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Appendix F:

Hydrology and Water Quality Supporting Information

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F.1 - Water Quality Management Plan

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Preliminary Water Quality Management Plan

(WQMP)

Project Name:

Presidio

15 Argonaut

Aliso Viejo, CA 92656

Prepared for:

Brandywine Homes

2355 Main Street, Suite 220

Irvine, CA 92614

Prepared by:

Advanced Civil Group, Inc.

Engineer: R. Steven Austin, PE

Registration No. 68795

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(866) 338-5778

Engineer's Seal



Prepared on:

April 7, 2026

Revised on:

May 28, 2026

Revised on:

July 8, 2026

Project Owner's Certification			
Permit/Application No.		Grading Permit No.	
Tract/Parcel Map No.	Tract No. 19489	Building Permit No.	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			623-093-10 and 623-093-11

This Water Quality Management Plan (WQMP) has been prepared for Presidio by Advanced Civil Group, 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:	**Emanual Robinson**		
Title	Owner's Representative		
Company			
Address	2355 Main Street, Suite 220, Irvine, CA 92614		
Email	emanual@brandywine-homes.com		
Telephone #	925-389-8632		
Signature		Date	

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Section 1 Discretionary Permit(s) and Water Quality Conditions

Project Infomation			
Permit/Application No.		Site Address or Tract/Parcel Map No.	15 Argonaut, Aliso Viejo, CA 92656
Additional Information/ Comments:	58 unit townhome development		
Water Quality Conditions			
Water Quality Conditions from prior approvals or applicable watershed-based plans	None		

Section 2 Project Description

2.1 General Description

Description of Proposed Project				
Site Location	15 Argonaut, Aliso Viejo, CA 92656			
Project Area (ft^2) 137,650	Number of Dwelling Units: 58		SIC Code: NA	
Narrative Project Description:	The project site is located at 15 Argonaut, Aliso Viejo, CA 92656. The project consists of 58 townhomes with associated drive aisles, sidewalks, parking, and landscaping. The north and west boundaries feature a 2:1 slope where v-ditches intercept undeveloped run-on and divert it through the site for untreated discharge into Argonaut. Because the development creates 48,700 square feet of impervious surface—exceeding the 10,000-square-foot threshold—it is classified as a Priority Project, requiring permanent Best Management Practices (BMPs) and water quality treatment for all onsite runoff.			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	1.21 ac	38%	1.95 ac	62%
Post-Project Conditions	1.12 ac	35%	2.04 ac	65%

2.2 Post Development Drainage Characteristics

The proposed redevelopment replaces an existing commercial property that slopes from northwest to southeast. The northern and western boundaries feature a 2:1 hillside slope with v-ditches that intercept runoff; under the new design, this drainage will be conveyed through underground pipes to the front of the property, maintaining existing hydraulic patterns. Onsite stormwater will be collected via area drains and directed to a biofiltration system for treatment before being pumped for final discharge into Argonaut.

2.3 Property Ownership/Management

The property is owned by Brandywine Homes.

Section 3 Site & Watershed Characterization

3.1 Site Conditions

3.1.1 Existing Site Conditions

The subject site is located at 15 Argonaut, Aliso Viejo, CA. The site is bounded on the north by Glenwood Drive, on the west by Aliso Viejo Pkwy, and the south and east by commercial developments. The north and west side of the property consists of a 2:1 hillside slope which drains to v-ditches. The runoff from the v-ditches discharge to the surface and flow to the front of the property along with all other surface flows where it discharges to Argonaut.

Existing Land Uses				
Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Commercial Development	3.16	1.21	1.95	62%
Total	3.16	1.21	1.95	62%

3.1.2 Infiltration-Related Characteristics

3.1.2.1 Hydrogeologic Conditions

Regionally, the subject site is located in the Peninsular Ranges geomorphic province, which characterizes the southwest portion of southern California where right-lateral major active fault zones predominately trend northwest-southeast. The Peninsular Ranges province is composed of plutonic and metamorphic rock, with lesser amounts of Tertiary volcanic and sedimentary rock, Quaternary drainage in-fills and sedimentary veneers.

3.1.2.2 Soil and Geologic Infiltration Characteristics

Monterey Formation: The Miocene-age Monterey Formation observed onsite primarily consists of silty sandstone, clayey sandstone, sandy claystone, sandstone, and claystone. The fine grained silty sandstone onsite is pale brown, white, dark yellowish brown, and brown in a slightly moist to moist and medium dense to very dense condition. The fine grained clayey sandstone onsite is pale brown, white, dark brown, brown, gray, light gray, dark grayish brown, and bluish gray in a slightly moist to moist and medium dense to dense condition. The sandy claystone onsite is dark

brown, brown, and gray in a moist and stiff to very stiff condition. The very fine to fine grained sandstone onsite is pale brown, yellowish brown, grayish pale brow, and orange in a slightly moist and medium dense to very dense condition. The claystone onsite is dark brown to brown in a moist and very stiff condition. This unit was logged to a depth of 51.5 feet below the ground surface and is overlain by a thin layer of asphalt.

3.1.2.3 Geotechnical Conditions

Groundwater was not encountered during our subsurface investigation. Based on state-provided information, the historic-high groundwater is greater than 20.0 feet below the ground surface (CGS, 2001). The most recent groundwater data retrieved from the nearest groundwater monitoring site, site ID 336555N1176965W001, was recorded in 2024 and indicates groundwater was approximately greater than 60.0-feet at that time (CDWR, 2025).

3.1.2.4 Summary of Infiltration Opportunities and Constraints of Existing Site

Infiltration will not suffice, due to the existing constraints with the existing soil conditions. Therefore, the project will require biofiltration.

3.2 Proposed Site Development Activities

3.2.1 Overview of Site Development Activities

The proposed site development consist of 58 townhomes, drive aisles, sidewalks, and landscape amenities.

3.2.2 Project Attributes Influencing Stormwater Management

Potential pollutant-generating activities include:

- Automobile repair and maintenance
- Automobile washing/ parking
- Home and garden care activities
- Pet Waste
- Green waste
- Irrigation

Plants known to have excessive root systems should also be avoided near structural improvements as they can cause heave conditions. Drought-resistant and maintenance-free plant species are recommended.

Proposed Land Uses				
Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Hardscape and Buildings	2.04	2.04	0	65%
Landscape	1.12	0	1.12	35%
Total	3.16			

3.2.3 Effects on Infiltration and Harvest and Use Feasibility

The existing soil type does not allow for adequate infiltration; however the site has been designed to try to drain hardscape areas into pervious areas to help increase the amount of natural infiltration. Harvest and use feasibility was also considered. A comparison of the Design Capture Volume (DCV) in gallons was compared to an estimated net wet season total water use (ETWU) in gallons. The results show that the DCV is greater than the ETWU, which makes harvest and use infeasible. Please see calculations in the Attachments. The proposed biofiltration system is required to treat the majority of the low flow runoff, due to the inability of adequate infiltration of the site with the existing soil type.

3.3 Receiving Waterbodies

Stormwater runoff from the project site discharges onto Argonaut, where it is conveyed via curb and gutter eastward to a catch basin. From there, flows are directed into Aliso Creek, eventually discharging into the Pacific Ocean.

