grading plans.

At the completion of rough grading, a geotechnical report of observation and testing will be prepared for submittal to the County. In addition, separate grading plan review letters will be prepared for each lot when precise grading plans become available. This report and letters will provide any necessary revised or additional geotechnical design parameters based on the as-graded conditions and the locations of the buildings as shown on the future precise grading plans.

Structure Seismic Design

At the completion of design rough grading and recommended remedial grading, the building pads will be underlain by approximately 3 to 25 feet pf compacted fill and then moderately hard to hard bedrock materials. Based on these conditions, the average Standard Penetration Resistance of the upper 100 feet of subsurface soil and bedrock materials (N_{30}) below each lot is expected to range between 15 and 50 which corresponds to a “stiff” soil profile (Site Class D). The seismic design coefficients based on ASCE 7-16 and 2019 CBC are listed in the following table for Site Class D.

2019 CBC and ASCE 7-16 Seismic Design Parameters
(To be utilized as per the requirements of Section 11.4.8 of ASCE 7-16)

Seismic Item	Design Value	2016 ASCE 7-16 or 2019 CBC Reference
Site Class based on soil profile (ASCE 7-16 Table 20.3-1)	D[(a)]	ASCE 7-16 Table 20.3-1
Short Period Spectral Acceleration S_s	1.389[(a)]	CBC Figures 1613.2.1 (1-8)
1-sec. Period Spectral Acceleration S_1	0.490[(a)]	CBC Figures 1613.2.1 (1-8)
Site Coefficient F_a (2019 CBC Table 1613.2.3(1))	1.200[(a)]	CBC Table 1613.2.3 (1)
Site Coefficient F_v (2019 CBC Table 1613.2.3(2))	1.810[(b)]	CBC Table 1613.2.3 (2)
Short Period MCE* Spectral Acceleration S_{MS} $S_{MS} = F_a S_s$	1.667[(a)]	CBC Equation 16-36
1-sec. Period MCE Spectral Acceleration S_{M1} $S_{M1} = F_v S_1$	0.887[(b)]	CBC Equation 16-37
Short Period Design Spectral Acceleration S_{DS} $S_{DS} = 2/3S_{Ms}$	1.111[(a)]	CBC Equation 16-38
1-sec. Period Design Spectral Acceleration S_{D1} $S_{D1} = 2/3S_{M1}$	0.591[(b)]	CBC Equation 16-39
Short Period Transition Period T_S (sec) $T_S = S_{D1}/S_{DS}$	0.532[(b)]	ASCE 7-16 Section 11.4.6
Long Period Transition Period Tl (sec)	8[(b)]	ASCE 7-16 Figures 22-14 to 22-17
MCE[(c)] Peak Ground Acceleration (PGA)	0.500[(a)]	ASCE 7-16 Figures 22-9 to 22-13
Site Coefficient F_{PGA} (ASCE 7-16 Table 11.8-1)	1.200[(a)]	ASCE 7-16 Table 11.8-1
Modified MCE[(c)] Peak Ground Acceleration (PGA_M)	0.600[(a)]	ASCE 7-16 Equation 11.8-1
Seismic Design Category	D[(b)]	ASCE 7-16 Tables 11.6.1 and 11.6.2

(a) Design Values Obtained from USGS Earthquake Hazards Program website that are based on the ASCE-7-16 and 2019 CBC and site coordinates of N33.6730º and W117.5990º.
(b) Design Values Determined per ASCE Table 11.4-2 and CBC Equations 16-36 through 16-39.
(c) MCE: Maximum Considered Earthquake.

Since the Site Class is designated as D and the S_1 value is greater than or equal to 0.2, the 2019 CBC requires either a site-specific ground motion hazard analysis per Section 21.2 of ASCE 7-16 or the application of Exception 2 of Section 11.4.8 of ASCE 7-16. Exception 2 states that a site specific ground motion hazard analysis is not required provided that the value of the seismic response coefficient, Cs, is conservatively calculated by the project structural engineer using Eqn. 12.8-2 of ASCE 7-16 for values of $T \leq 1.5Ts$ and taken as equal to 1.5 times the value computed in accordance with either Eqn. 12.8-3 for $T_L \geq T > 1.5Ts$ or Eqn. 12.8-4 for $T > T_L$.
Per the 2019 CBC and ASCE 7-16, the Design Earthquake peak ground acceleration (PGA_D) may be assumed to be equivalent to $S_{DS}/2.5$; therefore, for the subject site, a PGA_D value of 0.44g (1.111/2.5) should be used.

It should be recognized that much of southern California is subject to some level of damaging ground shaking due to movement along the major active (and potentially active) fault zones that characterize this region. Design utilizing the 2019 CBC is not meant to completely protect against damage or loss of function. Therefore, the preceding parameters should be considered as minimum design criteria.

Building Clearances from Ascending Slopes

To conform with Subarticle 10 of the County of Orange Grading and Excavation Code and Grading Manual and with Section 1808.7.1 and Figure 1808.7.1 of the 2019 CBC, a minimum building clearance of H/2 (one-half of the total slope height) varying from a minimum of 3 feet to a maximum of 15 feet should be maintained between the future buildings and the toes of the adjacent ascending slopes.

As shown on the plans for Lot 4, retaining walls and drainage channels are proposed around the perimeter of the proposed building pad to protect the future residence. The perimeter drainage channels should be sized to accommodate debris in addition to typical runoff volumes. In addition, the toe-of-slope retaining walls should be provided with extra freeboard and designed to support the additional loads of the potential debris.

Building Setbacks from Descending Slopes

To conform with Subarticle 10 of the County of Orange Grading and Excavation Code and Grading Manual, building footings to be constructed on or near descending slopes should be deepened to provide a minimum footing setback of H/2 (one-half the slope height). The footing setbacks should be 5 feet minimum where the slope height is 10 feet or less and vary up to 10 feet maximum for slopes heights up to 30 feet. For, slope heights in excess of 30 feet, the County of Orange Grading Manual indicates that a minimum footing setback of H/3 (one-third the slope height) is required up to a maximum of 40 feet.

In addition, to conform with Section 1808.7.2 and Figure 1808.7.1 of the 2019 CBC, building all footings to be constructed on or near descending slopes should be deepened to provide a minimum footing setback of H/3 (one-third the slope height). The footing setbacks should be 5 feet minimum where the slope height is 15 feet or less and vary up to 40 feet maximum where the slope height is 120 feet or more. The footing setbacks are measured along a horizontal line projected from the lower outside bottom edges of the footings to the face of the adjacent slope.
The retaining wall proposed along the northwest side of the building pad of Lot 7 will be located above sloping ground and will need to have footings that are deepened to meet setback requirement. Recommendations for these deepened footings are provided in the *Site Wall and Retaining Wall Design and Construction* section of this report.

Foundation Type

As described previously, the results of our laboratory expansion tests on the onsite soils (Appendix B) indicate that they have a low to medium expansion potential as defined by the CBC. However, it is expected that the onsite soils will be mixed and blended during grading; therefore, a medium expansion potential should be assumed for design purposes. As required by the CBC, foundations for structures resting on soils with an EI greater than 20 require special design consideration.

It is expected that the structures will be designed with conventional slab-on-ground foundation systems. Therefore, the proposed residences should be designed with foundation systems that are designed for moderately expansive soil conditions in accordance with Section 1808.6 of the 2019 CBC. The foundation systems will also need to be designed for future anticipated settlements and building loads.

The methods used in the design and construction of the slab foundation systems should conform to all applicable and current codes, ordinances, and standards. The allowable limits selected for foundation deflection due to any differential soil expansion should be coordinated with the architect and structural engineer responsible for the design of the structure framing and roof systems. They should confirm that such deflection will not cause excessive distress to those systems or to interior and exterior walls and ceilings of the planned structures.

Soil Parameters

Bearing Material: Compacted fill

Bearing Value: 2000 psf, based on a 12-inch-deep by 12-inch-wide footing: (see subsequent sections for actual minimum recommended footing embedment.)

- May be increased 10% for each additional foot of footing width and by 20% for each additional foot of footing depth to a maximum of 3000 psf).
- One-third increase for wind or seismic loading.

Coefficient of Friction: 0.35

- One-third increase for wind or seismic loading.

Passive Resistance: 275 psf/ft of depth

- Disregard upper 6 inches
- One-third increase for wind or seismic loading.

Modulus of Subgrade Reaction: 100 pci

Conventional Foundation Design Recommendations (Ribbed Slabs)

The following design parameters are considered applicable if conventional slabs-on-grade are used for the proposed structure. Per Section 1808.6 2 of the 2019 CBC, the slabs may be designed as ribbed slabs in accordance with the WRI/CRSI publication "Design of Slab-on-Ground Foundations" utilizing an Effective Plasticity Index of 28. The following minimum design recommendations are provided. Final design should be determined by the project structural engineer.

Slab Thickness:	5-inch-thick slabs.
Slab Reinforcement:	No. 4 bars at 18 inches on center, both ways.
Slab Subgrade Moisture Content:	2 percentage points over optimum to minimum depth of 18 inches.
Footing Depths:	Perimeter Footings Constructed On-Grade: Minimum 18-inch embedment from lowest adjacent final grade. Interior Footings: Minimum 12 inches below lowest adjacent final grade.
Footing Reinforcement:	Four No. 4 bars, two top and two bottom, but final reinforcement to be determined by structural engineer.

Mat Slab Foundation Design Recommendations

As an alternative to ribbed slabs, it is considered acceptable from a geotechnical point of view to design the foundation system using a strengthened non-pre-stressed uniform mat slab that is designed to resist differential soil volume changes and that has the same overall rigidity as a ribbed slab system. It is our professional opinion that design using a strengthened uniform mat slab will meet the intent of Section 1808.6.1 of the 2019 CBC.

Determination of mat slab thickness and reinforcement should be determined by the structural engineer based on an effective plasticity index of 28 and a modulus of subgrade reaction of 100 pci. However, the following minimum design recommendations are provided. Final design should be determined by the project structural engineer.

Mat Slab Thickness:	8-inch-thick slabs.
Slab Reinforcement:	No. 4 bars at 18 inches on center, both ways.
Slab Subgrade Moisture Content:	2 percentage points over optimum to a depth of 18 inches.
Perimeter Thickened Edge:	12-inch embedment from lowest adjacent final grade.

Foundation Settlement

At the completion of proposed design grading and recommended remedial grading, the building foundations and slabs will be underlain by depths of fill ranging from approximately 3 to 20 feet and then either competent native colluvium or competent bedrock. As a result, total settlements of the residences can be expected to range from approximately ½ of an inch to an inch with a maximum differential settlement of approximately ½ of an inch over a span of 40 feet.

Vapor Retarder/Barrier

- Stego 15 Mil Class A or equivalent
  - Constructed below all slab-on-grade areas of the foundation system, including non-living areas.
  - Installed per manufacture's specifications as well as with all applicable recognized installation procedures such as ASTM E 1643-18A.
  - Joints between the sheets and the openings for utility piping should be lapped and taped. If the retarder/barrier is not continuously placed across footings/ribs, the retarder/barrier should, as a minimum, be lapped into the sides of the footing/rib trenches down to the bottom of the trench.
  - Punctures in the vapor retarder/barrier should be repaired prior to concrete placement.
  - If full Green Code compliance is required by the governing agency, Stego 15 Mil or equivalent along with a 4-inch-thick layer of crushed rock should be used.
- The moisture vapor retarder/barrier may be placed directly on the subgrade soil. Prior to placing the retarder/barrier, the subgrade should be smooth and free of any protrusions that may damage the retarder.
- From a geotechnical standpoint, sand is not required above the moisture vapor retarder/barrier system. However, if sand above the retarder system is selected by the architect or structural engineer, then it should be placed in a dry condition.

Note: The architect may choose to omit the vapor retarder if a fully enclosed waterproofing system is utilized below the concrete slabs.

Water Vapor Transmission

As discussed above, placement of a moisture vapor retarder/barrier below all slab areas is recommended. This moisture vapor retarder/barrier recommendation is intended only to reduce moisture vapor transmissions from the soil beneath the concrete and is consistent with the current standard of the industry for residential construction in Southern California. It is not intended to provide a "waterproof" or "vapor proof" barrier or reduce vapor transmission from sources above the retarder. Sources above the retarder include any sand placed on top of the retarder (i.e., to be determined by the project structural designer) and from the concrete itself (i.e., vapor emitted during the curing process). The evaluation of water vapor from any source and its effect on any aspect of the proposed living space above the slab (i.e., floor covering applicability, mold growth, etc.) is outside our purview and the scope of this report.

Floor Coverings

Prior to the placement of flooring, the floor slabs should be properly cured and tested to verify that the water vapor transmission rate (WVTR) is compatible with the flooring requirements.

CONCRETE

Based on the results of our laboratory testing, the onsite soils will have a negligible sulfate exposure per the 2019 CBC but have slightly elevated levels of chlorides. Therefore, we recommend using the following:

Structural Elements (i.e., foundations, walls, etc.)

- Cement Type: II/V
- Maximum Water Cement Ratio: 0.50 (geotechnical perspective only, not required by code).
- Reinforcement steel should be covered by at least 3 inches of concrete

Consideration should also be given to including a corrosion inhibiting additive within the concrete mix. These recommendations will serve to minimize the potential of water and/or vapor transmission through the concrete, minimize the potential for physical attack to concrete from non-sulfate based salts, and add additional protection to embedded steel reinforcement. In addition, wet curing of the concrete as described in ACI Publication 308 should be considered.

Non-structural Elements (i.e., flatwork, etc.)

Non-structural onsite concrete (i.e. walkways, patios, driveways, etc.) may be designed with concrete strengths that are determined by the engineer or designer responsible for that particular site improvement. Specific flatwork concrete requirements are provided in Appendix E.

The aforementioned recommendations regarding concrete are made from a soils perspective only. Final concrete mix design as well as any concrete testing is outside our purview. All applicable codes, ordinances, regulations, and guidelines should be followed in regard to designing a durable concrete with respect to the potential for detrimental exposure from the on-site soils (i.e. high levels of chlorides) and/or changes in the environment.

CORROSION PROTECTION OF METAL STRUCTURES

The on-site soils are expected to be severely corrosive to metals. Consequently, metal structures in direct contact with the soil (i.e., underground metal conduits, pipelines, metal sign posts, metal door frames, etc.) and/or in close proximity to the soil (wrought iron fencing,weep screeds, etc.) may be subject to corrosion.

Special protection measures should be implemented to adequately protect the improvements noted above. Use of special coatings or cathodic protection around buried metal structures has been shown to be beneficial in reducing corrosion potential. It should also be noted that a significant potential for copper piping corrosion has been detected in various areas of south Orange County where similar soils are present. The potential for corrosion of ferrous metal reinforcing elements embedded in structural concrete will be minimized by use of the recommended maximum water/cement ratio for concrete.

The above discussion is provided for general guidance regarding the anticipated corrosiveness of the on-site soils to typical metal structures used for construction. Detailed corrosion testing and recommendations for protecting buried ferrous metal and/or copper elements is beyond our purview. If detailed testing is required, a corrosion engineer should be consulted to perform the testing and develop appropriate mitigation measures.

SITE WALL AND RETAINING WALL DESIGN AND CONSTRUCTION CRITERIA

General

Retaining walls are proposed within the building pads of Lots 4 and 7. Provided that remedial grading is performed per the recommendations of this report, these walls will be founded in either competent fill or competent bedrock. The criteria contained in the following sections may be used for the design and construction of these walls.

It should be noted that the walls proposed along the tops of descending slopes or on sloping ground will need to have footings that are deepened, as necessary, such that they meet slope setback requirements. Recommendations for these deepened footings are provided in the following sections.

In addition, walls proposed around the perimeter of the building pads and at the toes of adjacent ascending natural slopes (such as the perimeter walls proposed within Lot 4) should be provided with 2-feet of freeboard to catch and support any eroded material that may potentially accumulate behind the walls. Recommendations for this additional freeboard is provided in following sections.

Soil and Bedrock Parameters

Bearing Material:	Compacted Fill or Competent Bedrock
Allowable Bearing Value:	2000 psf (Fill) 3000 psf (Bedrock) based on: Minimum footing width = 12 inches Minimum footing depth = 12 inches • May be increased 10% for each additional foot of width and by 20% for each additional foot of depth to a maximum of 3000 psf for fill and 4500 psf for bedrock). • One-third increase for wind or seismic loading.
Coefficient of Friction:	0.35 • One-third increase for wind or seismic loading.
Passive Resistance:	275 psf/ft of depth (fill on level ground) 175 psf/ft of depth (fill on sloping ground) 350 psf/ft of depth (bedrock) • Disregard upper 6 inches (level ground) • Disregard upper 12 inches (sloping ground) • One-third increase for wind or seismic loading.

Minimum Footing Design Recommendations

Minimum Foundation Width:	24 inches
Minimum Foundation Depth:	Depth below lowest adjacent grade to bottom of footing: • 24 inches*

* For top-of-slope or sloping ground conditions, the wall footings should be deepened, as necessary, to provide a minimum 5-foot setback between the outside bottom edge of the wall footing and the face of slope. The wall footings should also be designed using the reduced passive resistance value provided above for sloping ground conditions and by ignoring passive in the upper 12 inches.

Minimum Reinforcement:	Four #4 bars (two at top and two at bottom).

Retaining Wall Lateral Earth Pressures

Static Lateral Earth Pressures:	40 pcf (Active – Level Backfill). 60 pcf (Active – 2:1 Backfill). 55 pcf (At-Rest – Level Backfill). 70 pcf (At-Rest – 2:1 Backfill).

The unrestrained values are applicable only when the walls are designed and constructed as cantilevered walls allowing sufficient wall movement to mobilize active pressure conditions. This wall movement should not be less than 0.01 H (H = height of wall) for the unrestrained values to be applicable.

As mentioned previously, walls proposed at the toes of the adjacent ascending natural slopes should be provided with 2-feet of freeboard. **The freeboard sections of the walls should be designed to support up to two feet of saturated soil with an equivalent fluid pressure of 125 pcf.**

Per the 2019 CBC, the following seismic lateral earth coefficients and lateral earth pressures should be utilized for walls with a retaining height in excess of 6 feet. These values are based on a "design level ground" acceleration (PGA) equivalent to $S_{DS}/2.5$ (1.137/2.5 = 0.45g).

Seismic Lateral Earth Coefficient:	K_H = (0.5)PGA = (0.5)0.45g = 0.225g
Seismic Earthquake Pressure (EFP):	17.5 pcf
Unit Weight of Backfill:	125 pcf

Waterproofing

The back side of all retaining walls should be waterproofed down to and onto the top of the foundation prior to placing subdrains or backfill. The design and selection of the waterproofing system is outside the scope of our report and is outside our purview.

Control Joints

Control/construction joints should be implemented and designed by a structural engineer. As a minimum, control/construction joints should be provided at maximum intervals of 15 to 20 feet and at all angle points and other locations where differential movement is likely to occur. Joints to consist of a clear vertical break of all masonry materials.