303(d) List

Aliso Creek: Indicator Bacteria, Nutrients, Selenium, Malathion, Benthic Community Effects

TMDL

Aliso Creek: Total Coliform, Fecal Coliform, Enterococcus

3.4 Stormwater Pollutants or Conditions of Concern

Residential water quality issues and related potential pollutants include the landscape planning and site design of the project. These proposed swales can trap pollutants such as suspended solids, oil and grease, as well as trace metals and it will reduce the flow velocity of storm water runoff.

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	Yes	No	Yes	Primary
Nutrients	Yes	No	Yes	Primary
Heavy Metals	No	No	Yes	Primary
Bacteria/Virus/Pathogens	Yes	No	Yes	Primary
Pesticides	No	No	Yes	Primary
Oil and Grease	Yes	No	No	No
Toxic Organic Compounds	No	No	No	No
Trash and Debris	Yes	No	No	No
Dry Weather Runoff	No	No	No	No

3.5 Hydrologic Conditions of Concern

Does a hydrologic condition of concern exist for this project

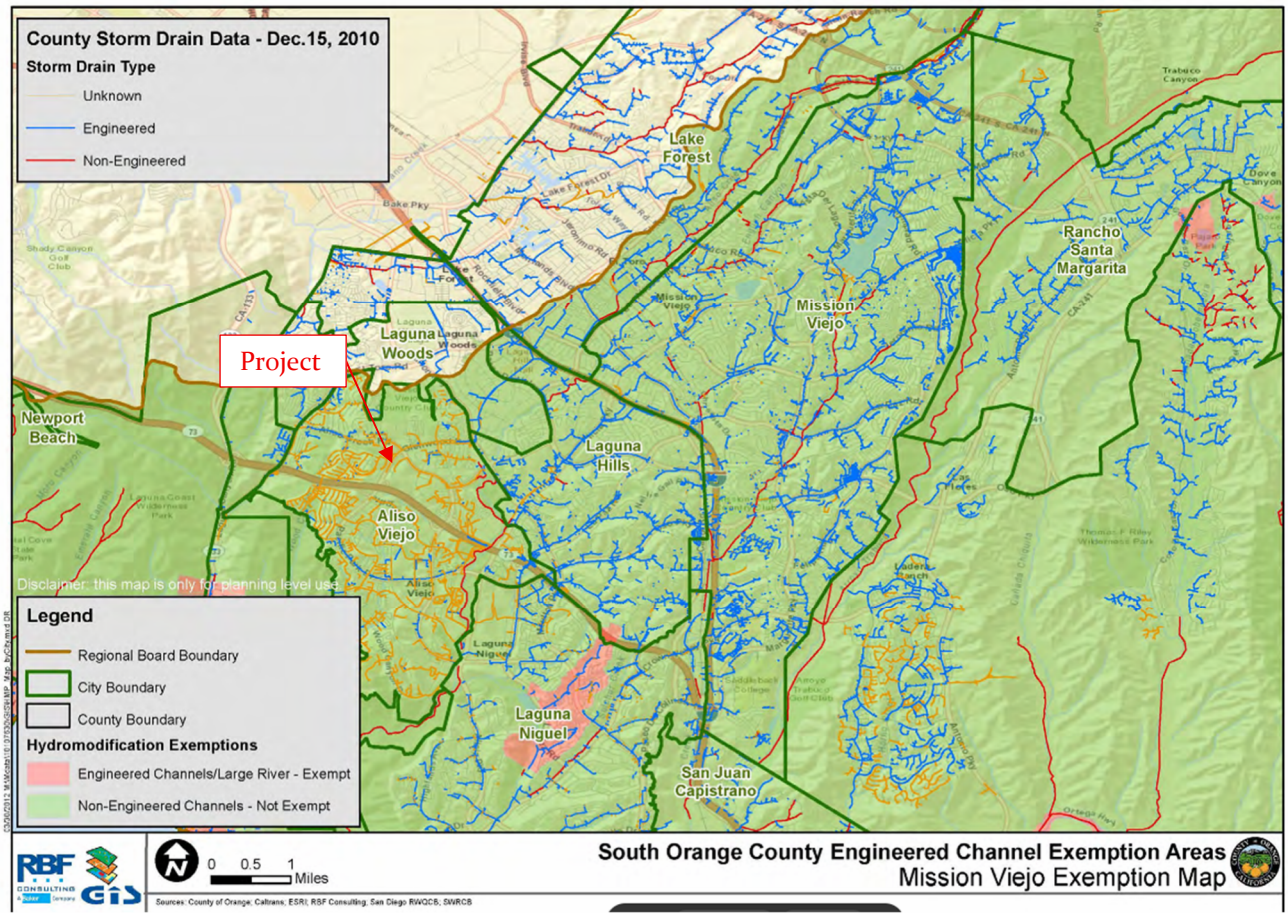
☐ No – An HCOC does not exist for this receiving water because *(select one)*:

- ☐ 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.

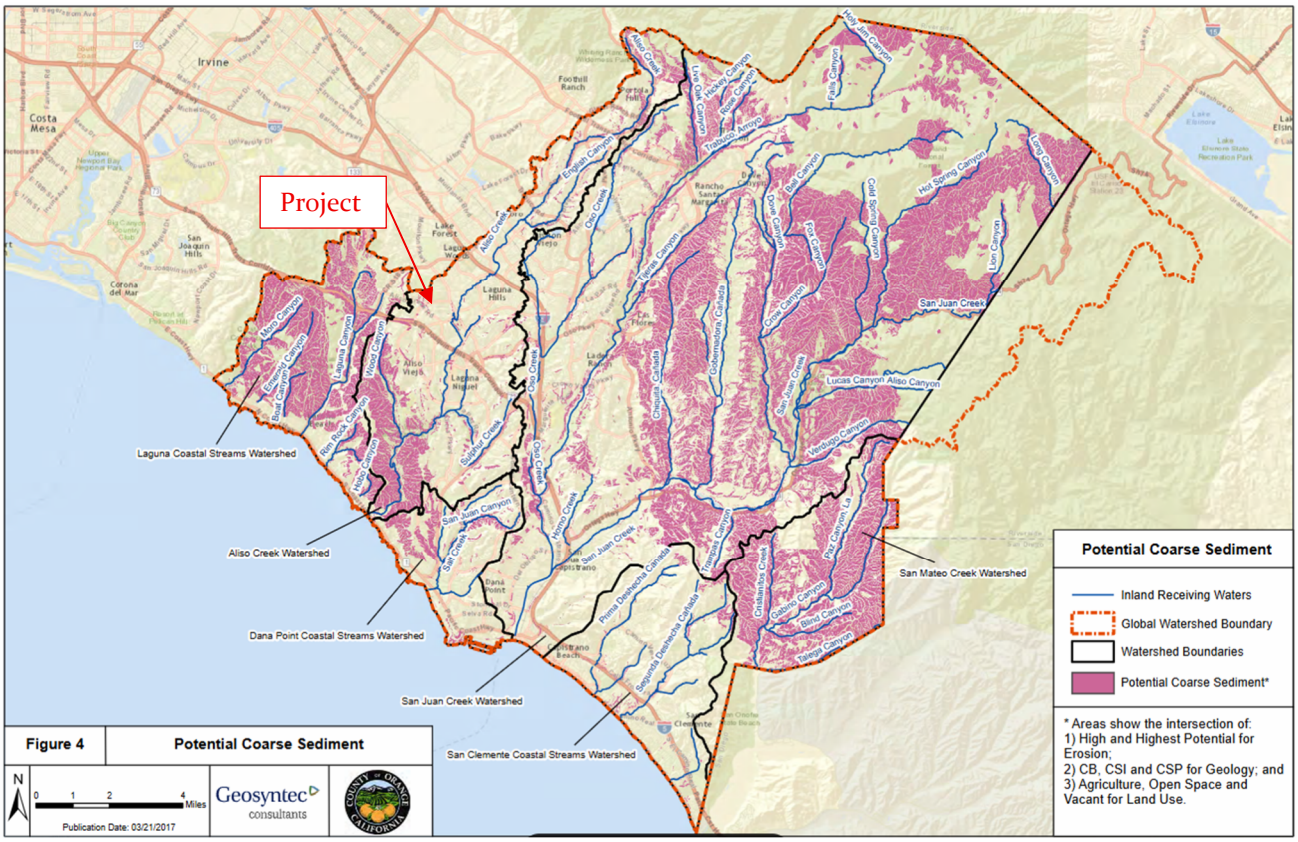
The projected is not exempt to hydromodification as shown on the TGD Exemption Maps.