Wall Backfill and Drainage

See the Retaining Wall Construction Detail diagram (Plate C-1) contained within Appendix C for backfill and drainage requirements.

CONCRETE FLATWORK

Concrete flatwork should be designed in minimum accordance with the recommendations contained in Appendix D. It should be noted that the recommendations contained in this table are largely to improve "post-cure" performance relative to expansive soils. All other aspects of concrete design (i.e., concrete mix design, curing, type, and location of joints, etc.) as well as concrete inspection of any kind is outside our purview. It is recommended that the final flatwork design be reviewed by our office prior to bidding.

Even with extensive crack control and expansive soil mitigation, all concrete flatwork will crack and move (i.e., lift) to some degree due to a variety of mechanisms. Consequently, concrete cracking and movement and hence concrete repair/replacement should be anticipated.

ASPHALT PAVEMENT DESIGN

The following asphalt pavement structural section is considered applicable for the design of asphalt access driveways within the subject lots, if any. The structural section assumes an R-value of 20 and a traffic index of 5 for the access driveways. At the completion of precise grading, R-value testing will need to be performed and, if needed, revised pavement sections will be provided.

Location	Traffic Index	Asphalt Concrete (in.)/ Aggregate Base (in.)	Full Depth Asphalt Concrete (in.)
Driveways	5.0	4/5.5	6.5

* Assumed R-Value = 78, meeting Crushed Aggregate Base (CAB) or Crushed Miscellaneous Base (CMB) Specifications

Aggregate base may consist of either CAB or CMB as per current Greenbook standards. The base materials (CAB or CMB) and asphalt concrete materials (AC) should be of a type meeting the minimum County of Orange and Greenbook standards. The subgrade soils should be moisture conditioned to at least 2% above the optimum moisture content and compacted to at least 90% relative compaction. For full depth asphalt sections, the subgrade soils should be compacted to at least 95% relative compaction to a depth of 12 inches. The AB and AC materials should be compacted to at least 95% relative compaction.

FUTURE PLAN REVIEW

GMU should review future project plans to check for conformance to the recommendations provided herein, and to provide additional recommendations as needed. Specifically, GMU should review the following plans:

- Finalized Rough Grading Plans
- Site/Retaining Wall Plans

FUTURE PRECISE GRADING, FOUNDATION DESIGN, AND LOT IMPROVEMENTS

Ultimate precise grading and development and use of the subject lots should be in minimum accordance with the applicable provisions of the Grading and Building Codes of the County of Orange, the current CBC, and the recommendations of the civil and geotechnical engineering consultants involved in the final development of the property.

Final recommendations for precise grading, foundation design and site improvements within each lot will be provided by GMU in future "Precise Grading Plan Review" letters to be submitted to the County of Orange.

LIMITATIONS

All parties reviewing or utilizing this report should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgments. Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and site construction will be identical to those observed, sampled, and interpreted during our study, or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property.

We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

Our conclusions and recommendations are based on the assumption that our firm will act as the geotechnical engineer of record during construction and grading of the project to observe the actual conditions exposed, to verify our design concepts and the grading contractor's general compliance with the project geotechnical specifications, and to provide our revised conclusions and recommendations should subsurface conditions differ significantly from those used as the basis for our conclusions and recommendations presented in this report. Since our conclusions and recommendations are based on a limited amount of current and previous geotechnical exploration and analysis, all parties should recognize the need for possible revisions to our conclusions and recommendations during grading of the project.

It should be further noted that the recommendations presented herein are intended solely to minimize the effects of post-construction soil movements. Consequently, minor cracking and/or distortion of all on-site improvements should be anticipated.

This report has not been prepared for the use by other parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

CLOSURE

We are pleased to present the results of our geotechnical investigation for this project. The Plates and Appendices that complete this report are listed in the Table of Contents.

If you have any questions concerning our findings or recommendations, please do not hesitate to contact us and we will be happy to discuss them with you.

REGISTERED PROFESSIONAL ENGINEER DAVID W. HANSEN GE 3056 GEOTECHNICAL STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST ALAN B. MUTCHNICK No. 1789 STATE OF CALIFORNIA

Respectfully submitted,

David Hansen, M.Sc., PE, GE 3056
Associate Geotechnical Engineer

Alan B. Mutchnick, PG, CEG 1789
Associate Engineering Geologist

dwh/21-170-00R (12-31-21)

REFERENCES

SITE-SPECIFIC REFERENCES

(1) *Rough Grading Plan for The Oaks at Trabuco, Tract No. 14749, Lots 3, 4, 6, 7 and 8, 30502 Shelter Canyon Road, 19942, 19961, 19991 and 20062 Summit Trail, Trabuco Canyon, Ca*; prepared by David Evans and Associates, Inc., dated November 16, 2021.

(2) *Preliminary Geotechnical Investigation and Grading Plan Review for The Oaks at Trabuco, Trabuco Canyon, County of Orange, CA;* prepared by Leighton and Associates, Inc., dated February 8, 1995.

(3) *As-Graded Geotechnical Report of Tract 14749, The Oaks at Trabuco Project, Trabuco Canyon Area, County of Orange, California;* prepared by Leighton and Associates, Inc., dated February 5, 2002.

TECHNICAL REFERENCES

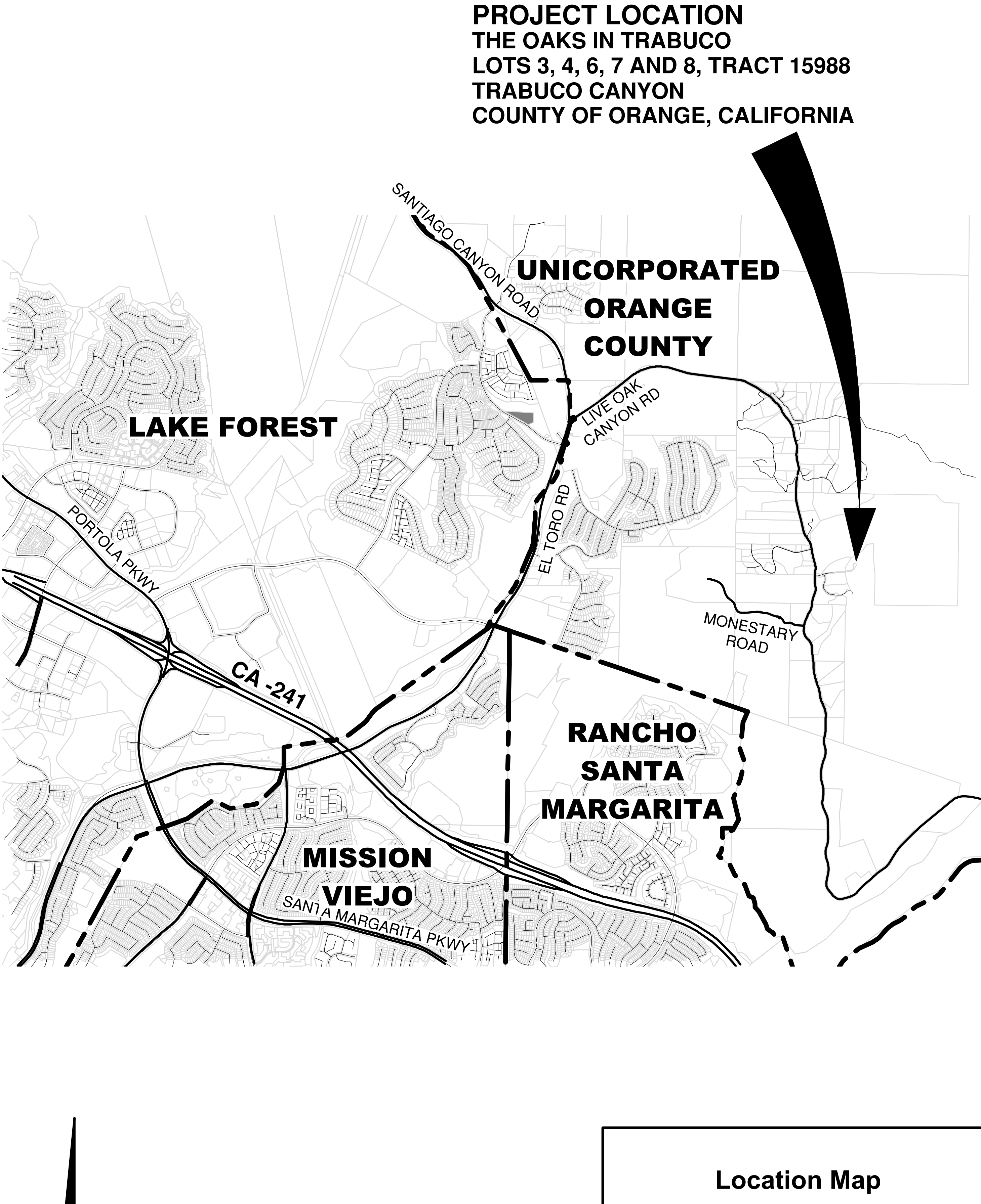
California Geologic Survey, 2002, *Seismic Hazard Zones Map for the Santiago Peak Quadrangle, Orange County, California, official map dated December 20, 2002*.

California Geologic Survey, 2002, *Seismic Hazard Zone Report for the Santiago Peak 7.5-Minute Quadrangle, Orange County, California, Seismic Hazard Zone Report 065*.

Miller, R.V., and Morton, P.K, 1984, *Engineering Geology of Part of the Western Half of the Santiago Peak Quadrangle, Orange County, California: California Division of Mines and Geology, Open File Report 84-58 LA.*

Morton, P.K., Miller, R.V., and Evans, J.R., 1976, *Environmental Geology of Orange County, California*: California Division of Mines and Geology, Open File Report 79-8 LA.

Morton, P.K., and Miller, R.V., 1981, *Geologic Map of Orange County, Showing Mines and Mineral Deposits*: California Division of Mines and Geology, Scale: 1” = 4000’.



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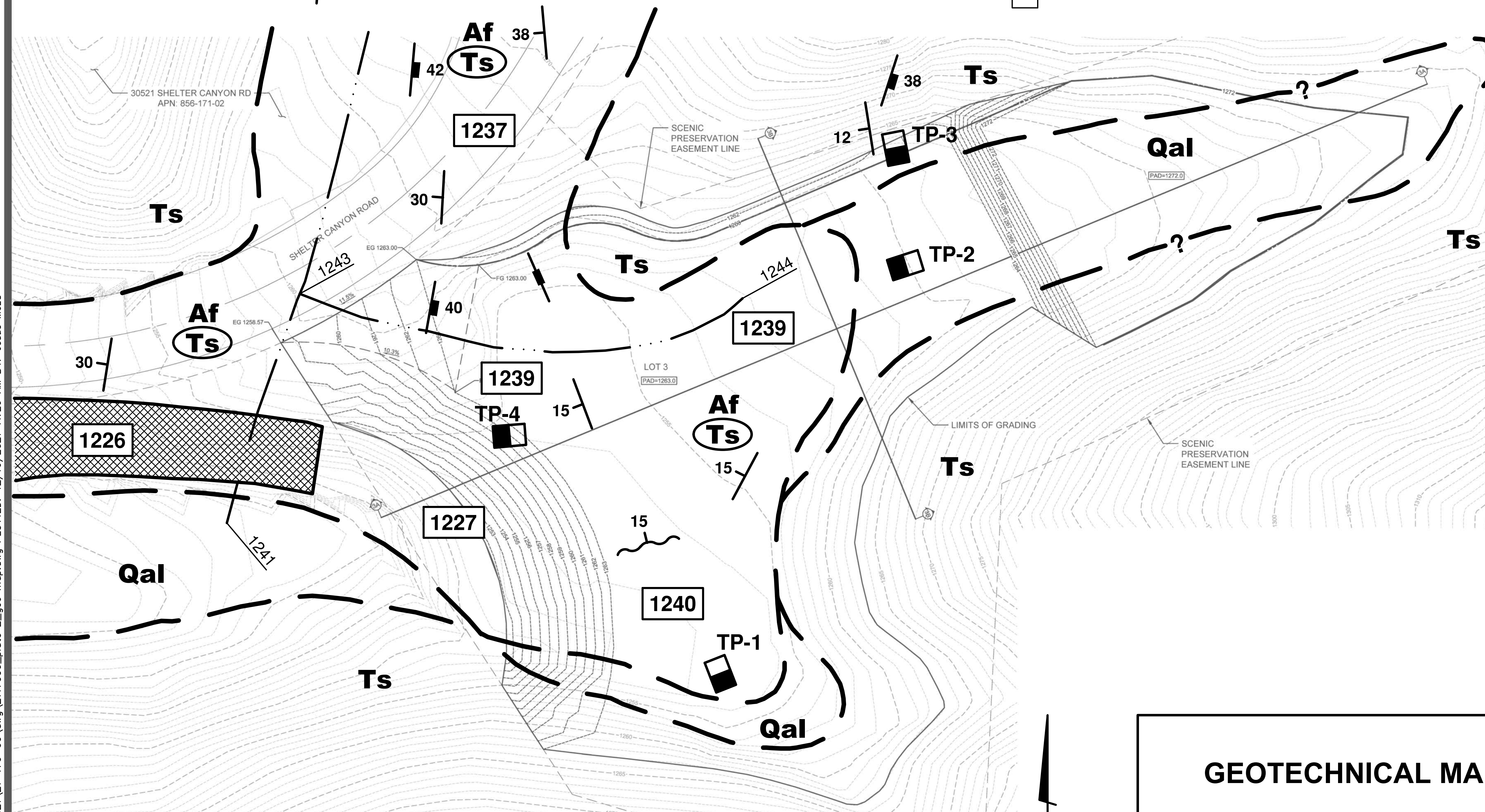
Location Map

GMU

Date:	December 31, 2021	Plate
Project No.:	21-170-00	1

GEOTECHNICAL LEGEND

TP-4	LOCATION OF EXPLORATORY TEST PIT
Af	EXISTING ARTIFICIAL FILL
Qal	ALLUVIUM
Ts	BEDROCK, SESPE FORMATION (CIRCLED WHERE BURIED)
38	STRIKE AND DIP OF BEDDING
42	STRIKE AND DIP OF JOINT BEDDING
15	STRIKE AND DIP OF GENERALIZED BEDDING
	GEOLOGIC CONTACT (QUERIED WHERE BURIED)
	LOCAITON OF SUBDRAIN WITH ELEVATIONS IN FEET
1226	APPROXIMATE ELEVATION OF REMOVAL BOTTOM IN FEET
	KEYWAY
	LOCATION OF GEOLOGIC SECTION



NOTE:
ALL PAD RUNOFF TO DISCHARGE TO SHELTER CANYON ROAD. REFER TO EROSION CONTROL SHEETS FOR RECOMMENDED V-DITCH AND BERM LOCATIONS

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THE OAKS AT TRABUCO
TR 14749, LOTS 3, 4, 6, 7 & 8
30502 SHELTER CANYON ROAD
19942, 19961, 19991, AND 20062 SUMMIT TRAIL
TRABUCO CANYON, CA

LOT 3 ROUGH GRADING PLAN

DAVID EVANS AND ASSOCIATES inc.

REVISIONS: APPD.

DATE: 11/16/2021
DESIGN: ATR
DRAWN: SPMO
CHECKED: LS
REVISION NUMBER:

SCALE: AS NOTED

PROJECT NUMBER:

DRAWING FILE: 02_ROUGH GRADING.dwg

SHEET NO. 2

GEOTECHNICAL MAP

GMU

Date:	December 31, 2021	Plate 2
Project No.:	21-170-00	

GEOTECHNICAL LEGEND

TP-4	LOCATION OF EXPLORATORY TEST PIT
Af	EXISTING ARTIFICIAL FILL
Qal	ALLUVIUM
Ts	BEDROCK, SESPE FORMATION (CIRCLED WHERE BURIED)
38	STRIKE AND DIP OF BEDDING
	GEOLOGIC CONTACT
	LOCATION OF SUBDRAIN WITH ELEVATIONS IN FEET
1226	APPROXIMATE ELEVATION OF REMOVAL BOTTOM IN FEET
	LOCATION OF GEOLOGIC SECTION

GEOTECHNICAL MAP

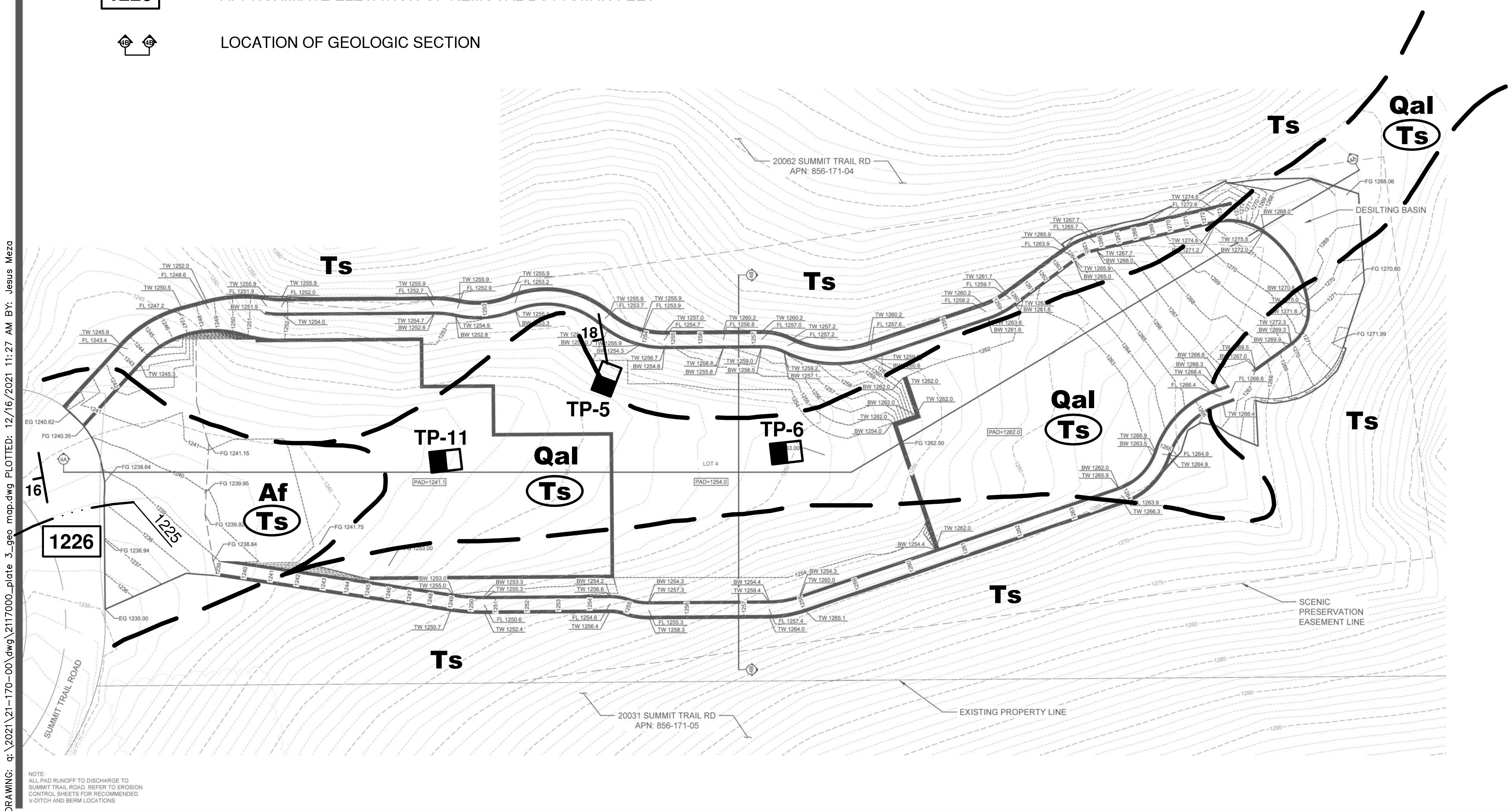
GMU

Date: December 31, 2021

Project No.: 21-170-00

Plate 3

0 30'



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THE OAKS AT TRABUCO
TR 14749, LOTS 3, 4, 6, 7 & 8
30502 SHELTER CANYON ROAD
19942, 19961, 19991, AND 20062 SUMMIT TRAIL
TRABUCO CANYON, CA

LOT 4 ROUGH GRADING PLAN

DAVID EVANS AND ASSOCIATES INC.