The proposed project condition does not result in an increase in runoff, as demonstrated in the Drainage Report. The existing condition generates a higher runoff due to its commercial land use classification. Therefore, hydromodification requirements are satisfied, as the project does not increase runoff from existing to proposed conditions. See supporting calculations in the attachments.



3.6 Critical Course Sediment Yield Areas

There are no potential critical coarse sediment yield areas on the site per the potential coarse sediment map in Attachments of the technical guidance document.



Section 4 Site Plan and Drainage Plan

4.1 Drainage Management Area Delineation

The Project will be characterized with four drainage management areas, however only one area (DMA 1) will be required to treat runoff. The other three areas are from hillside runoff which will be routed through the site via underground storm drain pipes and will be discharged to Argonaut. DMA 1 consists of all proposed impervious areas and landscaped/pervious areas (see WQMP Site Plan). More specifically, DMA 1 will include flows originating from the buildings, drive aisles, hardscape, and landscape areas. Runoff from DMA 1 will be treated by a biofilter and then pumped to Argonaut.

4.2 Overall Site Design BMPs

Minimize Impervious Area - This Project was designed as a single-family residence with appropriate hardscape areas and drive.

Preserve Existing Drainage Patterns and Time of Concentration - Existing drainage patterns were preserved by limiting the grading area and preserving slope directions.

Disconnect Impervious Areas – Disconnect impervious areas through the use of landscape planters.

Protect Existing Vegetation and Sensitive Areas - Existing vegetation will be supplemented and/or replaced with additional vegetation.

Revegetate Disturbed Areas - The portion of the disturbed area that is pervious will be revegetated or overlain with synthetic grass.

Soil Stockpiling and Site Generated Organics - There will be no soil stockpiling or site generated organics as landscaping will be maintained by the owner on a regular basis.

Water Efficient Landscaping - Water efficient landscaping will be implemented.

Slopes and Channel Buffers - Slopes will be either undisturbed or vegetated.

4.3 DMA Characteristics and Site Design BMPs

4.3.1 DMA 1

DMA 1 consists of all proposed impervious areas and landscaped/pervious areas (see WQMP Site Plan). More specifically, DMA 1 will include flows originating from the buildings, drive aisles, hardscape, and landscape areas. Runoff from DMA 1 will be treated by a biofilter and then pumped to Argonaut.

4.3.3 DMA Summary

Drainage Management Areas				
DMA (Number/Description)	Total Area (acres)	Imperviousness (%)	Infiltration Feasibility Category (Full, Partial, or No Infiltration)	Hydrologic Source Controls Used
DMA 1	3.16	65%	No	None

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	X		
N2	Activity Restrictions	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance (How development will comply)		X	SINGLE-FAMILY RESIDENTIAL
N6	Local Industrial Permit Compliance		X	SINGLE-FAMILY RESIDENTIAL
N7	Spill Contingency Plan		X	SINGLE-FAMILY RESIDENTIAL
N8	Underground Storage Tank Compliance		X	SINGLE-FAMILY RESIDENTIAL
N9	Hazardous Materials Disclosure Compliance		X	SINGLE-FAMILY RESIDENTIAL
N10	Uniform Fire Code Implementation		X	SINGLE-FAMILY RESIDENTIAL

N11	Common Area Litter Control		X	SINGLE-FAMILY RESIDENTIAL
N12	Employee Training		X	SINGLE-FAMILY RESIDENTIAL
N13	Housekeeping of Loading Docks		X	SINGLE-FAMILY RESIDENTIAL
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		
N16	Retail Gasoline Outlets		X	SINGLE-FAMILY RESIDENTIAL

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	☐	☒	Residential Development
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	Residential Development
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	Residential Development
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	Slopes will be vegetated and (see WQMP Site Plan)
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☐	☒	RESIDENTIAL
S7	Maintenance bays	☐	☒	RESIDENTIAL
S8	Vehicle wash areas	☐	☒	RESIDENTIAL
S9	Outdoor processing areas	☐	☒	RESIDENTIAL
S10	Equipment wash areas	☐	☒	RESIDENTIAL

S11	Fueling areas	☐	☒	RESIDENTIAL
S12	Hillside landscaping	☒	☐	Slopes will be vegetated (see WQMP Site Plan)
S13	Wash water control for food preparation areas	☐	☒	RESIDENTIAL
S14	Community car wash racks	☐	☒	RESIDENTIAL

Section 5 Low Impact Development BMPs

5.1 LID BMPs

The project proposes to use a proprietary biotreatment system to treat stormwater runoff. A conventional biotreatment system was evaluated and sized (see the attached calculations); however, the proposed site development does not provide sufficient space to accommodate a conventional biotreatment facility. Although a proprietary biotreatment system is not the preferred option in the BMP selection process, it has been determined to be the only feasible treatment alternative for this site while meeting the project constraints.

The proposed project consists of a townhome development that has been designed to provide the minimum number of dwelling units necessary to maintain project feasibility while satisfying applicable fire access, grading, and life safety requirements. Any reduction in the proposed unit yield would result in an economically infeasible project due to fixed development costs and required infrastructure improvements.

Infiltration-based and volume retention BMPs were evaluated; however, these approaches are not feasible for the site. As documented in the project geotechnical/soils report, onsite soils are not suitable for infiltration; therefore, infiltration-based compliance is not viable.

The site is also constrained by the required infrastructure improvements necessary to support the development, including domestic water service (serving residential units and fire protection hydrants), sanitary sewer facilities, storm drain improvements for both hillside and developed area drainage, and electrical utilities. These improvements, in combination with grading constraints and fire access requirements, do not allow sufficient area for implementation of a conventional flow-through or storage-based treatment control system.

Based on the above constraints, the project qualifies as a space-limited project under Section 4.2.4.1, Option 2 (Project-Specific Space Allocation) of the WQMP requirements. A proprietary biotreatment system is therefore proposed as the most feasible treatment control BMP due to its compact footprint and ability to provide the required water quality treatment within the constrained development envelope without modification to the approved site layout or reduction in unit count.

5.1.1 Hydrologic Source Controls

No HSC's are applicable:

HSC-1: Not applicable due to the lack of infiltration potential at the site.
HSC-2: Not applicable due to the lack of infiltration potential at the site.
HSC-3: Not feasible because the required 20- to 30-foot tree canopy diameter cannot be achieved within the site constraints.

HSC-4: Not feasible because overflow dispersion requires a minimum 8-foot separation from buildings, which cannot be accommodated by the proposed site layout.
HSC-5: Not feasible due to the significant cost impacts to the project.
HSC-6: Not applicable due to the lack of infiltration potential at the site.

5.1.2 Structural LID BMP for DMA 1

Proprietary biotreatment (BIO-7) BMP's will be used to treat the stormwater runoff for DMA 1. This BMP satisfy the LID performance standard using the Flow-Based Compact Biofiltration Sizing Method. The required design flow rate for the BIO-7 BMP was calculate as follows:

Time of concentration (Tc) = 10 minutes

The time of concentration was calculated using the Orange County Hydrology Manual (OCHM) time of concentration nomograph (see time of concentration nomograph in Attachments). The time of concentration found by using the OCHM nomograph is 10 minutes.

$Q_{Design} = C \times i \times A \times 1.5$

$C = 0.75 \times imp + 0.15$

$C = 0.75 \times 0.65 + 0.15$

$C = 0.64$

$I_1 = 0.225$ in/hr

$Q_{Design} = 0.64 \times 0.225 \frac{in}{hr} \times 3.16\ acres$

$Q_{Design} = 0.45\ cfs$

$Q_{Design-final} = 1.5 * 0.45\ cfs = 0.68\ cfs$

The proprietary BIO-7 BMP used for this project is the Modular Wetlands Biofiltration System 8' x 16'.

5.2 Summary of LID BMPs

LID BMP (Number/Description)	Average Total Area (square feet)	Depth (feet)	Total Volume (cubic feet)

Biotreatment	128	4.0	512

Section 6 Hydromodification BMPs

6.1 Points of Compliance

Point of Compliance is considered to be the manhole where all storm runoff is captured and flows to a single point. The Point of Compliance was selected since runoff flows to this location.

6.2 Pre-Development (Natural) Conditions

The pre-developed site is assumed to be a straight grade from the top of the slope on the west side to the existing street on the east side with a slope of greater than 15%.

6.3 Post-Development Conditions and Hydromodification BMPs

The post development site will consist of 58 townhomes, drive aisles, walkways, and landscape amenities. The project will not discharge more runoff than allowed by hydromodification requirements.

6.4 Measures for Avoidance of Critical Coarse Sediment Yield Areas

There are no potential critical coarse sediment yield areas on the site per the potential coarse sediment map in Appendix N of the technical guidance document (see the Appendix – Potential Course Sediment Areas Map).

6.5 Hydrologic Modeling and Hydromodification Compliance

The project site is located within a Hydromodification control zone and is required to mitigate any increase in runoff peak flow rates between existing and proposed conditions. As documented in the attached South Orange County Hydrology Manual, storm drain chamber were sized to mitigate runoff per hydromodification requirements. Therefore, the project meets and exceeds the minimum Hydromodification requirements.

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	x	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	x	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	x	Proper Maintenance Practices for Your Business	☐
Household Tips	x	Compliance BMPs for Mobile Businesses	☐
Proper Disposal of Household Hazardous Waste	x	**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)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	x		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	x		☐
Sewer Spill	x		☐
Tips for the Home Improvement Projects	x		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	x		☐
Tips for Pet Care	x		☐
Tips for Projects Using Paint	x		☐

Attachment A: EDUCATIONAL MATERIALS

POOL AND SPA DRAINAGE

Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is **not treated or cleaned** before entering our waterways and should never contain any pollutants. Many pools and spas are plumbed to drain directly to the sanitary sewer. If yours is not, you must take necessary steps before draining to landscaped areas or into the storm drain.

While the focus of this brochure is pools and spas, these requirements also apply to water features and fountains.



Who is H_2OC?

H_2OC is YOU. H_2OC is also a cooperative stormwater program which includes all 34 cities in Orange County, the County of Orange, and Orange County Flood Control District (OCFCD). Clean and healthy beaches, creeks, rivers, bays, wetlands, and ocean are important to Orange County. H_2OC provides resources to residents and businesses to encourage personal action and prevent polluted runoff from entering our waterways.

Join Us

Visit **h2oc.org** to learn more about runoff, water pollution, and how you can be the solution to runoff pollution and protect our water resources.

Contact

24-hour Pollution Reporting Hotline:
1-877-89-SPILL (1-877-897-7455)

24-hour Reporting Website:
myOCeServices.ocgov.com

For emergencies, dial 911

PROPER MAINTENANCE OF POOLS & SPAS TO PROTECT OUR WATERWAYS



H_2OC®
STORMWATER PROGRAM

PROPER DISPOSAL

When you cannot dispose of pool and spa water in the sanitary sewer, the release of dechlorinated pool and spa water to a landscaped area or in the storm drain system is allowed only if these parameters are met:

- ☑ Some cities may have ordinances that do not allow pool water disposal into a storm drain. Find your city's stormwater page here: h2oc.org/cities to check regulations.
- ☑ pH is between 6.5 and 8.5.
- ☑ Residual chlorine does not exceed 0.1 mg/L (parts per million).
- ☑ Water is clean and clear, free of any unusual coloration, dirt, or algae.
- ☑ There is no discharge of filter media or acid cleaning wastes.

Saltwater pools must be discharged to the sanitary sewer, landscaped areas, or other pervious surfaces that can accommodate the volume of water. Alternatively, they can be discharged directly to a naturally saline body of water.

Disposal Process

- When possible, discharge all water to the sanitary sewer.
- Monitor the drain hose to prevent leakage.
- Remove trash and debris in the flow path between the pool or spa and storm drain.
- Monitor the rate of flow to ensure that draining the pool or spa does not cause erosion or flooding.

PROPER MAINTENANCE

- To prevent vectors and algae do not allow dechlorinated water to stand for more than 72 hours.
- Clean your pool regularly, maintain consistent and adequate chlorine or sodium bromide levels, monitor pH levels, and maintain your filtration and circulation system.
- Rinse pool filters and diatomaceous earth filters in landscaped areas where water and debris can readily soak into the soil.
- When draining pools or rinsing filters to a landscaped area, cover any landscape drains to prevent water from reaching the storm drain system.
- Used diatomaceous earth should be tossed in with solid garbage. It should never be discharged into storm drains or any place where it may wash into streams, rivers, or the ocean.
- Store chemicals indoors.

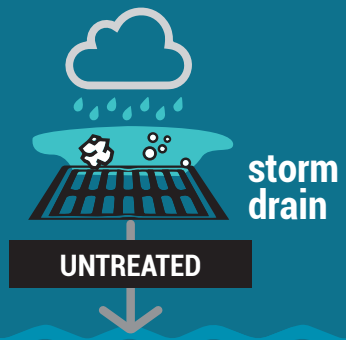


HOW TO KNOW IF YOU ARE FOLLOWING THE STANDARDS

You can find out how much chlorine is in your water by using a pool testing kit. Before discharging, reduce chlorine to 0.1 mg/L by discontinuing its use for a few days, or by using dechlorinating chemicals purchased from a local pool supply company. Always follow the instructions that come with any products you use.