REVISIONS: APPD.

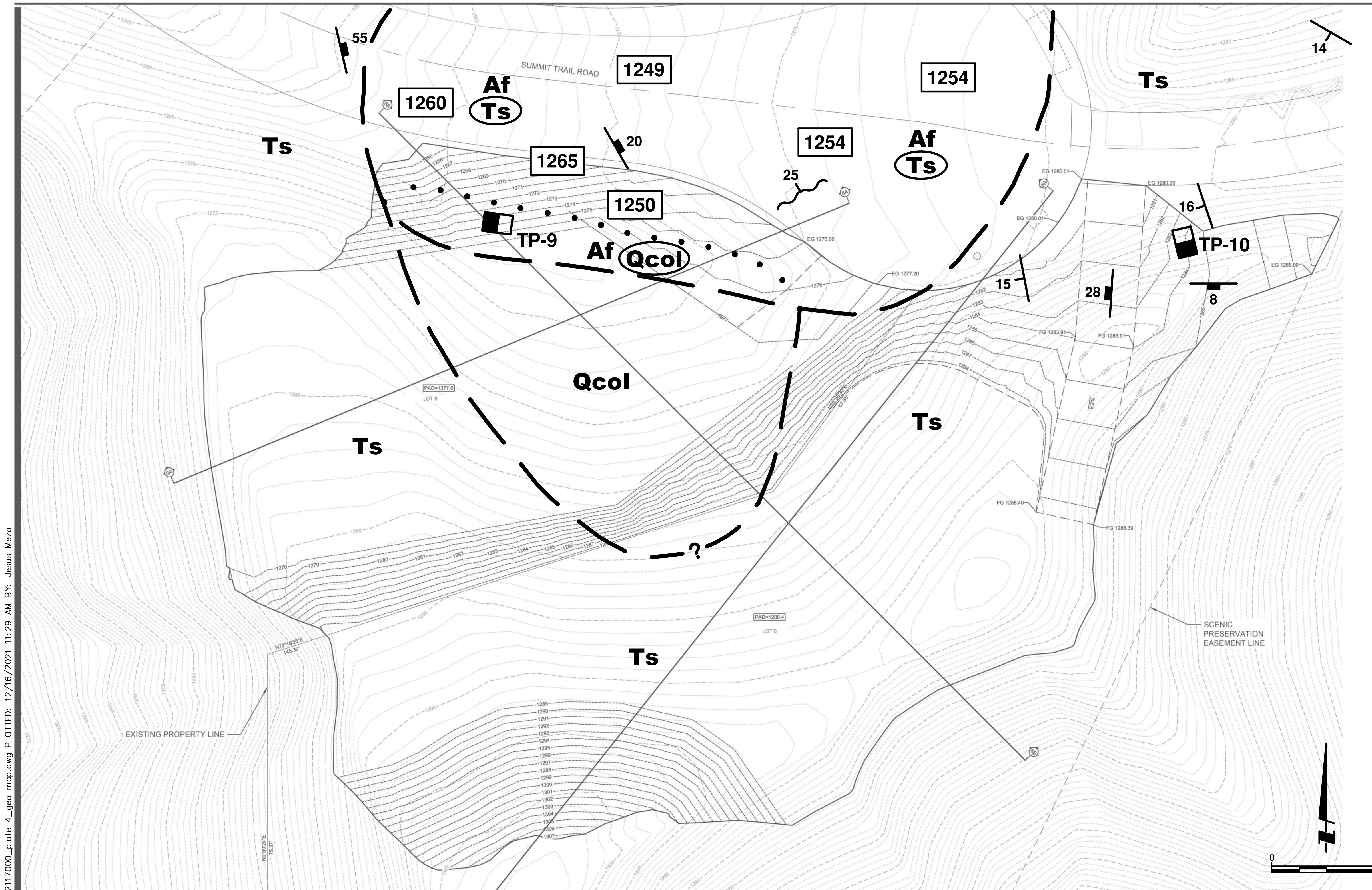
DATE: 11/16/2021
DESIGN: ATR
DRAWN: SPMO
CHECKED: LS
REVISION NUMBER:

SCALE: AS NOTED

PROJECT NUMBER:

DRAWING FILE: 02_ROUGH GRADING.dwg

SHEET NO. 3



GEOTECHNICAL LEGEND

TP-10 — LOCATION OF EXPLORATORY TEST PIT
Af — EXISTING ARTIFICIAL FILL
Qcol — COLLUVIUM (CIRCLED WHERE BURIED)
Ts — BEDROCK, SESPE FORMATION (CIRCLED WHERE BURIED)
38 — STRIKE AND DIP OF BEDDING
42 — STRIKE AND DIP OFJOINT BEDDING
15 — STRIKE AND DIP OF GENERALIZED BEDDING
GEOLOGIC CONTACT (DOTTED WHERE BURIED, QUERIED WHERE UNCERTAIN)
1226 — BOTTOM ELEVATION
LOCATION OF GEOLOGIC SECTION

GEOTECHNICAL MAP

GMU

Date: December 31, 2021
Project No.: 21-170-00
Plate 4

THE OAKS AT TRABUCO
TR 14749, LOTS 3, 4, 6, 7 & 8
30502 SHELTER CANYON ROAD
19942, 19991, AND 20062 SUMMIT TRAIL
TRABUCO CANYON, CA
LOTS 6&8 ROUGH GRADING PLAN

DAVID EVANS AND ASSOCIATES INC.

REVISIONS: APPD.

DATE: 11/16/2021
DESIGN: ATR
DRAWN: SPMO
CHECKED: LS
REVISION NUMBER:
SCALE: AS NOTED
PROJECT NUMBER:
DRAWING FILE: 02_ROUGH GRADING.dwg
SHEET NO. 4

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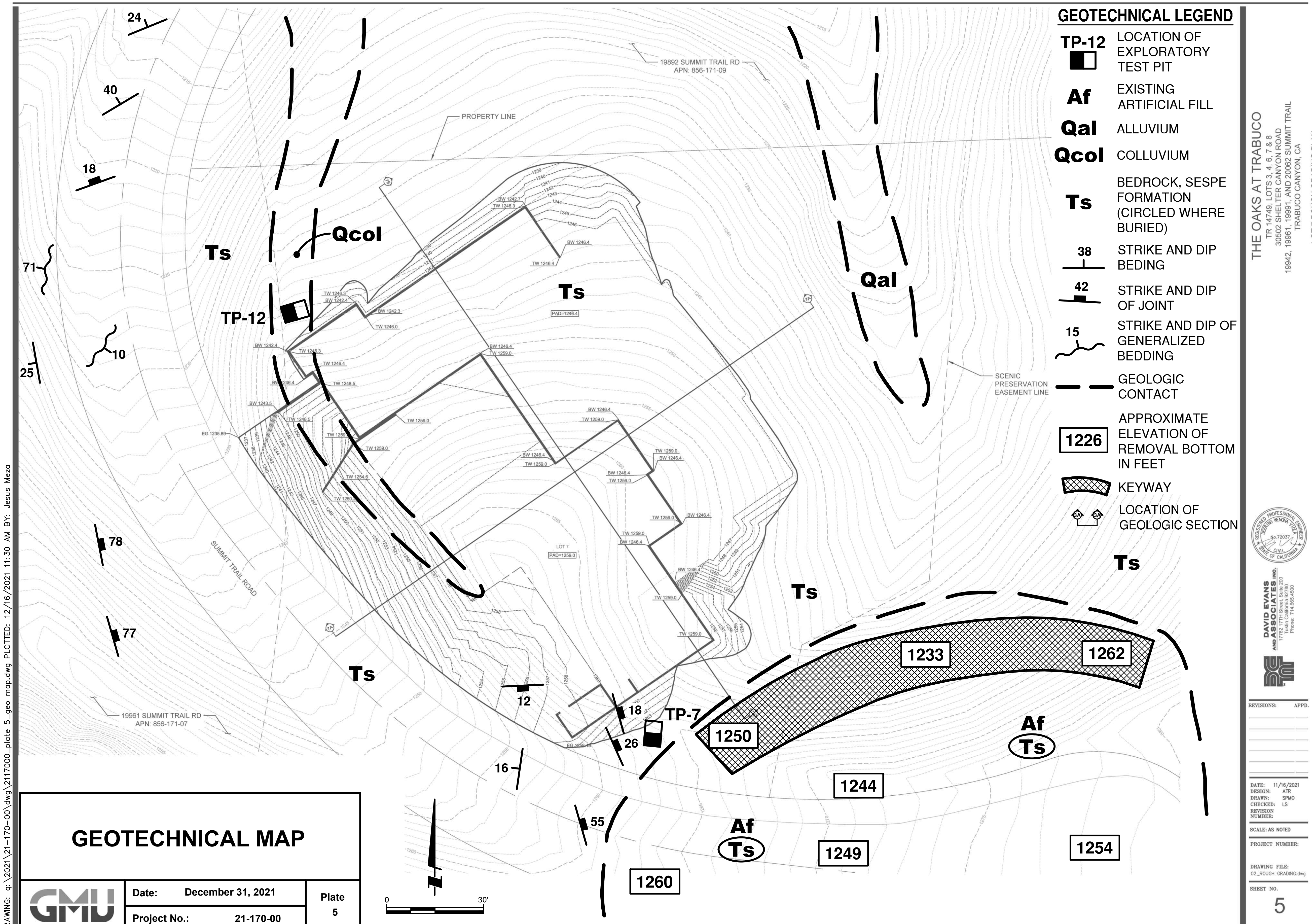


GEOTECHNICAL MAP

GMU

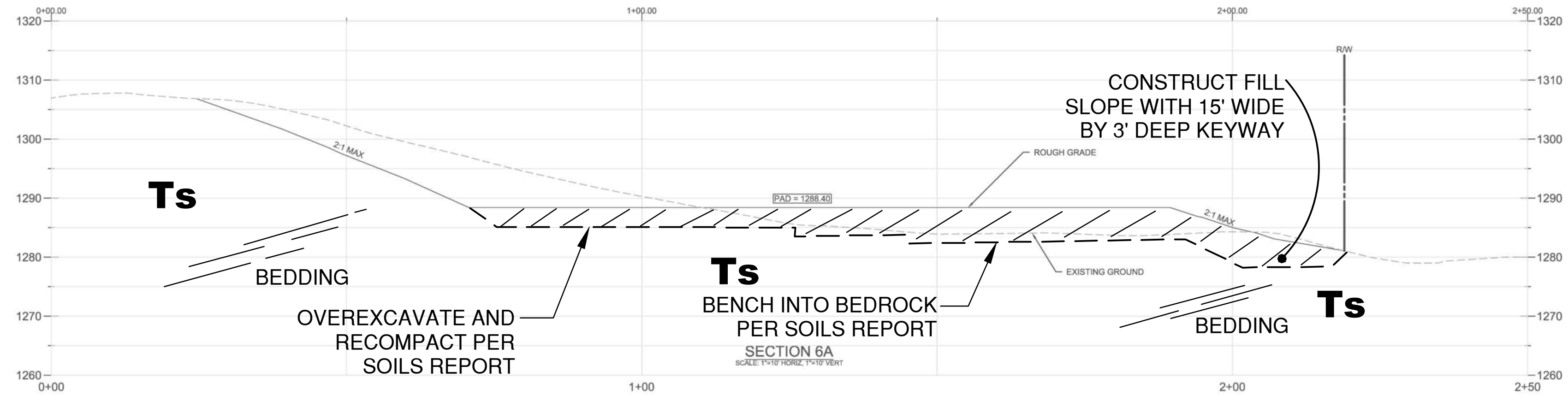
Date: December 31, 2021	Plate 5
Project No.: 21-170-00	

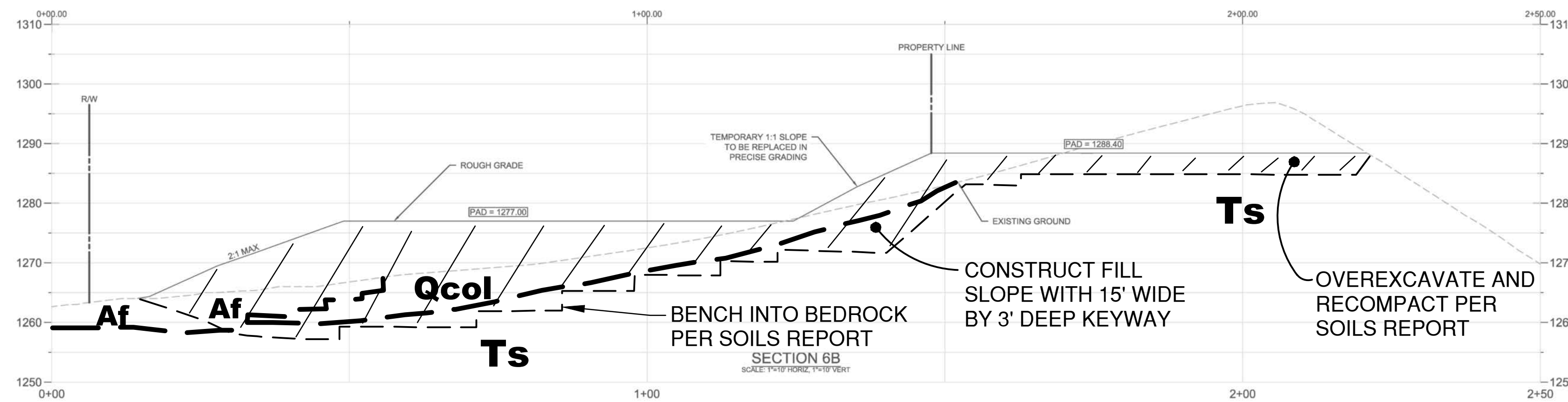
GEOTECHNICAL SECTIONS

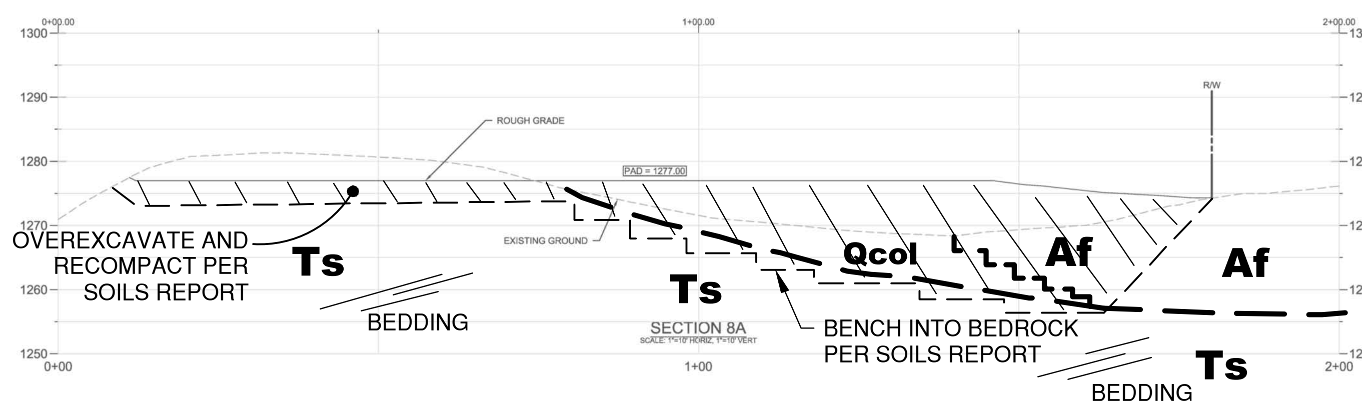
GMU

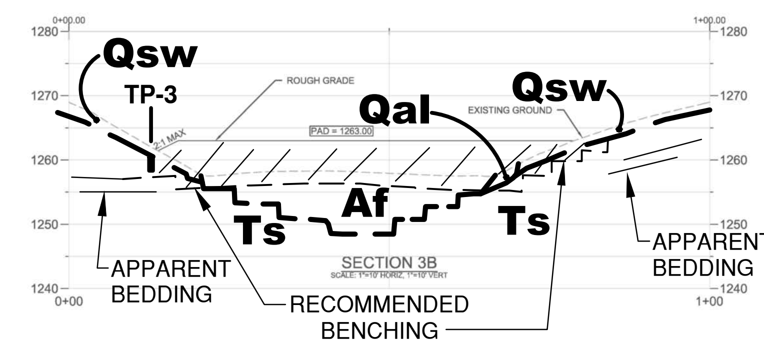
Date:	December 31, 2021	Plate
Project No.:	21-170-00	6

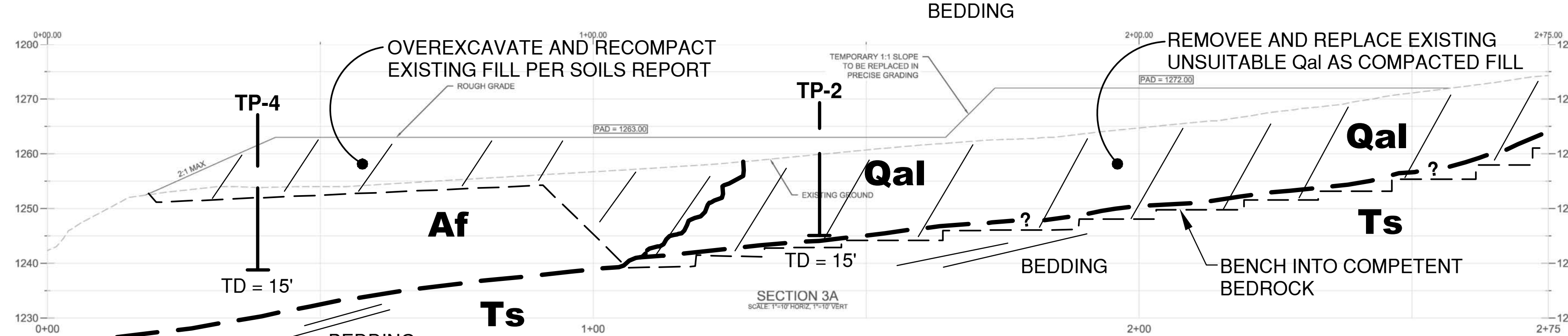
0 30'
SCALE: 1" = 30'-0"











THE OAKS AT TRABUCO
TR 14749, LOTS 3, 4, 6, 7 & 8
30502 SHELTER CANYON ROAD
19942, 19961, 19991, AND 20062 SUMMIT TRAIL
TRABUCO CANYON, CA

LOTS 6&8 SECTIONS

DAVID EVANS AND ASSOCIATES INC.
17782 17TH Street, Suite 200
Tustin California 92780
Phone: 714.665.4500

REVISIONS: APPD.