DOING YOUR PART

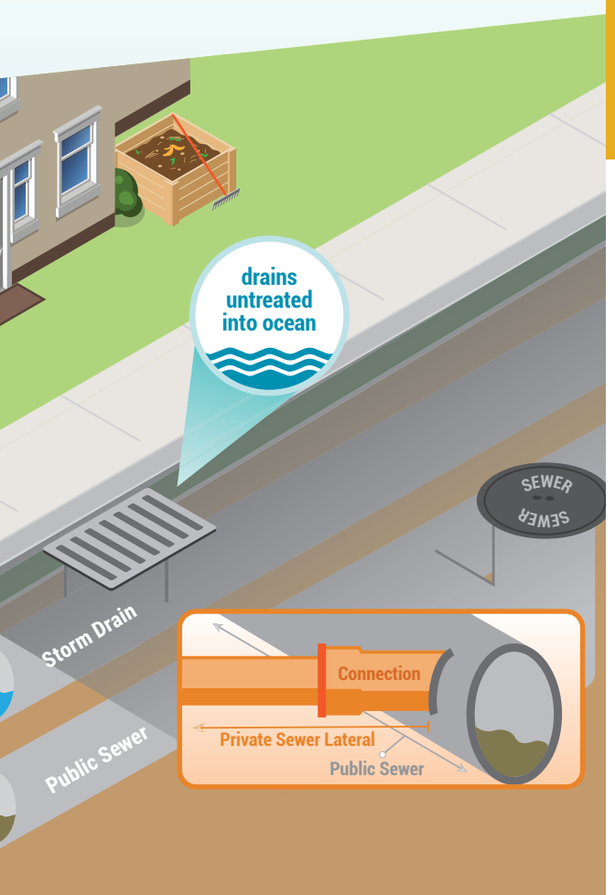
By following these requirements, you will make a significant contribution towards keeping pollutants out of Orange County's waterways. You can help protect organisms that are sensitive to pool chemicals and maintain the health of our environment.



OCEAN

Sewer System Maintenance

Property owners are responsible for maintaining their private laterals from the connection at the home or business to the connection with the public sewer; this can include areas under the sidewalk and the street. Inadequate maintenance of laterals can result in sewer backups and spills. Operation and maintenance of the local, public, and regional sewer lines, on the other hand, are the responsibility of the sewer agency.* Visit the link inside for agency contact information.



Who is H_2OC?

H_2OC is YOU! H_2OC is also a cooperative stormwater program which includes all 34 cities in Orange County, the County of Orange, and Orange County Flood Control District (OCFCD). Clean and healthy beaches, creeks, rivers, bays, wetlands, and ocean are important to Orange County. H_2OC provides resources to residents and businesses to encourage personal action and prevent polluted runoff from entering our waterways.

Join Us

Visit **h2oc.org** to learn more about runoff, water pollution, and how you can be the solution to runoff pollution and protect our water resources!

Contact

24-hour Pollution Reporting Hotline:
1-877-89-SPILL (1-877-897-7455)

24-hour Reporting Website:
myOCeServices.ocgov.com

For emergencies, dial 911

HOW TO PREVENT & REPORT SEWAGE SPILLS

A PROPERTY OWNER'S GUIDE TO PRIVATE SEWER LATERALS

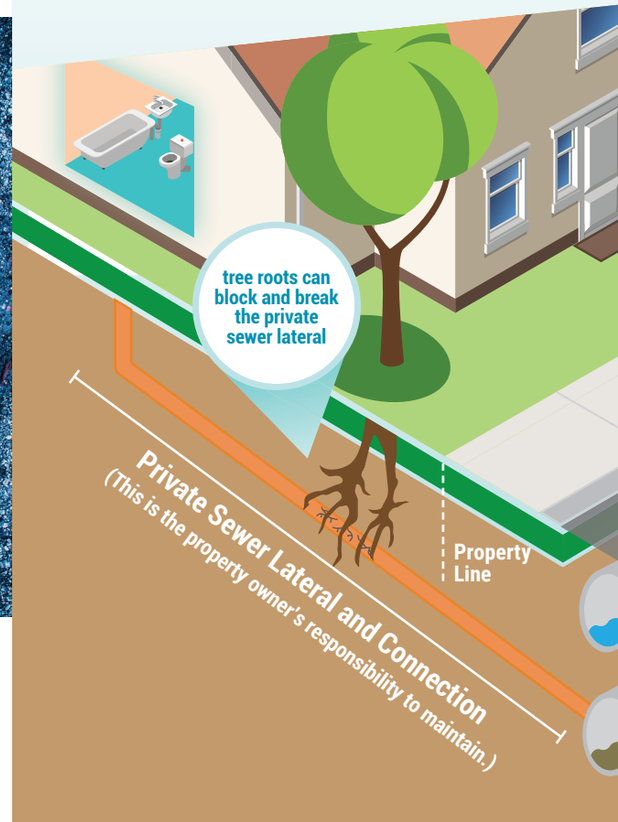


H_2OC STORMWATER PROGRAM

Developed in Collaboration with Orange County's Sewer Agencies

The Sanitary Sewer System

Every property with sewer service owns a private sewer line, also known as a "private lateral." The private lateral carries wastewater from indoor plumbing fixtures, like toilets, sinks, and dishwashers, to the public sewer line under the street. The sewer system transports wastewater to treatment plants before being released. It is important to maintain your private laterals to prevent sewage spills that can reach our storm drains. Unlike water in sanitary sewers, water that flows into storm drains is **not treated** before entering our waterways and should never contain sewage.



Backups and Sewage Spills

Sewage spills and backups occur when the wastewater being transported is blocked and overflows or leaks out of broken pipes inside or outside of your building. Once out of the pipe, the sewage can discharge to the curb, gutter, and storm drain system, which flows to local waterways. Sewage spills can cause health hazards, beach closures, damage to homes and businesses, and threaten the quality of our local waterways. As a property owner, if sewage from your property discharges to a gutter or storm drain, you may be subject to fines, penalties, or increased rates.

Common Causes

BLOCKAGES

Common causes of blockages include

- Flushing anything other than toilet paper, including: wipes (even those advertised as "flushable"), feminine products, rags, and other items.
- Fats, oils, and grease (FOG) can get into the private lateral from household drains, as well as from poorly maintained commercial grease traps and interceptors.
- Tree roots can find their way into cracked or broken sewer laterals and cause blockages.

STRUCTURAL PROBLEMS

Common structural problems include

- Broken/cracked pipes.
- Deteriorated, missing, or broken cleanout caps.
- Aging or undersized sewers.