DATE: 11/16/2021
DESIGN: ATR
DRAWN: SPMO
CHECKED: LS
REVISION NUMBER:

SCALE: AS NOTED

PROJECT NUMBER:

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SHEET NO.
4A

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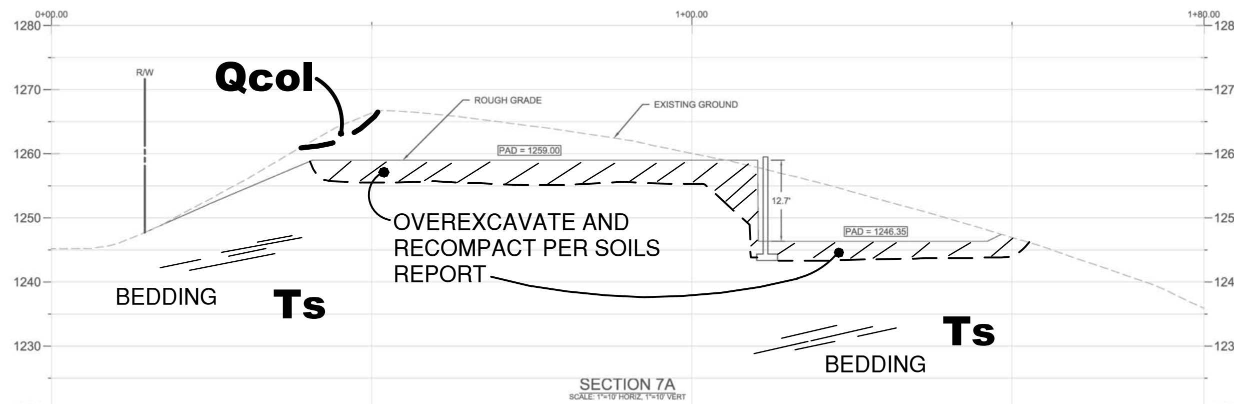
GEOTECHNICAL SECTIONS

GMU	Date: December 31, 2021	Plate 7
	Project No.: 21-170-00	

SCALE: 1" = 30'-0"



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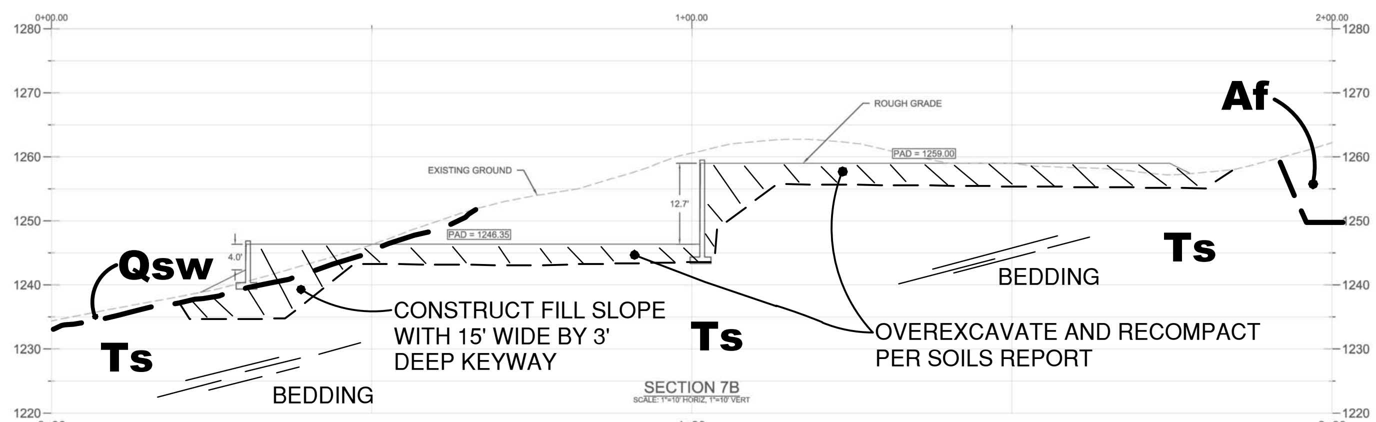

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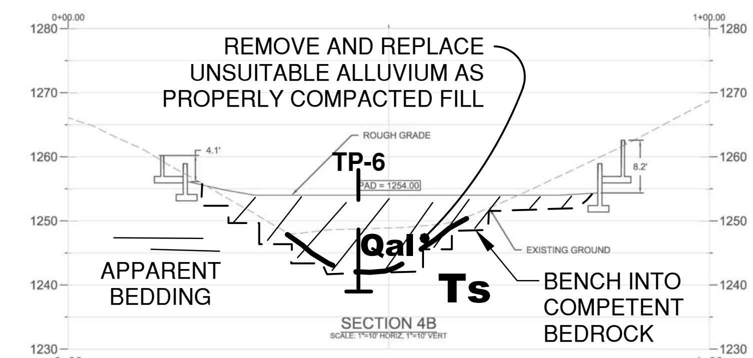

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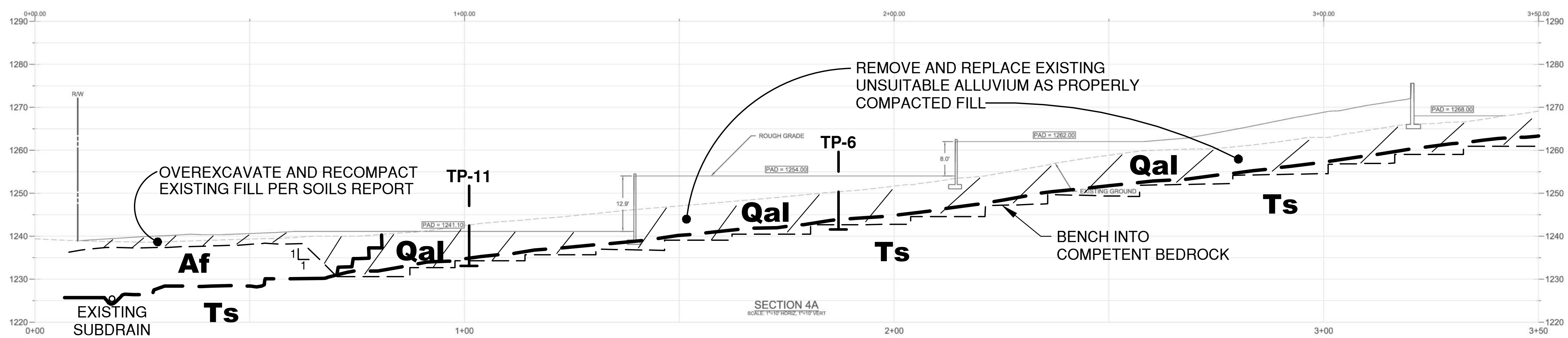

SECTION 4A

THE OAKS AT TRABUCO
TR 14749, LOTS 3, 4, 6, 7 & 8
30502 SHELTER CANYON ROAD
19942, 19961, 19991, AND 20062 SUMMIT TRAIL
TRABUCO CANYON, CA

LOT 7 SECTIONS

DAVID EVANS AND ASSOCIATES INC.
17782 17TH Street, Suite 200
Tustin California 92780
Phone: 714.665.4500

REVISIONS: APPD.

DATE: 11/16/2021
DESIGN: ATR
DRAWN: SPMO
CHECKED: LS
REVISION NUMBER:

SCALE: AS NOTED

PROJECT NUMBER:

DRAWING FILE: 02_ROUGH GRADING.dwg

SHEET NO. 5A

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APPENDIX A

Geotechnical Exploration Procedures and Test Pit Logs

APPENDIX A

GEOTECHNICAL EXPLORATION PROCEDURES AND TEST PIT LOGS

Our exploration at the subject site consisted of the excavation of eleven (11) exploratory test pits within the site utilizing a rubber-tired backhoe. The test pits were excavated to depths of 4 to 15 feet below the existing ground surfaces. The approximate locations of the test pits are shown on the enclosed Geotechnical Maps - Plates 2 through 5.

Our test pits were logged, and undisturbed samples of the onsite soil and bedrock materials were taken at various depths using a 3.0-inch outside-diameter drive sampler which contains a 2.416-inch-diameter brass sample sleeve 6 inches in length. Bulk samples of the subsurface soil and bedrock materials were collected as well as the California Modified drive samples. The logs of the test pits are contained in this Appendix A, and the Legend to Logs is presented as Plates A-1 and A-2.

The geologic and engineering field descriptions and classifications that appear on these logs are prepared according to Corps of Engineers and Bureau of Reclamation standards. Major soil classifications are prepared according to the Unified Soil Classification System as modified by ASTM Standard No. 2487. Since the description and classification that appear on the Log of Drill Hole are intended to be that which most accurately describe a given interval of a drill hole (frequently an interval of several feet), discrepancies do occur in the Unified Soil Classification System nomenclature between that interval and a particular sample in that interval. For example, an 8-foot-thick interval in the Log of Drill Hole may be identified as silty sand (SM) while one sample taken within the interval may have individually been identified as sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

MAJOR DIVISIONS			Group Letter	Symbol	TYPICAL NAMES
COARSE-GRAINED SOILS More Than 50% Retained On No.200 Sieve. Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	**GRAVELS** 50% or More of Coarse Fraction Retained on No.4 Sieve	Clean Gravels	GW		Well Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
			GP		Poorly Graded Gravels and Gravel-Sand Mixtures Little or No Fines.
		Gravels With Fines	GM		Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures.
	SANDS More Than 50% of Coarse Fraction Passes No.4 Sieve	Clean Sands	SW		Well Graded Sands and Gravelly Sands, Little or No Fines.
			SP		Poorly Graded Sands and Gravelly Sands, Little or No Fines.
		Sands With Fines	SM		Silty Sands, Sand-Silt Mixtures.
			SC		Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS 50% or More Passe The No.200 Sieve. Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	**SILTS AND CLAYS** Liquid Limit Less Than 50%		ML		Inorganic Silts, Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts With Slight Plasticity.
			CL		Inorganic Clays of Low To Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
			OL		Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS Liquid Limit 50% or Greater		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silts.
			CH		Inorganic Clays of High Plasticity, Fat Clays.
			OH		Organic Clays of Medium To High Plasticity, Organic Silts.
HIGHLY ORGANIC SOILS			PT		Peat and Other Highly Organic Soils.

The descriptive terminology of the logs is modified from current ASTM Standards to suit the purposes of this study

ADDITIONAL TESTS

DS = Direct Shear
HY = Hydrometer Test
TC = Triaxial Compression Test
UC = Unconfined Compression
CN = Consolidation Test
(T) = Time Rate
EX = Expansion Test
CP = Compaction Test
PS = Particle Size Distribution
EI = Expansion Index
SE = Sand Equivalent Test
AL = Atterberg Limits
FC = Chemical Tests
RV = Resistance Value
SG = Specific Gravity
SU = Sulfates
CH = Chlorides
MR = Minimum Resistivity
pH
(N) = Natural Undisturbed Sample
(R) = Remolded Sample
CS = Collapse Test/Swell-Settlement

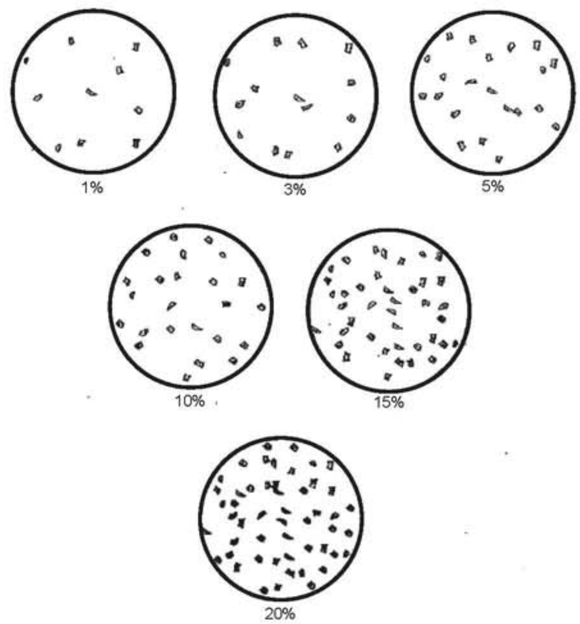
GEOLOGIC NOMENCLATURE

B = Bedding C = Contact J = Joint
F = Fracture Flt = Fault S = Shear
RS = Rupture Surface = Seepage
= Groundwater

SAMPLE SYMBOLS

Undisturbed Sample (California Sample)
Undisturbed Sample (Shelby Tube)
Bulk Sample
Unsuccessful Sampling Attempt
SPT Sample

5 10 15 Blows per 6-Inches Penetration
10: 10 Blows for 12-Inches Penetration
6/4": 6 Blows for 4-Inches Penetration
P: Push
(13): Uncorrected Blow Counts ("N" Values) for 12-Inches Penetration- Standard Penetration Test (SPT)



GMU

LEGEND TO LOGS
ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate **A-1**

P8-11/16/2012

SOIL DENSITY/CONSISTENCY

FINE GRAINED

Consistency	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Soft	Easily penetrated by thumb, exudes between fingers	<2	<3
Soft	Easily penetrated one inch by thumb, molded by fingers	2-4	3-6
Firm	Penetrated over 1/2 inch by thumb with moderate effort	4-8	6-12
Stiff	Penetrated about 1/2 inch by thumb with great effort	8-15	12-25
Very Stiff	Readily indented by thumbnail	15-30	25-50
Hard	Indented with difficulty by thumbnail	>30	>50

COARSE GRAINED

Density	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Loose	Easily penetrated with 0.5" rod pushed by hand	<4	<5
Loose	Easily penetrated with 0.5" rod pushed by hand	4-10	5-12
Medium Dense	Easily penetrated 1' with 0.5" rod driven by 5lb hammer	10-30	12-35
Dense	Dificult to penetrat 1' with 0.5" rod driven by 5lb hammer	31-50	35-60
Very Dense	Penetrated few inches with 0.5" rod driven by 5lb hammer	>50	>60

BEDROCK HARDNESS

Density	Field Test	SPT (#blows/foot)
Soft	Can be crushed by hand, soil like and structureless	1-30
Moderately Hard	Can be grooved with fingernails, crumbles with hammer	30-50
Hard	Can't break by hand, can be grooved with knife	50-100
Very Hard	Scratches with knife, chips with hammer blows	>100

MODIFIERS

Trace	1%
Few	1-5%
Some	5-12%
Numerous	12-20%
Abundant	>20%

GRAIN SIZE

Description		Sieve Size	Grain Size	Approximate Size
Boulders		>12"	>12"	Larger than a basketball
Cobbles		3-12"	3-12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4-3"	3/4-3"	Thumb-sized to fist-sized
	Fine	#4-3/4"	0.19-0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10-#4	0.079-0.19"	Rock-salt-sized to pea-sized
	Medium	#40-#10	0.017-0.079"	Sugar-sized to rock salt-sized
	Fine	#200-#40	0.0029-0.017"	Flour-sized to sugar-sized
Fines		passing #200	<0.0029"	Flour-sized and smaller

MOISTURE CONTENT

Dry- Very little or no moisture
Damp- Some moisture but less than optimum
Moist- Near optimum
Very Moist- Above optimum
Wet/Saturated- Contains free moisture

GMU

LEGEND TO LOGS
ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate
A-2

Log of Test Pit TP- 1

Date(s) Excavated	08/18/2021	Logged By	RA	Checked By	DW
Excavation Equipment	Backhoe - John Deer 310C	Excavation Contractor	J.E.S Engineering Contractors Inc,	Total Depth of Test Pit	12.5 feet
Sampling Method(s)	Open drive sampler with 6-inch sleeve, Bulk			Approx. Surface Elevation, ft MSL	1261.0
Groundwater Depth [Elevation], feet	N/A []	Test Pit Dimensions	Width: 2.5 ft; Length: 10 ft; Depth: 12.5 ft		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: MAXIMUM DENSITY, pcf	TEST DATA: ADDITIONAL TESTS
	ARTIFICIAL FILL, UNDOCUMENTED (Qafu) Unconsolidated soils, gravel approximately 1/4- to 1/2-inch in diameter, some rootlets, top 8-inches of unit contains increased coarse-grained sand, pinhole porosity	SILTY SAND (SM) with GRAVEL; light brownish yellow, dry to damp, loose, fine- to coarse-grained sand	1260							
2	Subhorizontal contact with material of increased cohesion, few roots approximately 1/2-inch in diameter, numerous subround to subangular gravel approximately 1/2- to 3/4-inch in diameter, subround cobble approximately 4- to 6-inches in diameter	CLAYEY SAND (SC) with GRAVEL; light yellowish brown to grayish brown, damp to moist, loose to medium dense, fine- to coarse-grained sand, some cobble	1258	2						
4	Contact with increased clayey soils, angular to subround gravel approximately 1/2- to 3/4-inch in diameter, subround cobble approximately 4- to 6-inches in diameter	CLAYEY SAND (SC) with GRAVEL; dark grayish brown to yellowish brown staining, moist, medium dense, fine- to coarse-grained sand, few gravel, some cobble	1256	4						
6	Hard digging			6						
	Some decomposing rootlets	Some red staining	1254							
8	Some charcoal fragments, few buried sticks and roots, subhorizontal lenses of gray clayey silt	SILTY SAND (SM) with CLAY; grayish brown, moist, medium dense, fine-to coarse-grained sand, some gravel and cobble	1252	8						

TP_REV1 21-170-00.GPJ GM&U.GDT 8/24/21

Project: The Oaks at Trabuco Project Location: Trabuco Project Number: 21-170-00	**Log of Test Pit TP- 1** Sheet 2 of 2

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: MAXIMUM DENSITY, pcf	TEST DATA: ADDITIONAL TESTS
12	**ARTIFICIAL FILL, UNDOCUMENTED (Qafu)** Buried sticks, subround gravel and cobble up to 6-inches in diameter	SILTY SAND (SM) with CLAY; grayish brown, moist to very moist, medium dense to dense, fine- to coarse-grained sand, some gravel and cobble	1250	12						
		Total Depth = 12.5 ft No Caving No Groundwater								

TP_REV1 21-170-00.GPJ GM&U.GDT 8/24/21

GMU

Project: The Oaks at Trabuco **Project Location: Trabuco** **Project Number: 21-170-00**	# Log of Test Pit TP- 2 Sheet 1 of 2

Date(s) Excavated	**08/18/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**12.5 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1265.0**
Groundwater Depth [Elevation], feet	**N/A []**	Test Pit Dimensions	**Width: 2.5 ft; Length: 10 ft; Depth: 12.5 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	ALLUVIUM (Qal) Subhorizontal to horizontal depositional features - some undulating, some rootlets, lens of silt approximately 1-inch thick	SILTY SAND (SM) with GRAVEL; pale reddish yellow, very loose to loose, dry, fine- to coarse-grained sand, few cobbles								
	Subhorizontal contact with 2-inch zone of increased gravel abundance, few roots Cohesionless, subangular to subround gravel approximately 1/2- to 3/4-inch in diameter, subround cobble approximately 4- to 6-inches in diameter		1264							
2				2						
	Subhorizontal contact with 3-inch zone of increased gravel abundance, few rootlets		1262							
4				4						
	Tip of sampler has an increase in clayey material, few roots approximately 1/2-inch in diameter Zone of increased cohesion	SILTY SAND (SM) with CLAY; light brownish yellow, damp, medium dense, fine- to coarse-grained sand, some gravel and cobble	1260							
6		SILTY SAND (SM) with CLAY; pale reddish yellow, dry, loose to medium dense, fine- to coarse-grained sand, some cobble	1258	6						
8				8						
	OLDER ALLUVIUM (Qoal) Increased cohesion, round cobbles up to 12-inches in diameter, granitic clasts	SILTY SAND (SM) with CLAY; grayish brown, damp, medium dense to dense, fine- to coarse-grained sand, some cobble	1256							

TP_REV1 21-170-00.GPJ GM&U.GDT 8/24/21

Project: The Oaks at Trabuco
Project Location: Trabuco
Project Number: 21-170-00

Log of Test Pit TP- 2

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	OLDER ALLUVIUM (Qoal)	SILTY SAND (SM) minor CLAY; yellowish gray, dry to damp, medium dense to dense, fine- to coarse-grained sand, some gravel and cobble								
	Decomposing stump, round cobbles up to 12-inches in diameter		1254							
12				12						
		Total Depth = 12.5 ft No Caving No Groundwater								

Log of Test Pit TP- 3

Project: The Oaks at Trabuco
Project Location: Trabuco
Project Number: 21-170-00

Date(s) Excavated	**08/18/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**6.0 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1268.0**
Groundwater Depth [Elevation], feet	**N/A []**	Test Pit Dimensions	**Width: 2.5 ft; Length: 5 ft; Depth: 6 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	SLOPEWASH (Qsw) Some rootlets, subangular to subround gravel approximately 1/2-inch in diameter, subround cobbles approximately 4- to 6-inches in diameter	CLAYEY SAND (SC) with GRAVEL; yellowish brown, loose, dry, fine- to coarse-grained sand, few cobble								
2	**SESPE FORMATION (Ts)** Slightly weathered, some rootlet infilled joints, subround gravel approximately 1/2-inch in diameter, subround cobbles approximately 4-inches in diameter, gradationally fining downwards	SILTY SANDSTONE; brownish yellow, moderately hard, dry, fine- to coarse-grained sand, few gravel	1266	2						
		Sand becomes fine-grained								
	Subhorizontal undulating irregular joints filled with powdery white mineral, bedding attitude of N25°W, 12°SW; faint undulating irregular subvertical fractures	SILTY SANDSTONE; whitish gray, dry, moderately hard to hard, fine- to coarse-grained sand, numerous fine gravel								
4		SILTY SANDSTONE; light reddish brown, moderately hard to hard, dry, fine-grained sand	1264	4						
	Few rootlets									
6		Total Depth = 6ft No Caving No Groundwater	1262	6						

Project: The Oaks at Trabuco **Project Location: Trabuco** **Project Number: 21-170-00**	# Log of Test Pit TP- 4 Sheet 1 of 2

Date(s) Excavated	**08/18/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**12.0 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1262.0**
Groundwater Depth [Elevation], feet	**N/A []**	Test Pit Dimensions	**Width: 2.5 ft; Length: 10 ft; Depth: 12 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	ARTIFICIAL FILL, UNDOCUMENTED (Qafu) Some rootlets, lenses of coarse-grained sand	SILTY SAND (SM) with GRAVEL; light yellowish brown, dry, loose, fine- to coarse-grained sand								
2	Subhorizontal lift, subround cobble approximately 4- to 6-inches in diameter, subround gravel approximately 1/2-inch in diameter, trace rootlets, lens with slate fragments within lift	CLAYEY SILTY SAND (SM); grayish brown, dry, medium dense to dense, fine-grained sand, trace gravel and cobble	1260	2						
	Subhorizontal lift, subround cobbles 4- to 6-inches in diameter	SILTY SAND (SM) with GRAVEL; light yellowish red with white staining, dry, dense, fine- to coarse-grained sand, few cobble								
4			1258	4						
	Subhorizontal lift, lens with slate fragments, subround gravel 1/2- to 3/4-inch in diameter, subround cobble 4- to 6-inches in diameter	CLAYEY SILTY SAND (SM); dark grayish brown, damp to moist, medium dense to dense, fine- to medium-grained sand, few gravel, trace cobble								
6			1256	6						
	Buried organic odor	SILTY SAND (SM) with CLAY, dark grayish brown, moist, medium dense to dense, fine- to medium-grained sand								
8			1254	8						
	Lens of increased clay and moisture									

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DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: MAXIMUM DENSITY, pcf	TEST DATA: ADDITIONAL TESTS
	ARTIFICIAL FILL, UNDOCUMENTED (Qafu) Few rootlets, subround cobbles approximately 4- to 6-inches in diameter	Becomes dark gray, trace cobble								
12		Total Depth = 12 ft No Caving No Groundwater	1250	12						

GMU

Project: The Oaks at Trabuco	# Log of Test Pit TP- 5
Project Location: Trabuco	Sheet 1 of 1
Project Number: 21-170-00	

Date(s) Excavated	**08/18/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**6.5 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1253.0**
Groundwater Depth [Elevation], feet	**N/A []**	Test Pit Dimensions	**Width: 2.5 ft; Length: 10 ft; Depth: 6.5 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: MAXIMUM DENSITY, pcf	TEST DATA: ADDITIONAL TESTS
	SLOPEWASH (Qsw) Some rootlets, subround fine gravel	CLAYEY SAND (SC); yellowish brown, dry, loose, fine- to medium-grained sand, trace gravel	1252							
2	**SESPE FORMATION (Ts)** Subhorizontal contact with an orientation of N40W, 19NE, few rootlets, highly weathered, moderately fractured	SILTY SANDSTONE; dark reddish gray, dry, soft to moderately hard, fine- to coarse-grained sand		2						
	Massive, moderately weathered, few rootlets, some oxidation, moderately fractured, subround gravel approximately 1/2- to 3/4-inch in diameter	SILTY SANDSTONE; light yellowish red, dry, soft to moderately hard, fine- to coarse-grained sand, few gravel	1250							
4	No observable bedding due to fractures			4						
	Faint irregular fractures, irregular joints filled with powdery white mineral approximately 1/2-inch thick, some rootlets, faint laminae, few irregular subvertical joints, gradational color change	SILTY SANDSTONE; yellowish red to grayish brown, dry, moderately hard, fine- to coarse-grained sand	1248							
6		Becomes whitish gray		6						
		Total Depth = 6.5 ft No Caving No Groundwater								

Project: The Oaks at Trabuco Project Location: Trabuco Project Number: 21-170-00	**Log of Test Pit TP- 6** Sheet 1 of 1

Date(s) Excavated	08/18/2021	Logged By	RA	Checked By	DW
Excavation Equipment	Backhoe - John Deer 310C	Excavation Contractor	J.E.S Engineering Contractors Inc,	Total Depth of Test Pit	7.5 feet
Sampling Method(s)	Open drive sampler with 6-inch sleeve, Bulk			Approx. Surface Elevation, ft MSL	1254.0
Groundwater Depth [Elevation], feet	N/A []	Test Pit Dimensions	Width: 2.5 ft; Length: 10 ft; Depth: 7.5 ft		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	ALLUVIUM (Qal) Some rootlets, pinhole porosity	SILTY SAND (SM) pale reddish yellow, dry, loose, fine- to coarse-grained sand								
		SILTY SAND (SM) with minor CLAY; grayish brown, dry, medium dense, fine- to medium-grained sand, some coarse sand, few gravel								
	Depositional wedge of fine- to coarse-grained sand, no porosity observed									
2	Subangular to subround gravel, subround cobble up to 6-inches in diameter	Some gravel and cobble	1252	2						
	Trace 1/2-inch thick roots, moderate porosity up to 10mm									
		Decreased clay, sand becomes fine- to coarse-grained, increased cobble abundance								
4	Granitic and metamorphic clasts, cobble abundance ~15%		1250	4						
	Trace rootlets, pockets of well graded sand, rocks causing difficult digging									
6	Trace boulders up to 15-inches in diameter, numerous cobble at contacts		1248	6						
	SESPE FORMATION (Ts) Slightly weathered, moderately fractured	SILTY SANDSTONE; gray, damp, moderately hard to hard, fine- to medium-grained sand								
		Total Depth = 7.5 ft No Caving No Groundwater								

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Project: The Oaks at Trabuco **Project Location: Trabuco** **Project Number: 21-170-00**	**Log of Test Pit TP- 7** Sheet 1 of 1

Date(s) Excavated	**08/19/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**3.5 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1262.0**
Groundwater Depth [Elevation], feet	**N/A []**	Test Pit Dimensions	**Width: 2.5 ft; Length: 7 ft; Depth: 3.5 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: MAXIMUM DENSITY, pcf	TEST DATA: ADDITIONAL TESTS
	SLOPEWASH (Qsw) Some rootlets, pinhole porosity	CLAYEY SAND (SC); light yellowish red, dry to damp, loose, fine- to coarse-grained sand								
	SESPE FORMATION (Ts) Highly weathered subhorizontal downwards curving joints, infilled with powdery white mineral with an approximate orientation of N30W, 18NE, some rootlets Decreased rootlets, moderately weathered, infilled joints, subvertical irregular root filled joints approximately 1/2-inch thick	SILTY SANDSTONE; pale reddish yellow, dry, moderately hard, fine- to coarse-grained sand Gradational change to grayish yellow Few fine gravel, becomes reddish yellow with white mottles								
2	Approximate joint orientation of N30°W, 26°NE, joint spacing of approximately 1-inch thick increasing to 2- to 6-inches thick moving downward Few rootlets within joints Slighty weathered, some jointing, massive, no discernible bedding, very faint wavy laminae	Becomes pale reddish gray, moderately hard to hard, fine- to medium-grained sand	1260	2						
		Total Depth = 3.5 ft No Caving No Groundwater								

TP_REV1 21-170-00.GPJ GM&U.GDT 8/24/21

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Project: The Oaks at Trabuco	Log of Test Pit TP- 8
Project Location: Trabuco	Sheet 1 of 1
Project Number: 21-170-00	

Date(s) Excavated	08/19/2021	Logged By	RA	Checked By	DW
Excavation Equipment	Backhoe - John Deer 310C	Excavation Contractor	J.E.S Engineering Contractors Inc,	Total Depth of Test Pit	5.0 feet
Sampling Method(s)	Open drive sampler with 6-inch sleeve, Bulk			Approx. Surface Elevation, ft MSL	1275.0
Groundwater Depth [Elevation], feet	N/A []	Test Pit Dimensions	Width: 2.5 ft; Length: 10 ft; Depth: 5 ft		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	SLOPEWASH (Qsw) Some rootlets, pinhole porosity	CLAYEY SAND (SC); light yellowish brown, dry, loose, fine- to coarse-grained sand								
	ARTIFICIAL FILL, UNDOCUMENTED (Qafu) Fine angular gravel, subround cobble approximately 4- to 5-inches in diameter, few rootlets	CLAYEY SAND (SC); light reddish yellow, dry, medium dense, fine- to medium-grained sand, few gravel	1274							
2	**SESPE FORMATION (Ts)** Faint subhorizontal undulating contact, gradationally fining downward, moderately weathered, moderately fractured, no distinct bedding or jointing, few krotovina observed	SILTY SANDSTONE; pale reddish yellow, dry, moderately hard, fine- to coarse-grained sand, few fine gravel		2						
	Slightly weathered, massive, continuing to fine downwards	Becomes light yellowish red	1272							
4	Few round gravel up to 3-inches in diameter			4						
	Continues to be massive, slightly weathered, few 1- to 2-inch krotovina	Total Depth = 5ft No Caving No Groundwater	1270							

TP_REV1 21-170-00.GPJ GM&U.GDT 8/24/21

Project: The Oaks at Trabuco
Project Location: Trabuco
Project Number: 21-170-00

Log of Test Pit TP- 9

Date(s) Excavated	**08/19/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**7.0 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1277.0**
Groundwater Depth [Elevation], feet	**N/A**	Test Pit Dimensions	**Width: 2.5 ft; Length: 8 ft; Depth: 7 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	SLOPEWASH (Qsw) Few rootlets, pinhole porosity	CLAYEY SAND (SC); light yellowish brown, dry, loose, fine- to medium-grained sand								
	ARTIFICIAL FILL, UNDOCUMENTED (Qafu) Bedrock fragments observed within fill	SILTY SAND (SM) with CLAY; pale yellowish brown, dry, medium dense to dense, fine- to medium-grained sand	1276							
2	Red plastic piece observed within fill Yellow and white plastic pieces observed, pockets of clayey sand approximately 4-inches in diameter			2						
	Subhorizontal lift of dark clayey sand, below becomes homogenous fine- to coarse-grained sandy material	CLAYEY SAND (SC); dark grayish brown, dry to damp, medium dense to dense, fine- to medium-grained sand	1274							
4	Disturbed sample			4						
			1272							
6	**SESPE FORMATION (Ts)** Heavily weathered, massive, blocky structure, dense hard digging Subround cobble approximately 5- to 8-inches in diameter, few roots approximately 1/2-inch thick Slightly weathered, massive	SILTY SANDSTONE; dark grayish brown, dry to damp, moderately hard to hard, fine-to coarse-grained sand Becomes pale reddish yellow		6						
		Total Depth = 7 ft No Caving No Groundwater	1270							

GMU

Project: The Oaks at Trabuco
Project Location: Trabuco
Project Number: 21-170-00

Log of Test Pit TP-10

Date(s) Excavated	08/19/2021	Logged By	RA	Checked By	DW
Excavation Equipment	Backhoe - John Deer 310C	Excavation Contractor	J.E.S Engineering Contractors Inc,	Total Depth of Test Pit	4.5 feet
Sampling Method(s)	Open drive sampler with 6-inch sleeve, Bulk			Approx. Surface Elevation, ft MSL	1285.0
Groundwater Depth [Elevation], feet	N/A []	Test Pit Dimensions	Width: 2.5 ft; Length: 4 ft; Depth: 4.5 ft		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
	SLOPEWASH (Qsw) Few rootlets, pinhole porosity, few fine gravel	CLAYEY SAND (SC); light yellowish brown, dry, loose, fine- to coarse-grained sand								
	SESPE FORMATION (Ts) Highly weathered, subhorizontal contact, gradationally fining downward, moderately fractured, friable	SILTY SANDSTONE; pale yellowish red, dry, moderately hard, fine- to coarse-grained sand, few fine gravel	1284							
2				2						
	Slightly weathered, subhorizontal contact with color change, decomposing granitic clast No clear bedding or jointing, moderately fractured	Becomes yellowish red to brown	1282							
4				4						
		Total Depth = 4.5 ft No Caving No Groundwater								

TP_REV1 21-170-00.GPJ GM&U.GDT 8/24/21

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Project: The Oaks at Trabuco
Project Location: Trabuco
Project Number: 21-170-00

Log of Test Pit TP-11

Date(s) Excavated	**08/19/2021**	Logged By	**RA**	Checked By	**DW**
Excavation Equipment	**Backhoe - John Deer 310C**	Excavation Contractor	**J.E.S Engineering Contractors Inc,**	Total Depth of Test Pit	**8.0 feet**
Sampling Method(s)	**Open drive sampler with 6-inch sleeve, Bulk**			Approx. Surface Elevation, ft MSL	**1249.0**
Groundwater Depth [Elevation], feet	**N/A []**	Test Pit Dimensions	**Width: 2.5 ft; Length: 8 ft; Depth: 8 ft**		
Remarks					

DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION, feet	DEPTH, feet	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	MAXIMUM DENSITY, pcf	ADDITIONAL TESTS
0	**ALLUVIUM (Qal)** Some rootlets, pinhole porosity	SILTY SAND with GRAVEL (SM); pale reddish yellow, dry, loose, medium- to coarse-grained sand, few fine gravel								
	Few rootlets	Some fine gravel	1248							
2	Subround to subangular gravel approximately 1/2- to 3/4-inch in diameter, subround cobble approximately 4- to 5-inch in diameter, some rootlets, lenses with increased silt abundance		1246	2						
4	Contact with approximately 3-inch thick zone of subround fine gravel, lenses of coarse-grained sand		1244	4		X				
6	Dense hard digging, cobble up to 7-inch in diameter	Numerous gravel, some cobble		6						
	SESPE FORMATION (Ts) Subhorizontal joints infilled with a powdery white mineral, slightly weathered, massive	SILTY SANDSTONE; pale yellowish white, dry, moderately hard to hard, fine- to coarse-grained sand	1242			X				
8		Total Depth = 8 ft Slight Caving with Alluvial Deposits No Grounwater		8						

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APPENDIX B

Geotechnical Laboratory Test Procedures and Results

APPENDIX B

GEOTECHNICAL LABORATORY PROCEDURES AND TEST RESULTS

Moisture and Density

Field moisture content and in-place density were determined for each 6-inch sample sleeve of soil or bedrock material obtained from the test pits. The field moisture contents were determined in general accordance with ASTM Test Method D 2216 by obtaining one-half the moisture sample from each end of the 6-inch sleeve. The in-place dry densities of the samples were determined by using the wet weight of the entire sample.

At the same time the field moisture content and in-place density were determined, the soil material at each end of the sleeve was classified according to the Unified Soil Classification System. The results of the field moisture content and in-place density determinations are presented on the right-hand column of the Log of Drill Hole and are summarized on Table B-1. The results of the visual classifications were used for general reference.