Keep Your Private Laterals Functioning Properly

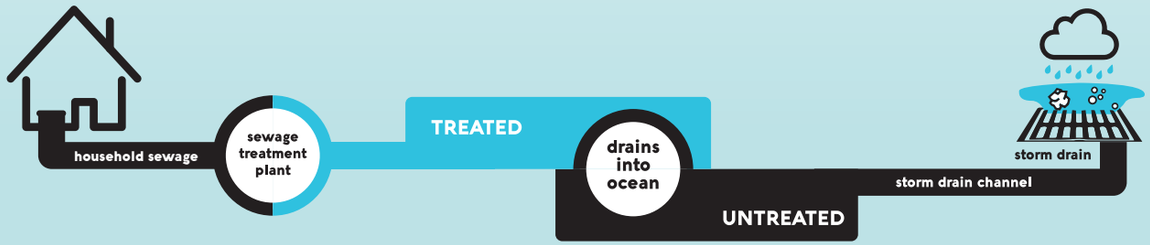
Prevent Blockages

Remember, **the drain is not a dump!**

- Only flush toilet paper down the toilet.
- Use a mesh sink strainer to catch food scraps before they go down the drain.
- Scrape food scraps into a designated food waste/organics receptacle before rinsing dishes and utensils in the sink.
- After cooking at home, let grease cool then pour or scrape it into a metal can. When the can is full, dispose of grease properly.
- For businesses, grease traps or interceptors must be serviced regularly. Have spill kits readily available for cleaning up spills.
- Do not plant trees or large shrubs above or within several feet of your sewer laterals.

Structural Maintenance

- Contact a licensed plumber to determine the optimal maintenance schedule.
- Perform periodic cleaning to eliminate grease, debris, and roots from private laterals.
- Repair or replace deteriorated or damaged private laterals as soon as possible.
- Install a backflow device to prevent sewage from ending up in your home or business.



Identify & Report Sewage Spills or Backups

Know the Signs

Sewage spills can cause damage to your property, the environment, and our local waterways. Look for potential signs of a spill, which may include:

- Drains are operating slower than normal and continuing to slow over time.
- Drains backup inside of buildings.
- Unusually wet or soggy ground in your yard that may be accompanied by odors.
- Leakage from sewer cleanouts, outside drains, or manhole lids.

Report Sewage Spills Immediately

- If you suspect a sewer backup or leak, contact a licensed plumber.
- If you observe a sewer spill from a cleanout or manhole, contact your sewer agency.*
- Plumbers should contact the sewer agency prior to pushing roots from private sewer laterals to the sewer main.

Alternatively, you can contact the **24-Hour Pollution Reporting Hotline** by calling **1-877-89-SPILL (1-877-897-7455)** or visiting **myOCeServices.ocgov.com.**

Spill Control & Containment

- Turn off main water supply or stop all water use.
- Have a plumbing professional clear the blockage and make necessary repairs.
- Keep people and pets away from the affected area.
- When safe, place sandbags or other material in the flow path of the spill to control, contain, and prevent sewage from entering the storm drain system.



Sewer overflow



Plumber making repairs on private lateral

* Scan for more sewage spill resources or visit https://h2oc.org/resources/pollution-prevention-for-residents/sewage-maintenance/

H2OC
STORMWATER PROGRAM

LANDSCAPE & SUSTAINABLE WATER USE GUIDE



Making Your Landscape Stormwater-Safe

Runoff is the flow of water from your property that doesn't get absorbed into the ground. When harmful substances like pesticides, fertilizer, and dirt are handled improperly, this water can pick them up on its way to the storm drain system where it flows untreated to our creeks, rivers, and ocean. There are simple actions you can take to collect runoff and use it on site to maintain your landscape and protect our water resources.

This guide will help you use rainwater as a resource to waste less water and keep your landscape stormwater-safe. Planting OC Garden Friendly plants, proper watering practices, and harvesting and using rainwater are terrific ways to beautify your landscape while protecting our water resources. Continue reading to learn how!

What Are OC Garden Friendly Plants?

OC Garden Friendly plants are either native or adapted to Orange County. Because they're accustomed to our climate, they require less water, pesticides, and fertilizer than other plants. These plants can be terrific assets to waste less water and keep our waterways healthy. Here are some beautiful OC Garden Friendly plants to add to your garden:

Groundcover

African daisy



Coral bells/ Allum root



Sage



Germander



Penstemon



Sundrops



Gaura



1

Heat and drought-tolerant groundcover with showy flowers.

Rock rose



2

Terrific groundcover for a dry garden whose colorful flowers blossom in the spring.

Perennial

Narrow-leaf milkweed



Douglas iris



Pumpkin monkey



Pine muhly grass



Beach strawberry



Yellow monkey



Shrub

Baja fairy duster



California fuchsia



Pacific mist manzanita



Sea lavender



Texas ranger



Toyon



Westringia/Coast rosemary



3

Charming and fragrant evergreen shrub with lavender flowers which shine in the spring.

Tree

Desert museum palo verde



4

Attractive tree with bright flowers appearing in mid-spring and leaves that shed each winter. Water deeply once or twice a month in the summer to promote flowering.

Marina madrone



5

Shiny evergreen leaves with drooping flower clusters followed by berries lasting into late winter. Plant if you want to see hummingbirds!

Desert willow



Where to Use Them:









Note: *For new or rehabilitated landscape projects greater than 500 sq. ft., it is mandatory to follow the Model Water Efficient Landscape Ordinance (MWELO) standards for landscape design and installation. These are a set of minimum standards to be followed. Check with your local city for specific requirements.*

Scan to learn more:

https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Model-Water-Efficient-Landscape-Ordinance

For more information regarding how to create a sustainable landscape please visit the UCCE Master Gardeners of Orange County website: https://mgorange.ucanr.edu.

Photos credited to GardenSoft Corp. – ***Left Page:*** *Coral bells/Allum root, Sage, Penstemon, Gaura, Rock rose, Douglas iris, Pumpkin monkey, Pine muhly grass, Beach strawberry, Yellow monkey, Baja fairy duster, Pacific mist manzanita, Toyon, Westringia/Coast rosemary, Desert museum palo verde, Marina madrone, and Desert willow.* ***Right Page:*** *All photos.*

Sustainable Water Use Best Practices

Watering

Proper irrigation practices are critical to protect Orange County's water bodies.

- Utilize smart irrigation controllers and, and/or soil moisture sensors. These can help manage your garden's water needs to waste less water.
- Take advantage of a drip irrigation system to directly water plant roots. This reduces water loss and runoff.
- Install rotating sprinkler nozzles to spread water more uniformly across your landscape.

Rainwater Collection and Use

In Orange County, 60%-70% of water is used for irrigation and other outdoor uses. Collecting and using rainwater are great ways to decrease water usage.

- Direct downspouts to flow towards vegetated areas to reduce runoff and use a splash block to prevent erosion.
- Install a rain barrel to collect rainwater from roofs and use for landscape irrigation. Make sure it has a screen, spigot to siphon water for use and an overflow tube.
- Build a rain garden using OC Garden Friendly plants and other landscape materials.

Rebates

Beautify your landscape in stormwater-safe ways by utilizing rebates from your local water district or the Municipal Water District of Orange County (MWDOC). Save money on water-efficient devices like smart irrigation controllers, high-efficiency nozzles, soil moisture sensors, and drip irrigation systems. Also, upgrade your landscape with their conversion rebates to replace turf with OC Garden Friendly plants. These rebates can change frequently, so check with your local water agency and MWDOC (mwdoc.com/rebates) regularly.



THANK YOU FOR PROTECTING OUR WATERWAYS BY CREATING AN OC GARDEN FRIENDLY LANDSCAPE.