Particle Size Distribution

As part of the engineering classification of the materials underlying the site, bulk samples of the existing onsite fill and bedrock materials were tested to determine their distribution of particle sizes. The distribution was determined in general accordance with ASTM Test Method D 422 using U.S. Standard Sieve Openings 3", 1.5", ¾", ⅜", and U.S. Standard Sieve Nos. 4, 10, 20, 40, 60, 100, and 200. In addition, a standard hydrometer test was performed to determine the distribution of particle sizes passing the No. 200 sieve (i.e., silt and clay-size particles). The results of these tests are contained in this Appendix B. Key distribution categories (% gravel; % sand, etc.) are contained within Table B-1.

Atterberg Limits

As part of the engineering classification of the soils underlying the site, bulk samples of the onsite fill and bedrock materials were tested to determine their relative plasticity. The relative plasticity is based on the Atterberg limits determined in general accordance with ASTM Test Method D 4318. The results of these tests are contained in this Appendix B, Table B-1.

Expansion Tests

To provide a standard definition of one-dimensional expansion, expansion index tests were performed on bulk samples of the onsite soil and bedrock materials in general accordance with ASTM Test Method D 4829. The results from these tests are reported as the "expansion indices." The results of these tests are contained in this Appendix B.

Chemical Tests

The corrosion potential of typical on-site soil and bedrock materials under long-term contact with both metal and concrete was determined by chemical and electrical resistance tests. The soluble sulfate test for potential concrete corrosion was performed in general accordance with California Test Method 417, the minimum resistivity tests for potential metal corrosion were performed in general accordance with California Test Method 643, and the concentration of soluble chlorides was determined in general accordance with California Test Method 422. The results of these tests are presented on Table B-1.

Compaction Test

A bulk sample representative of the on-site fill materials was tested to determine the maximum dry density and optimum moisture content of the soil. These compactive characteristics were determined in general accordance with ASTM Test Method D 1557. The results of this test are contained in Appendix B and also Table B-1.

Consolidation Tests

The one-dimensional consolidation properties of undisturbed samples of existing alluvium obtained at depths of 2.5 and 7.5 feet within test pit TP-2 were evaluated in general accordance with the provisions of ASTM Test Method D 2435. The diameter of each sample was 2.625 inches and the height of each sample was 1 inch. Water was added during the tests at various normal loads to evaluate the potential for hydro-collapse and to produce saturation during the remainder of the testing. Consolidation readings were taken regularly during each load increment until the change in sample height was less than approximately 0.0001 inch over a two-hour period. The graphic presentation of consolidation data is a representation of volume change in change in axial load. The results of these tests are contained in this Appendix B.

Direct Shear Strength Test

A direct shear test was performed on an undisturbed sample of the onsite bedrock materials. The general philosophy and procedure of the test was in accordance with ASTM Test Method D 3080 - "Direct Shear Tests for Soils Under Consolidated Drained Conditions".

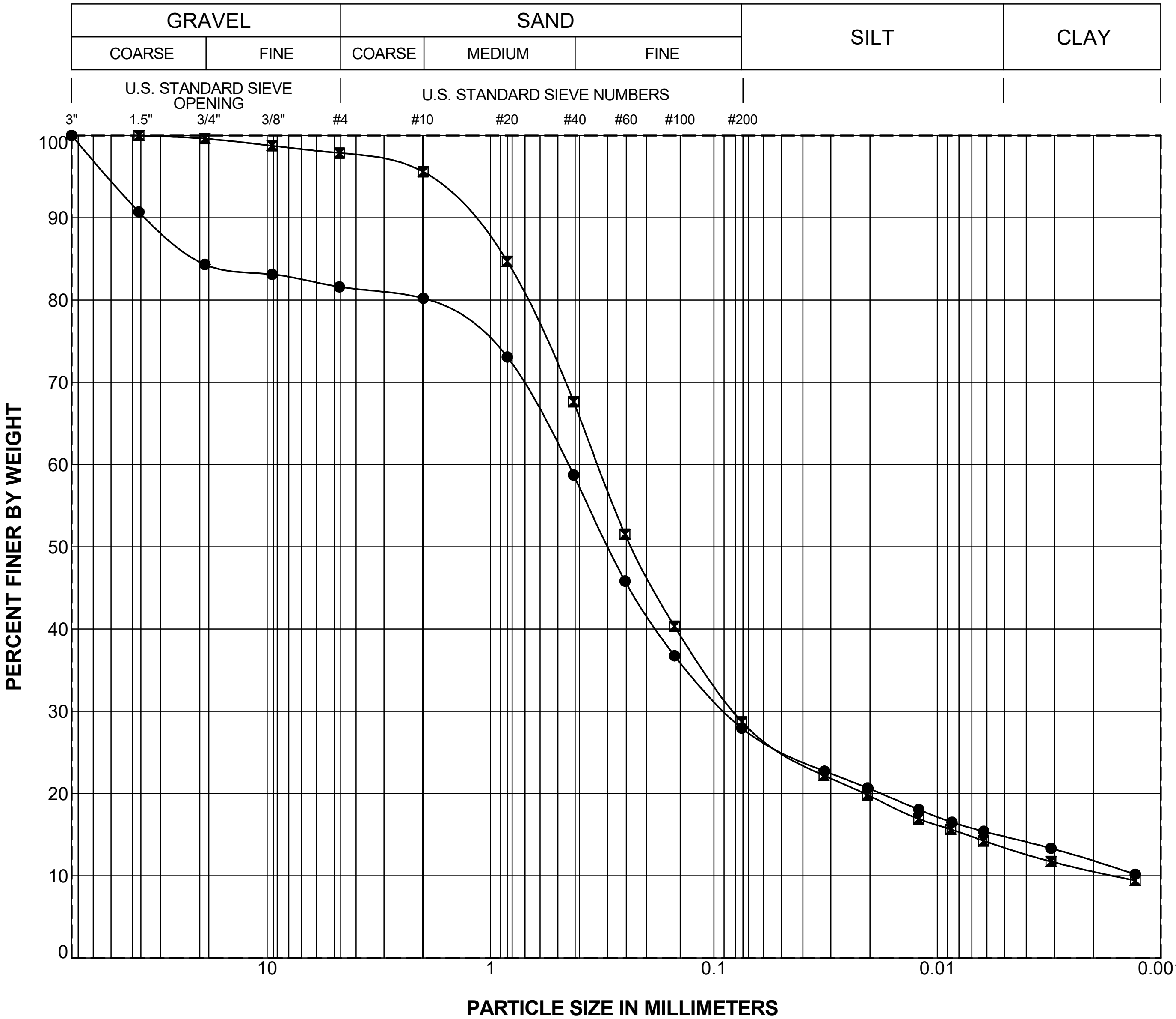
This test was a single shear test and was performed using a sample with a diameter of 2.416 inches and a height of 1.00 inch. The normal load was applied by a vertical dead load system. A constant rate of strain was applied to the upper one-half of the sample until failure occurs. Shear stress was monitored by a strain gauge-type precision load cell and deflection was measured with a digital dial indicator. This data was transferred electronically to data acquisition software which plotted shear strength vs. deflection. The shear strength plots were then interpreted to determine peak and ultimate shear strengths. A strain rate compatible with the grain size distribution of the fill materials was utilized. The interpreted results of this test are shown in this Appendix B.

TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Satur-ation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
TP- 1	5	1256.0	Af	SC	7.3	118	49	18	54	28	12	40	17	23	131.5	7.0	62		7.8	84	552	1860
TP- 2	3.5	1261.5	Qal	SM	3.4	110	18															
TP- 2	7.5	1257.5	Qal	SM	5.0	115	31															
TP- 4	6	1256.0	Af	SM	8.8	110	46															
TP- 5	5.5	1247.5	Ts	SM/SP-SM	3.8	113	22															
TP- 7	3	1259.0	Ts	SM	6.5	117	41															
TP- 8	3	1272.0	Ts	CL	8.1																	
TP- 9	4	1273.0	Af	SM-SP	5.0	108	25															
TP- 9	6	1271.0	Ts	SM	6.5	104	29															
TP-10	1	1284.0	Ts	SC	6.2			2	69	29	11	30	18	12	129.0	8.0	27		8.4	98	570	2138
TP-10	3.5	1281.5	Ts	SM	5.3	117	34															

GMU_TABLE_SOIL_LAB_DATA 21-170-00.GPJ FNC AB GWGN01.GDT 9/21/21

Project: The Oaks at Trabuco
Project No. 21-170-00



Boring Number	Depth (feet)	Geologic Unit	Symbol	LL	PI	Classification
TP- 1	5.0	Af	●	40	23	CLAYEY SAND (SC)
TP-10	1.0	Ts	⊠	30	12	CLAYEY SAND (SC)

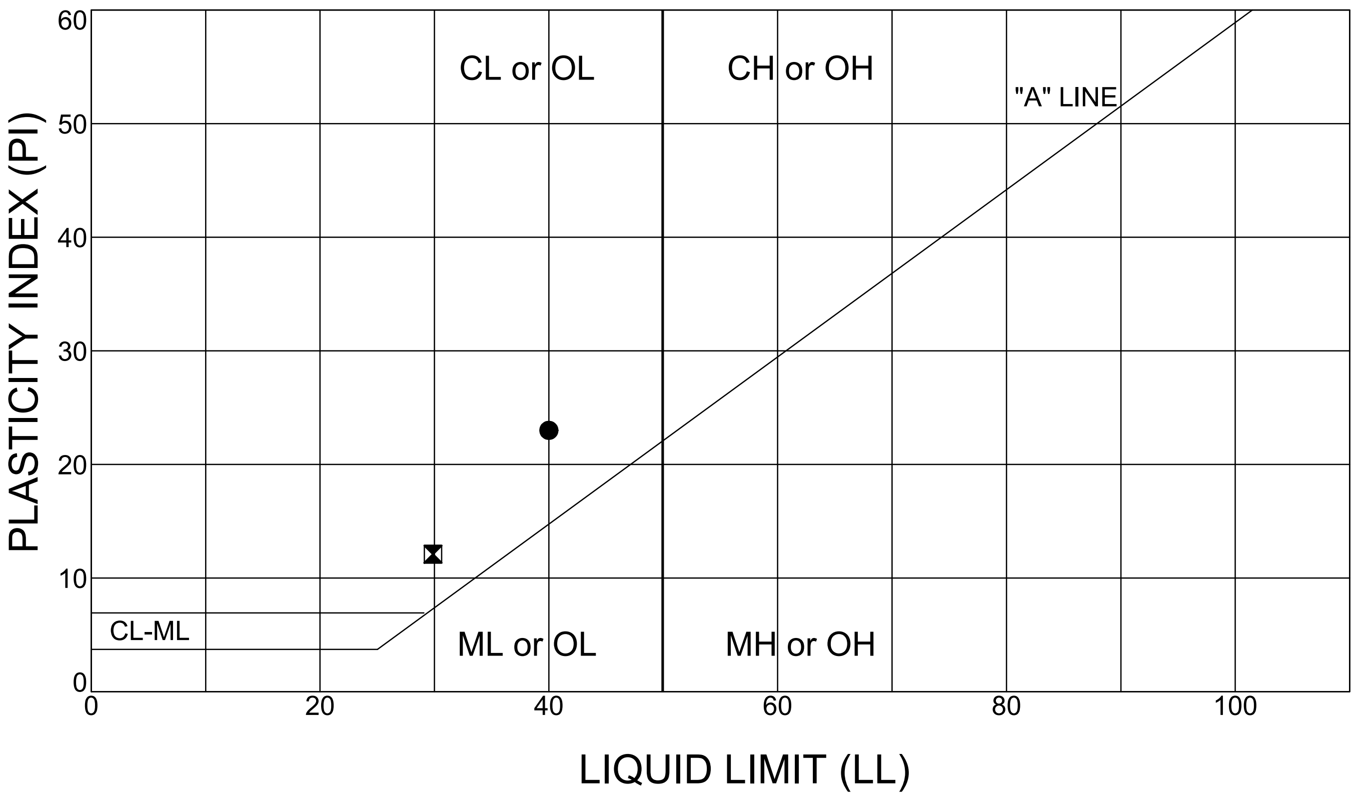
GMU_GRAIN_SIZE 21-170-00.GPJ 9/21/21

PARTICLE SIZE DISTRIBUTION

Project: The Oaks at Trabuco

Project No. 21-170-00

GMU

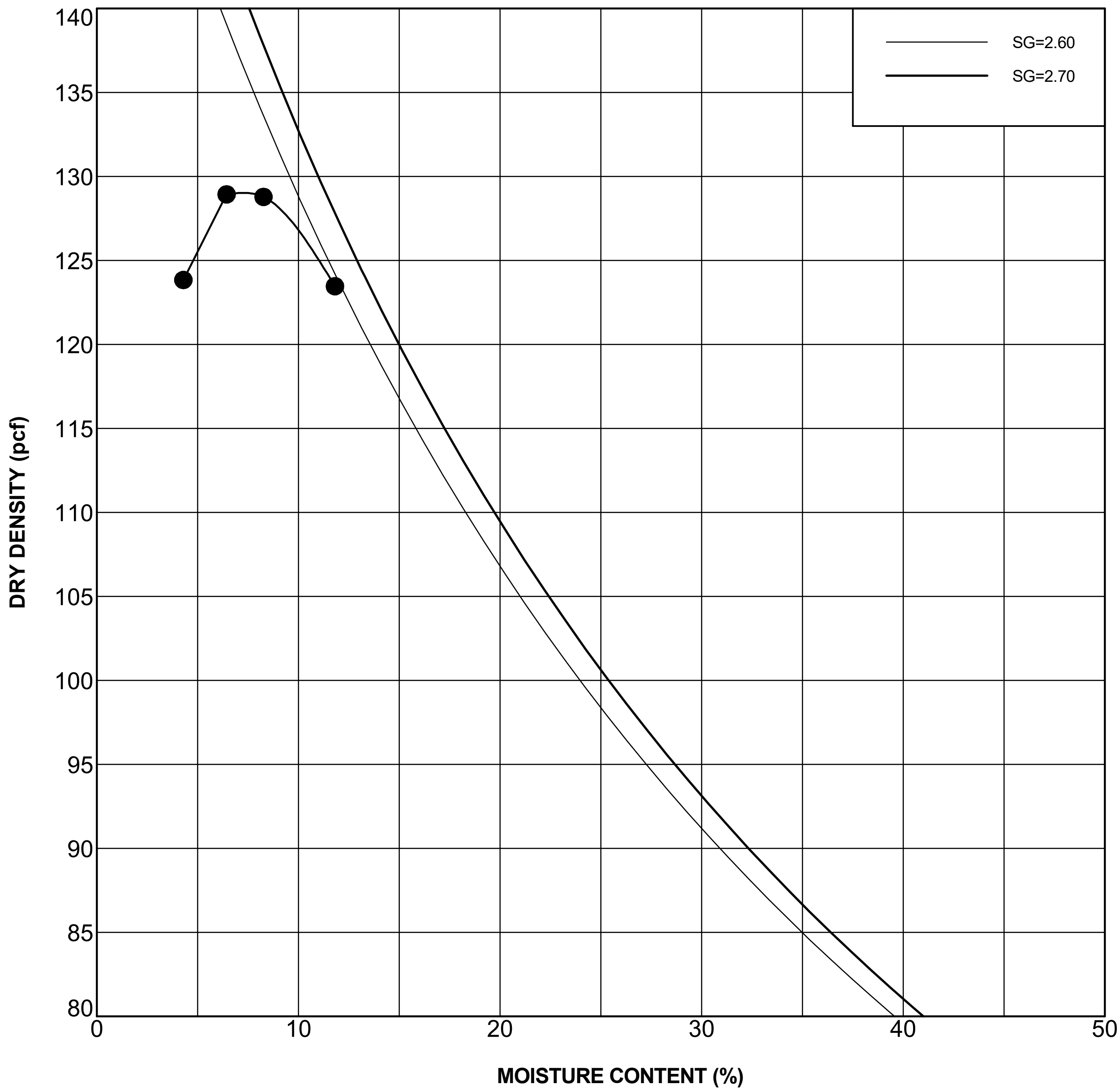


Boring Number	Depth (feet)	Geologic Unit	Test Symbol	Insitu Water Content (%)	LL	PL	PI	Classification
TP- 1	5.0	Af	●	7	40	17	23	CLAYEY SAND (SC)
TP-10	1.0	Ts	⊠	6	30	18	12	CLAYEY SAND (SC)

ATTERBERG LIMITS

Project: The Oaks at Trabuco

Project No. 21-170-00



Boring Number	Depth (feet)	Geologic Unit	Symbol	Maximum Dry Density, pcf	Optimum Moisture Content, %	Classification
TP- 1	5.0	Af	●	129.0	7.5	CLAYEY SAND (SC)

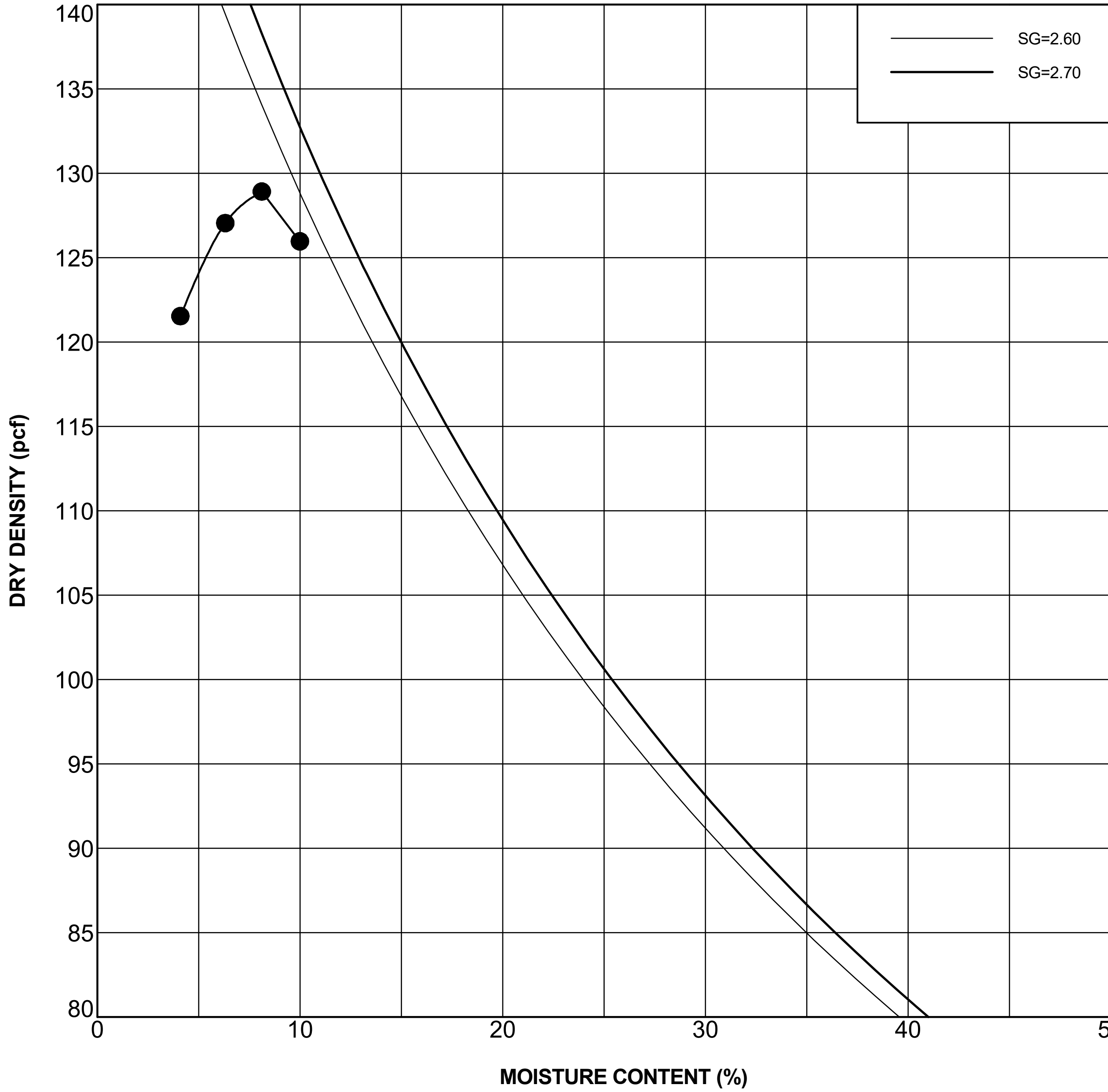
DVTCOMP 21-170-00.GPJ 9/21/21

COMPACTION TEST DATA

Project: The Oaks at Trabuco

Project No. 21-170-00

GMU



Boring Number	Depth (feet)	Geologic Unit	Symbol	Maximum Dry Density, pcf	Optimum Moisture Content, %	Classification
TP-10	1.0	Ts	●	128	8	CLAYEY SAND (SC)