Learn more at our Overwatering is Out webpage by scanning the QR code or visiting: h2oc.org/resources/take-action/overwatering-is-out.

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Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

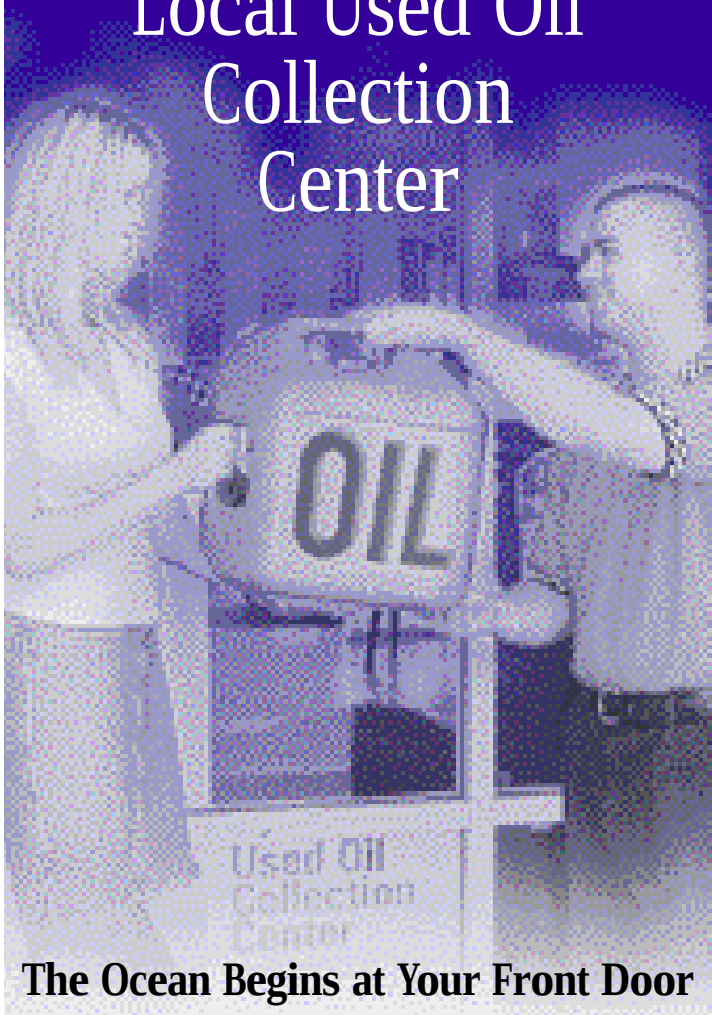
For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

SOUTH COUNTY

Used Oil Collection Centers

ALISO VIEJO

Big O Tires
27812 Aliso Creek Rd, Suite E-100
(949) 362-4225

Econo Lube N' Tune
22932 Glenwood Dr.
(949) 643-9667

Jiffy Lube
27832 Aliso Creek Road
(949) 362-0005

Pep Boys
26881 Aliso Creek Road
(949) 362-9254

DANA POINT

Dana Point Fuel Dock
34661 Puerto Pl. (949) 496-6113

EZ Lube Inc.
34242 Doheny Park Rd.
(949) 477-1223

FOOTHILL RANCH

USA Express Tire & Service
26492 Town Center Dr.
(714) 826-1001

LAGUNA BEACH

USA Express Tire & Service Inc.
350 Broadway (949) 494-7111

LAKE FOREST

Big O Tires
20742 Lake Forest Dr.
(949) 443-4155

EZ Lube
26731 Rancho Parkway
(949) 465-9912

Firestone Store
24421 Rockfield Blvd.
(949) 581-2660

Jiffy Lube
20781 Lake Forest Dr.
(949) 583-0470

Kragen Auto Parts
24601 Raymond Way
(949) 829-8292

Pep Boys
22671 Lake Forest Dr.
(949) 855-9593

Ryan's Foothill Ranch Transmission
20622 Pascal Way (949) 770-6888

USA Express Tire & Service
24561 Trabuco Rd (949) 454-8001

LAGUNA NIGUEL

Econo Lube N Tune
27912 Forbes Rd. (949) 364-5833

Laguna Niguel Auto Center
26042 Cape Dr. #12
(949) 582-2191

LAGUNA HILLS

David J Phillips Buick
24888 Alicia Pkwy.
(949) 831-0434

EZ Lube
24281 Moulton Pkwy.
(949) 830-9840

EZ Lube
26921 Moulton Pkwy.
(949) 751-3436

Kragen Auto Parts
26562 Moulton Ave.
(949) 831-0434

Firestone Store
24196 Laguna Hills Mall
(949) 581-4700

MISSION VIEJO

AAA Complete Auto Care & Tire
27913 Center Street
(949) 347-8200

Autobahn West
25800 Jeronimo Rd. Suite 401
(949) 770-2312

Auto Zone
22942 Los Alisos (949) 830-8181

Econo Lube & Tune
25902 El Paseo (949) 582-5483

Jiffy Lube
27240 La Paz Rd. (949) 455-0470

Kragen Auto Parts
24510 Alicia Pkwy. (949) 951-9175

Mission Viejo Chevron
27742 Crown Vly. Pkwy.
(949) 364-0137

Oilmax 10 Minute Lube
25800 Jeronimo Rd. #300
(949) 859-9271

Ramona Auto Service
27210 La Paz Rd. (949) 583-1233

RANCHO SANTA MARGARITA

Jiffy Lube
23401 Antonio Parkway
(949) 589-7447

SAN CLEMENTE

EZ Lube
525 Avenida Pico (949) 940-1850

Kragen Auto Parts
1113 S. El Camino Real
(949) 492-9850

Kragen Auto Parts
400 Camino de Estrella
(949) 240-9195

San Clemente Car Wash & Oil
1731 N. El Camino Real
(949) 847-4924

SAN JUAN CAPISTRANO

Saturn of San Juan Capistrano
33033 Camino Capistrano
(949) 248-5411

Texaco Xpress Lube
27201 Ortega Hwy.
(949) 489-8008

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

POLLUTION PREVENTION

No matter how large or small your home improvement project is, pollution prevention must always be part of the process. Use the required best management practices (BMPs) listed here to protect our waterways as you make your improvements. Whether you do-it-yourself or hire a contractor, you are responsible for preventing pollution.