DVTCOMP 21-170-00.GPJ 9/21/21

COMPACTION TEST DATA

Project: The Oaks at Trabuco

Project No. 21-170-00

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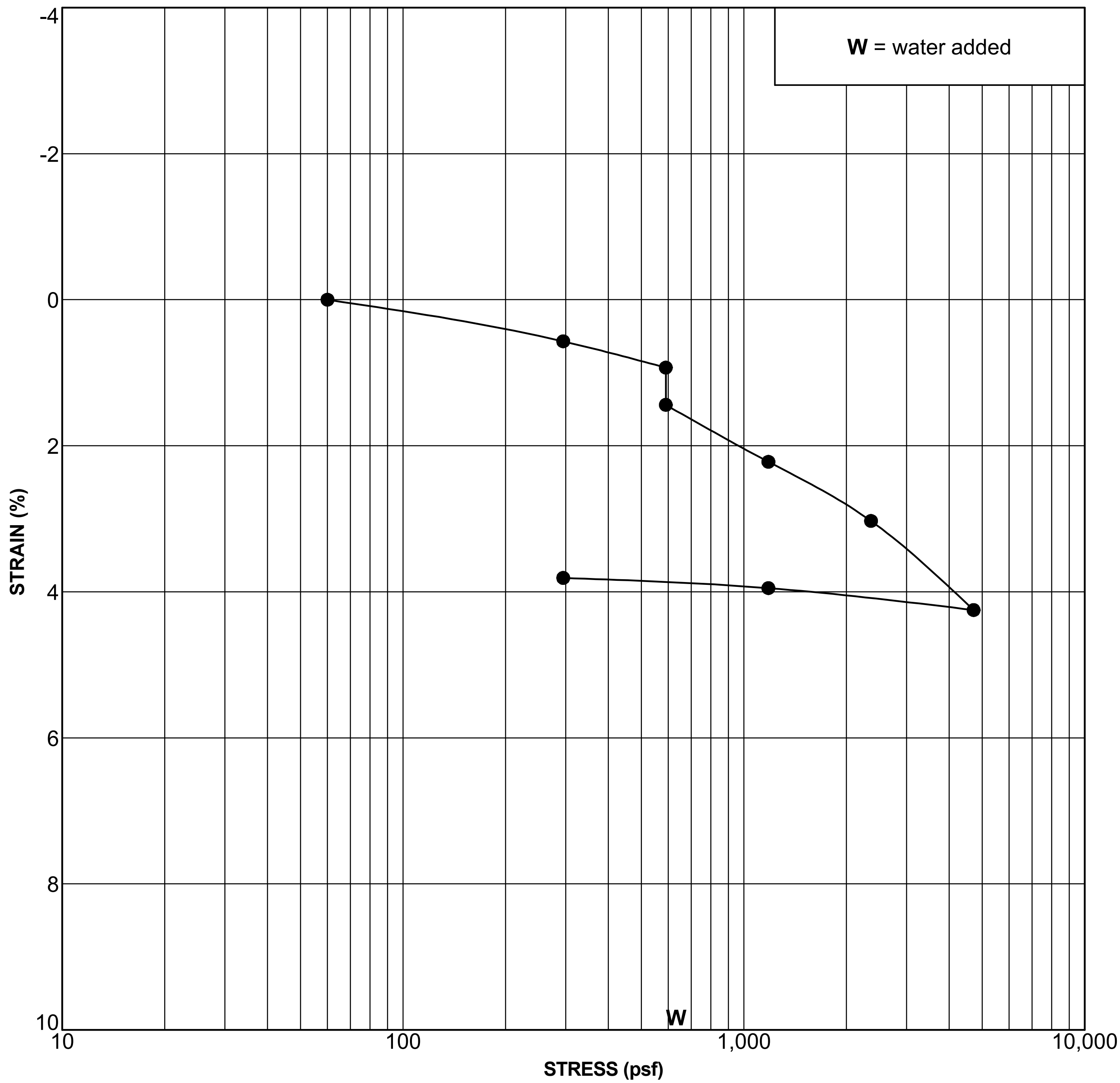


GMU_CONSOL 21-170-00.GPJ GM&U.GDT 9/21/21

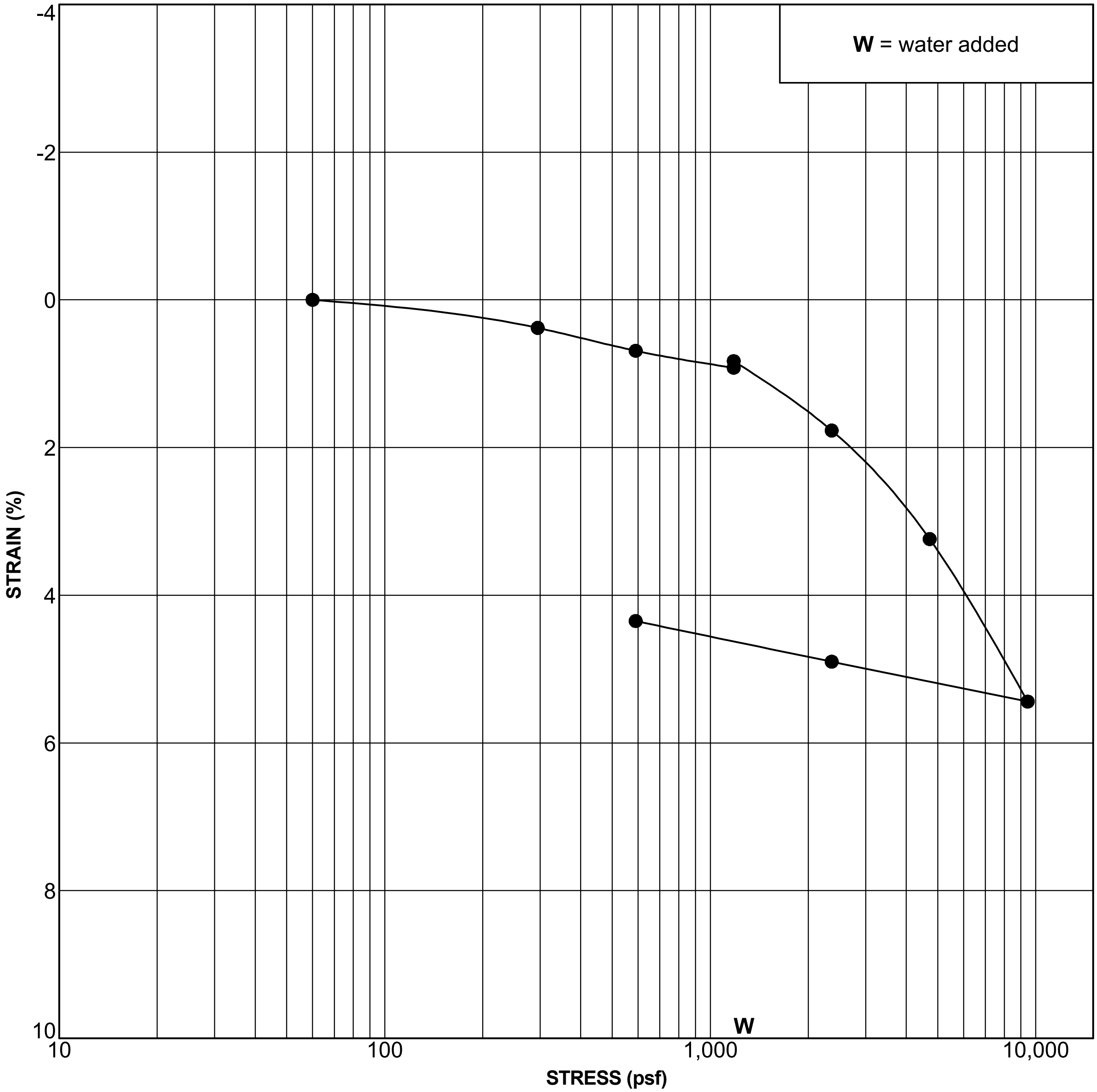
Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
TP- 2	3.5	Qal	●	In Situ	0.51	SILTY SAND (SM)

CONSOLIDATION TEST DATA

Project: The Oaks at Trabuco

Project No. 21-170-00

GMU



GMU_CONSOL 21-170-00.GPJ GM&U.GDT 9/21/21

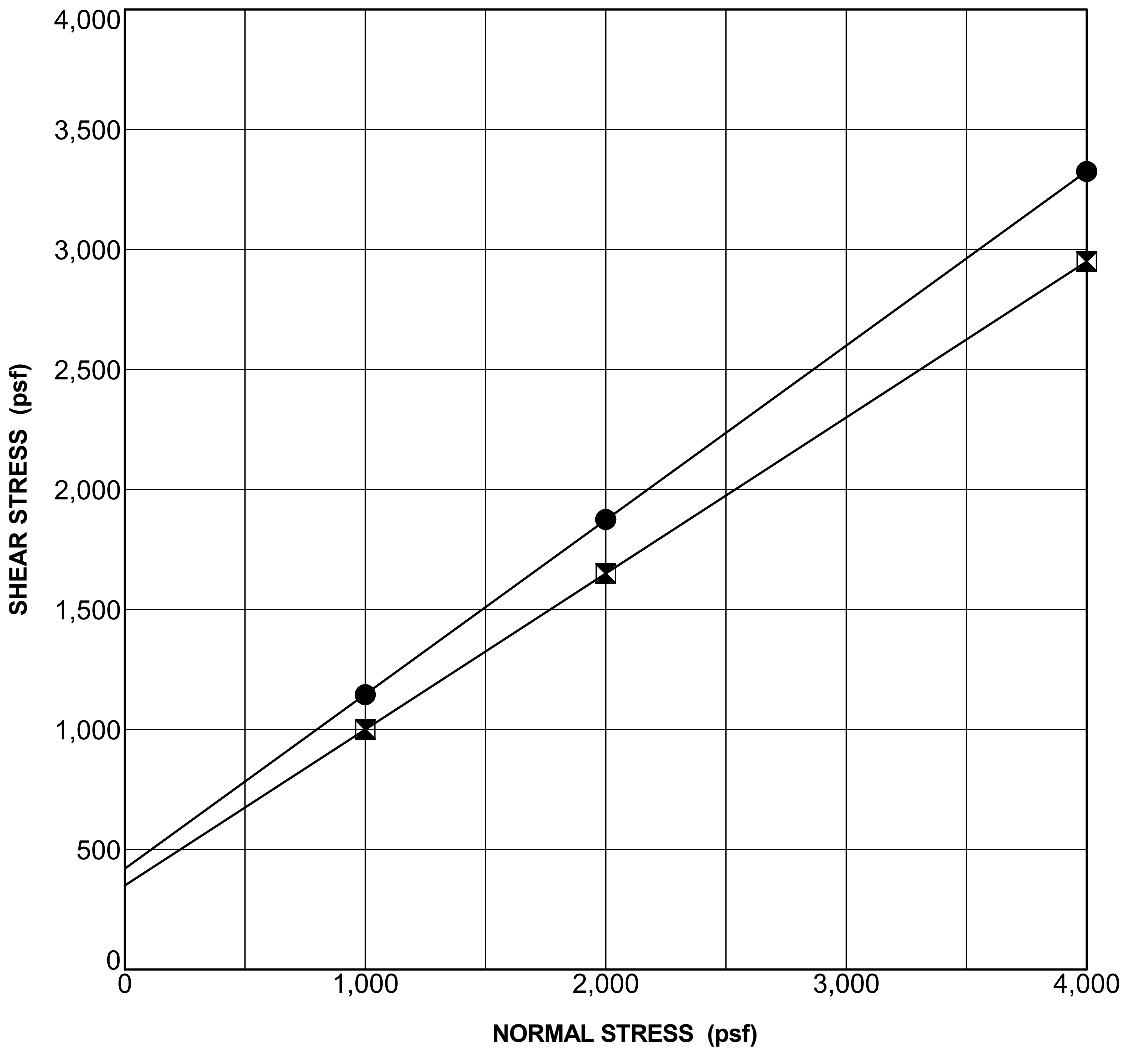
Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
TP- 2	7.5	Qal	●	In Situ	-0.09	SILTY SAND (SM)

CONSOLIDATION TEST DATA

Project: The Oaks at Trabuco

Project No. 21-170-00

GMU



SAMPLE AND TEST DESCRIPTION
Sample Location: TP- 7 @ 3.0 ft **Geologic Unit:** Ts **Classification:** SANDSTONE **Strain Rate (in/min):** 0.005 **Sample Preparation:** Undisturbed **Notes:** Sample saturated prior and during shearing

STRENGTH PARAMETERS		
STRENGTH TYPE	**COHESION (psf)**	**FRICTION ANGLE (degrees)**
● Peak Strength	420	36.0
⧗ Ultimate Strength	350	33.0

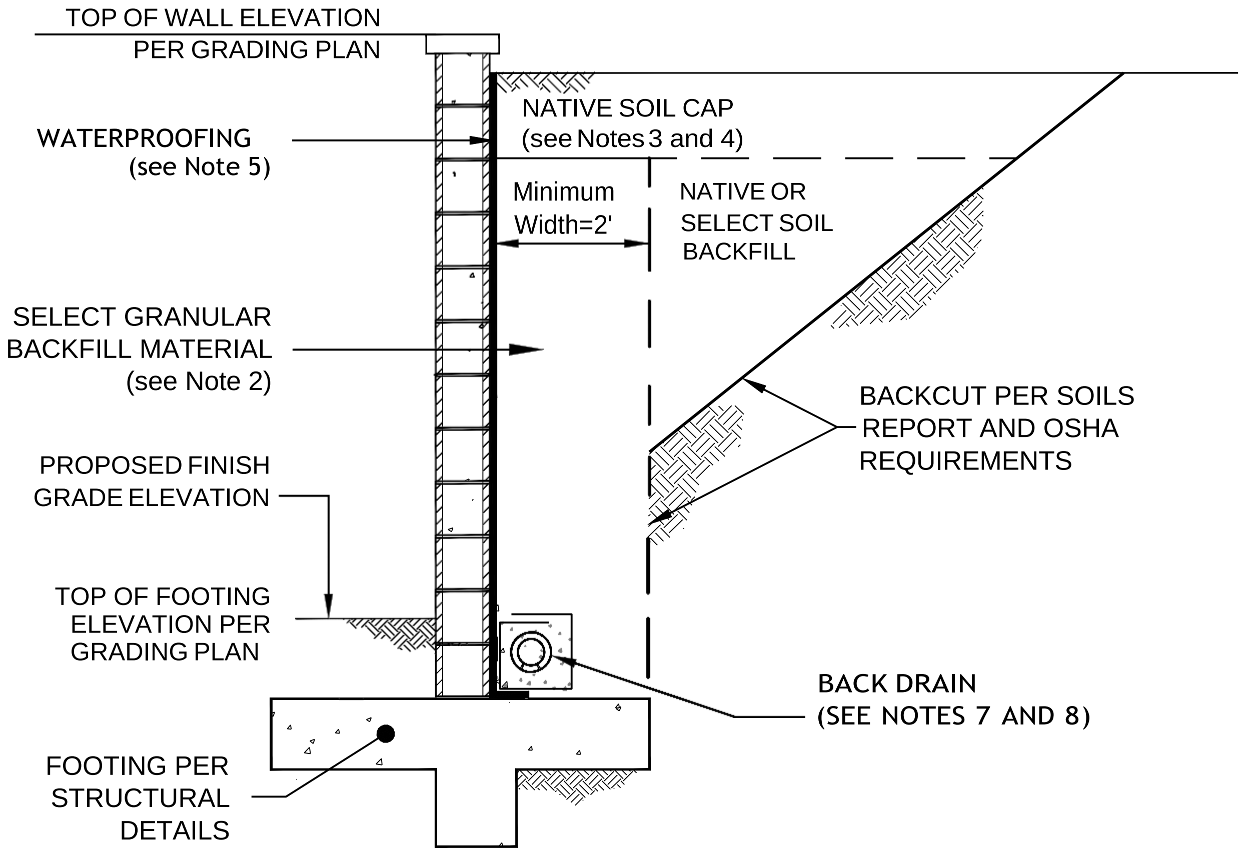
SHEAR TEST DATA

Project: The Oaks at Trabuco
Project No. 21-170-00

GMU

APPENDIX C

Retaining Wall Construction Details



RETAINING WALL DETAIL

NOT TO SCALE

1. FINAL DETERMINATION OF THE MATERIAL TO BE USED FOR BACKFILL SHALL BE MADE BY GMU.
2. ALL SELECT BACKFILL TO WITHIN 1 TO 2 FEET OF FINAL GRADE SHOULD CONSIST OF FREE-DRAINING GRANULAR MATERIAL (I.E. SE 30 SAND, PEA GRAVEL, OR CRUSHED ROCK). CRUSHED ROCK, IF USED, SHOULD BE WRAPPED IN FILTER FABRIC (MIRAFI 140N OR EQUIVALENT) TO MINIMIZE THE POTENTIAL FOR MIGRATION OF FINES INTO THE ROCK. THE SELECT BACKFILL SHOULD BE MOISTURE CONDITIONED TO ACHIEVE OVER OPTIMUM MOISTURE CONTENT AND COMPACTED TO AT LEAST 90% RELATIVE COMPACTION AS DETERMINED BY ASTM TEST METHOD D 1557.
3. FINE-GRAINED NATIVE SOILS SHOULD BE USED TO CAP THE SELECT BACKFILL ZONE.
4. ALL NATIVE OR SELECT SOIL WALL BACKFILL SHOULD BE MOISTURE CONDITIONED AS NECESSARY TO A MINIMUM 2% OVER THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO AT LEAST 90% RELATIVE COMPACTION AS DETERMINED BY ASTM TEST METHOD D 1557.
5. THE BACKSIDE OF THE WALLS SHOULD BE WATERPROOFED DOWN TO AND ACROSS THE TOP OF THE FOOTING. THE DESIGN AND SELECTION OF THE WATERPROOFING SYSTEM IS OUTSIDE THE SCOPE OF THIS REPORT.
6. THE WATERPROOFING SYSTEM AND ANY DRAIN BOARDS SHOULD BE PROTECTED FROM DAMAGE BY CONSTRUCTION ACTIVITIES. THE TOP EDGE OF THE WATERPROOFING AND ANY DRAIN BOARDS SHOULD BE PROPERLY ADHERED TO THE WALL AND SEALED TO PREVENT THE POSSIBLE ACCUMULATION OF DEBRIS BETWEEN THE DRAINAGE/WATERPROOFING SYSTEM AND THE WALL.
7. THE BACKDRAIN SYSTEM SHOULD CONSIST OF 4" PERFORATED PIPE SURROUNDED BY AT LEAST ONE CUBIC FOOT OF 3/4"-1.5" OPEN GRADED GRAVEL WRAPPED IN MIRAFI 140N FILTER FABRIC (OR EQUIVALENT). THE PERFORATED PIPE SHOULD CONSIST OF SDR-35 OR SCHEDULE 40 PVC PIPE (OR APPROVED EQUIVALENT) LAID ON AT LEAST 2" OF CRUSHED ROCK WITH THE PERFORATIONS LAID DOWN. THE BACKDRAIN GRADIENT SHOULD NOT BE LESS THAN 1% WHEN POSSIBLE. THE PERFORATED PIPE SHOULD OUTLET INTO AREA DRAINS AT RUNS OF 200 FEET OR LESS, IF PRACTICAL. IF THE BACKDRAINS CANNOT BE OUTLETTED BY GRAVITY FLOW, A SUMP PUMYP SYSTEM WILL NEED TO BE DESIGNED AND CONSTRUCTED. REDUNDANT BACK-UP PUMPS AND COMPONENTS ARE RECOMMENDED. DESIGN OF THIS SYSTEM IS OUTSIDE OF THE PURVIEW OF GMU.
8. THE TIE-IN LOCATIONS FOR BACKDRAIN OUTLETS SHOULD BE SHOWN ON THE PRECISE GRADING, SITE WALL, AND/OR LANDSCAPE PLANS.

GMU	RETAINING WALL CONSTRUCTION DETAIL	PLATE C-1

APPENDIX D

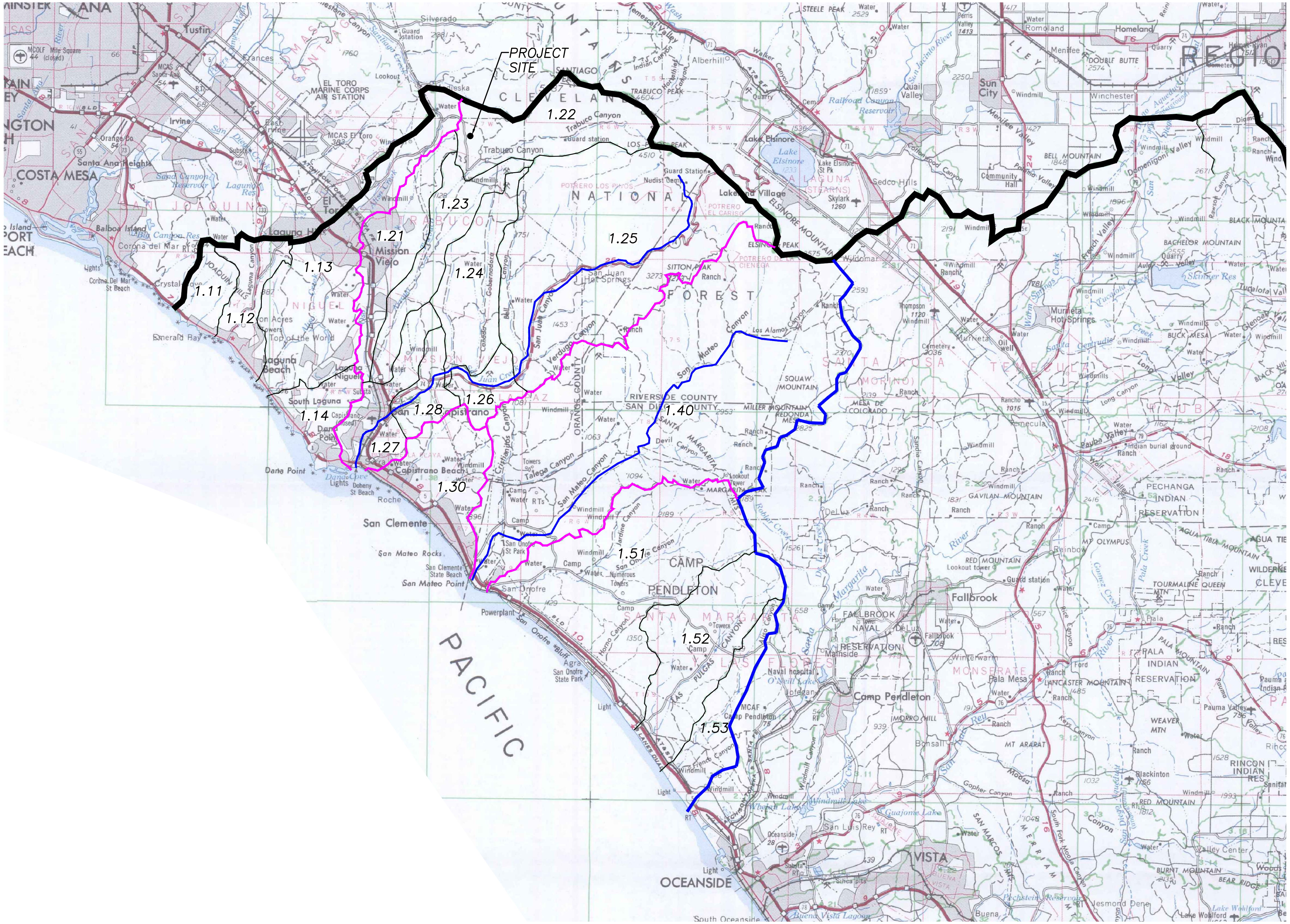
Concrete Flatwork Recommendations

APPENDIX E
CONCRETE FLATWORK RECOMMENDATIONS
THE OAKS AT TRABUCO CANYON, LOTS 3, 4, 6, 7 and 8, TRACT 14749, TRABUCO CANYON, COUNTY OF ORANGE

Description	Subgrade Preparation	Minimum Concrete Thickness (Full)	Edge Thickness	Reinforcement[2]	Control Joint Spacing (Maximum)	Cement Type	Corrosion Resistance
Concrete Sidewalks and Walkways (≤5 feet in width) [4]	1) 2% over optimum to 12" [1], 2) optional 2" of well graded rock (i.e., Class II base or equiv.) above moisture conditioned subgrade.	4 inches	Not Required	1) No. 3 bars at 18" o.c. [2] , 2) where adjacent to curbs or structures and at cold joints use dowels: No. 3 bars at 18" o.c. [5]	5 feet	II/V	(3)
Concrete Patios, Courtyards and Walkways (>5 feet in width) [4]	1) 2% over optimum to 18"[1], 2) optional 2" of well graded rock (i.e., Class II base or equiv.) above moisture conditioned subgrade.	5 inches	Where adjacent to landscape areas – 8" from adjacent finish grade. Min. 8" width	1) No. 3 bars at 18" o.c. [2] extend into thickened edge, 2) where adjacent to structures and at cold joints use dowels: No 3 bars @ 18" o.c. [5]	8 feet	II/V	(3)
Concrete Driveways[4]	1) 2% over optimum to 18" [1], 2) optional 2" of well graded rock (i.e., Class II base or equiv.) above moisture conditioned subgrade.	6 inches	Where adjacent to landscape areas - 8" from adjacent finish grade. Min. 8" width	1) No. 3 bars @ 18" o.c. [2] extend into thickened edge; 2) dowel into garage slab and where adjacent to sidewalks, curbs and at cold joint - use dowels: No. 3 bars @ 18" o.c. [5]	10 feet	II/V	(3)
Tile and/or Stone Patios, Entry's, & Courtyards [4]	1) 2% over optimum to 18"[1], 2) optional 2 inches of well graded rock (i.e., Class II base or equiv.) above moisture conditioned subgrade.	5 inch concrete sub slab	Where adjacent to landscape areas - 8" from adjacent finish grade. Min. 8" width	1) Slab – No. 3 bars @ 18" o.c. [2] extend into thickened edge. Where adjacent to structures curbs and at cold joints use dowels: No. 3 bars at 18" o.c. [5]	10 feet	II/V	(3)
Concrete Interlocking Pavers (non-vehicular) [4,6]	1) 2% over optimum to 18"[1], 2) 4 inches of CAB or CMB compacted to a minimum of 95% relative compaction or concrete sub slab may be used in lieu of base section (see adjacent columns).	3.5 inch concrete sub slab if base section not used	Where adjacent to landscape areas - 8" from adjacent finish grade. Min. 8" width	1) Slab – No. 3 bars @ 18" o.c. [2] extend into thickened edge, 2) where adjacent to structures, curbs, etc. and at cold joints - use dowels: No. 3 @ 18" o.c. [5]	10 feet	II/V	(3)
Concrete Interlocking Pavers (vehicular) [4, 6]	1) 2% over optimum to 18"[1] 2) 8 inches of CAB or CMB compacted to a minimum of 95% relative compaction over Mirafi 600X or equivalent fabric or concrete sub slab may be used in lieu of base/fabric section (see adjacent columns)	5 inch concrete sub slab if base section not used	Where adjacent to landscape areas - 8" from adjacent finish grade. Min. 8" width	1) Slab – No. 3 bars @ 18" o.c. [2] extend into thickened edge, 2) where adjacent to curbs and at cold joinsts - use dowels: No. 3 bars @ 18" o.c. [5] Driveways: dowel into garage grade beam – No. 3 bars @ 18" o.c. [5]	10 feet	II/V	(3)

(1) The moisture content of the subgrade must be verified by the geotechnical consultant prior to sand/rock placement.
(2) Reinforcement to be placed at or above the mid-point of the slab (i.e., a minimum of 2.0 to 2.5 inches above the prepared subgrade).
(3) Soils having negligible sulfates and low chlorides as defined by CBC are expected. Concrete mix design shall be selected by the concrete designer. Concrete mix design is outside the geotechnical engineer's purview.
(4) Where flatwork is adjacent a stucco surface, a ¼" to ½" foam separation/expansion joint should be used.
(5) If dowels are placed in cored holes, the core holes shall be placed at alternating in-plane angles (i.e., not cored straight into slab).
(6) Pavers to be installed per minimum manufacturers recommendations.
General Note: Minor deviations to the above recommendations may be required at the discretion of the soils engineer or his representative.

Attachment H: Figures and Exhibits



LEGEND

- Regional Boundary
- Hydrologic Unit Boundary (HU)
- Hydrologic Area Boundary (HA)
- Hydrologic Subarea Boundary (SA)
- FLOW PATH

901.00	SAN JUAN HYDROLOGIC UNIT
901.10	Laguna HA
1.11	San Joaquin Hills HSA
1.12	Laguna Beach HSA
1.13	Aliso HSA
1.14	Dana Point HSA
901.20	Mission Viejo HA
1.21	Oso HSA
1.22	Upper Trabuco HSA
1.23	Middle Trabuco HSA
1.24	Gobernadora HSA
1.25	Upper San Juan HSA
1.26	Middle San Juan HSA
1.27	Lower San Juan HSA
1.28	Ortega HSA
901.30	San Clemente HA
1.31	Prima Deshecha HSA
1.32	Segunda Deshecha HSA
901.40	San Mateo Canyon HA
901.50	San Onofre HA
1.51	San Onofre Valley HSA
1.52	Las Pulgas HSA
1.53	Stuart HSA

TRACT 14749
RECEIVING WATERS MAP

N

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

FIGURE 1

Drawing Name: O:\166.09.21\Engineering\WQMP\Lot 4 WQMP\Exhibits\Receiving Waters Map.dwg
Last Opened: Jan 24, 2022 - 11:47am by jcarver

THE OAKS-TRACT 14749 LOT 4

COUNTY OF ORANGE, STATE OF CALIFORNIA

CONCEPTUAL DMA EXHIBIT PA NO. 22-0015

SOURCE CONTROL BMP SUMMARY	
SC-A	ON-SITE STORM DRAIN INLETS
SC-D1	NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
SC-D2	LANDSCAPE/OUTDOOR PESTICIDE USE
SC-E	POOLS, SPAS, PONDS, FOUNTAINS, AND OTHER WATER FEAUTRES
SC-G	REFUSE AREAS
SC-J	VEHICLE AND EQUIPMENT CLEANING
SC-K	VEHICLE/EQUIPMENT MAINTENANCE AND REPAIR
SC-N	FIRE SPRINKLER TEST WATER
SC-O	MISCELLANEOUS DRAIN OR WASH WATER
SC-P	PLAZAS, SIDEWALKS, AND PARKING LOTS

N

GRAPHIC SCALE
20' 0 10' 20' 40'
1" = 20'

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EXHIBIT "A"

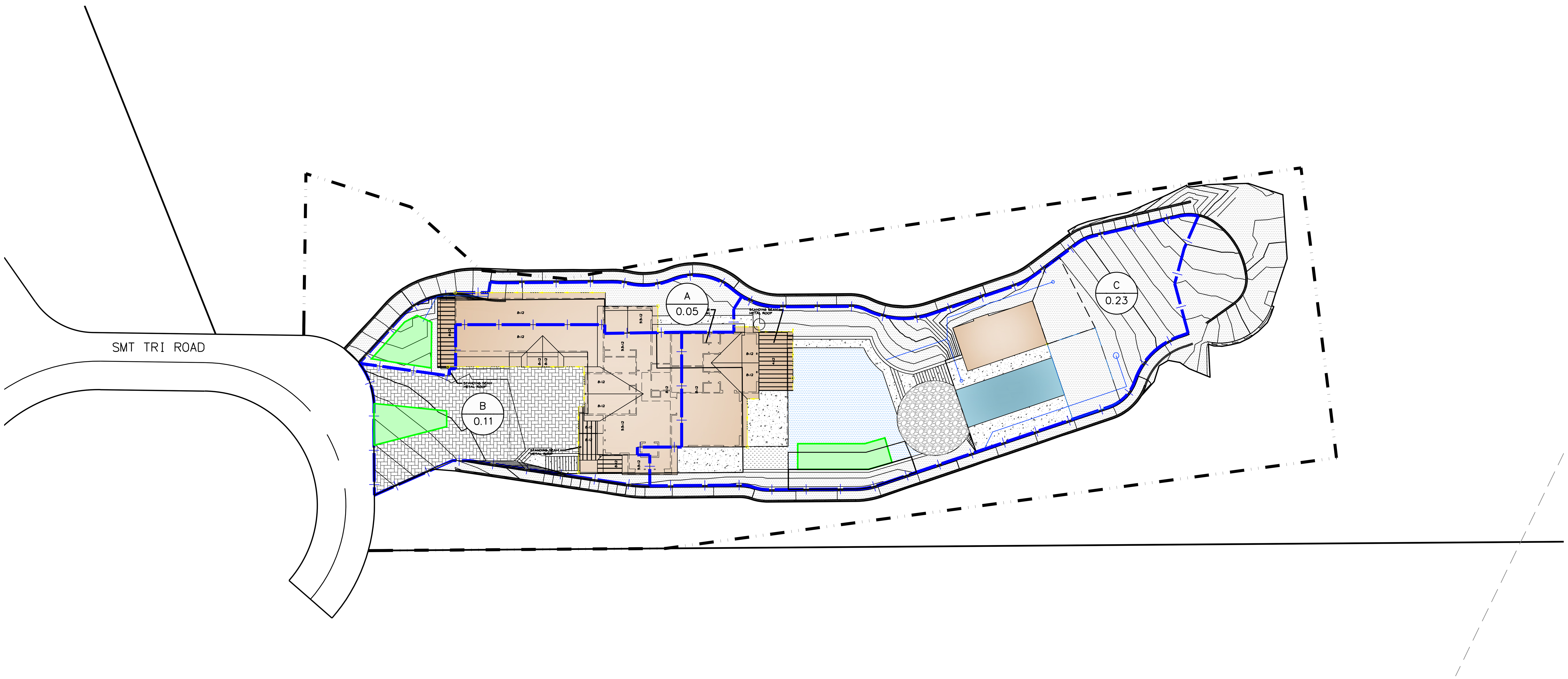
THE OAKS-TRACT 15988 LOT 4

CONCEPTUAL WQMP
EXHIBIT PA NO. 22-0015

THE OAKS-TRACT 14749 LOT 4

COUNTY OF ORANGE, STATE OF CALIFORNIA

CONCEPTUAL LAND COVER MAP PA NO. 22-0015



LEGEND:

- ROOF TOP AREA
- HARDSCAPE AREA
- LANDSCAPE AREA
- LAWN AREA
- LANDSCAPE AREA (HSC AREA)
- PAVER AREA
- POOL AREA
- GRAVEL AREA
- LANDSCAPE AREA (BMP AREA)

LEGEND:

- XXX / X.X — DMA / ACRES
- DMA BOUNDARY
- SURFACE FLOW PATH
- STORM DRAIN FLOW PATH
- LIMITS OF DVELOPMENTS

DMA AREA SUMMARY TABLE

DMA	ROOF TOP AREA (SF)	HARDSCAPE AREA (SF)	LANDSCAPE AREA (SF)	LAWN AREA (SF)	PAVER AREA (SF)*	POOL AREA (SF)	GRAVEL AREA (SF)	TOTAL AREA (SF)	TOTAL AREA (AC)	IMPERVIOUS PERCENT
A	921.10	81.37	1,156.00	0.00	0.00	0.00	0.00	2,158.47	0.05	46%
B	2,299.12	0.00	506.27	0.00	2,213.08	0.00	0.00	5,018.47	0.11	59%
C	1,758.56	1,489.58	5,836.72	128.67	0.00	491.97	505.11	10,210.61	0.23	37%

*NOTE: PAVER AREA ANALYZED AS 70% IMPERVIOUS.

GRAPHIC SCALE
20' 0 10' 20' 40'
1" = 20'

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EXHIBIT "?"

THE OAKS-TRACT 15988 LOT 4

CONCEPTUAL LAND COVER MAP PA NO. 22-0015