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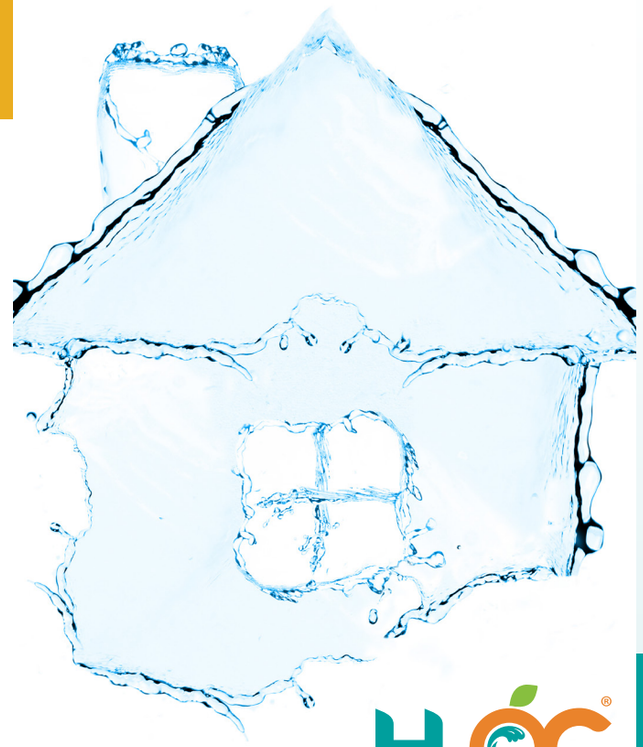
24-hour Pollution Reporting Website:
myOCeServices.ocgov.com

Orange County Stormwater Program:
714-955-0600

For emergencies, dial 911

*oclandfills.com/hazardous
**calrecycle.ca.gov/condemo

CONDUCT HOME IMPROVEMENT PROJECTS PROPERLY TO PROTECT OUR WATERWAYS



H_2OC STORMWATER PROGRAM

UNDERSTAND THE REQUIREMENTS TO PREVENT POLLUTION WHEN COMPLETING HOME IMPROVEMENT PROJECTS

Home improvement activities such as remodeling, stucco repair, painting, landscape improvements, and power washing can generate pollution that can harm Orange County's waterways. These pollutants can include paint, debris, chemicals, and more. If not properly managed, these pollutants can flow into Orange County's rivers, creeks, channels, and ocean through our storm drain system. Unlike water in sanitary sewers (from sinks and toilets), water that flows into storm drains is not treated before entering our waterways and must never contain pollutants generated by home improvement projects.

Understand the Requirements When Conducting Home Improvement Projects

General Construction

- Plan and complete projects when rain is not predicted.
- Keep all waste and debris away from the street, gutter, and storm drain. All area drains flow into the storm drain and can reach local waterways.
- Store all materials off of the ground, and under secured cover such as tarps or plastic sheets, and never near drains.
- When using concrete or drywall, liquid waste may be temporarily stored in a baby pool or plastic lined depression until dried. Powdery waste, like dry concrete, must be properly contained in a bag or box before placing into a dumpster.





Paint

- Before painting, prepare your work area with tarps to contain drips and spills.
- Rinse tools such as brushes, buckets, and rags in a sink connected to the sanitary sewer.
- Never wash tools where washwater can drain into the street, gutter, or storm drain. Discharges to the storm drain system are prohibited.
- Store leftover paint in original or clearly marked containers and in a dry location away from the elements.
- Dispose of water-based, oil-based, and aerosol paint at a Household Hazardous Waste Collection Center (HHWCC).*
- To dispose of small amounts of water-based paint, remove the lid, let it dry in the can, and recycle the can in your recycling bin.
- Visit paintcare.org for other disposal options.

Cleaning & Maintenance

- Use dry cleanup methods such as sweeping or vacuuming whenever possible and clean work areas at least daily.
- Clean paint, plaster, and drywall tools in a contained area to prevent pollution. No discharges to the storm drain are permitted.
- Dispose of solid or non-liquid debris in the trash or dumpster.
- Hazardous waste must be collected and disposed of at a Household Hazardous Waste Collection Center (HHWCC).*
- Vacuum or sweep sawdust and dispose of it in the trash or green waste bin.

Disposal & Recycling

- Use a construction and demolition recycling company to properly dispose of construction materials and debris.**



For more information scan the QR Code or visit
h2oc.org/resources/pollution-prevention-for-residents/home-repair-and-improvements/



Spills & Cleanup

- Clean up spills immediately using absorbent material, then sweep, wipe, or vacuum and dispose of material properly.
- To clean a paint spill, use rags for a small spill and dry absorbent material for larger spills. Dispose of soiled rags and used dry absorbent material at a Household Hazardous Waste Collection Center (HHWCC).*
- Report spills that have entered the street, gutter, or storm drain to the 24-Hour Pollution Reporting Hotline by calling 1-877-89-SPILL (1-877-897-7455) or visiting myOCeServices.ocgov.com.

Landscaping

- While new plants are being established, use BMPs such as mulch, straw wattles, or jute netting to prevent erosion.
- Use gravel bags or fiber rolls along the perimeter of your property to keep water on site and to prevent discharges to the street, gutter, or storm drain.
- Cover bare soil with mulch.
- Store all bulk materials including soil, mulch, or gravel under tarps while not in use.

VEHICLE MAINTENANCE

Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is **not treated or cleaned** before entering our waterways and should never contain any pollutants. Vehicle maintenance can generate a variety of waste products which can become pollutants like oil, gasoline, antifreeze, lubricants, metals, grease, and other harmful substances. If not properly managed, these pollutants can be transported to Orange County's creeks, rivers, and ocean through our storm drain system.

Understand the Best Practices for Conducting Car Maintenance at Home



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*oclandfills.com/hazardous-waste
**www2.calrecycle.ca.gov/UsedOil/CertifiedCenters

HOW TO BE A RESPONSIBLE HOME MECHANIC

TO PROTECT OUR WATERWAYS



H_2OC®
STORMWATER PROGRAM

BE PREPARED & PLAN AHEAD

Before working on a vehicle, it is important to prepare to prevent pollution.

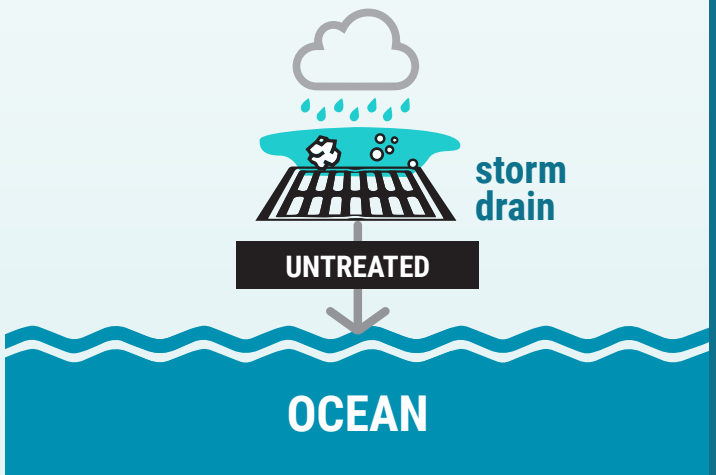
- ☑ Identify all actions that can cause spills or release pollutants.
- ☑ Locate and protect all storm drains on or near your property in case there is a spill.
- ☑ Only perform repair and maintenance activities when it isn't raining, and on non-porous surfaces like concrete.
- ☑ Store car parts, batteries, oils, other materials and waste off the ground, under overhead cover, and in labeled containers.
- ☑ Have spill cleanup materials available, including absorbents like kitty litter, gloves, goggles, brooms, and rags.
- ☑ Park leaking vehicles on private property over a drip pan until repairs can be made.



COLLECT & CONTAIN WASTE

There are many types of waste products that result from vehicle maintenance. Keeping wastes contained properly will make pollution prevention simple.

- Use absorbents like rags or kitty litter to clean up any spills right away.
- Clean work areas using dry methods (use a vacuum or broom to sweep up debris).
- Drain vehicle fluids into appropriate receptacles for proper disposal. Check with your city to see if free recycle kits are offered.
- Place a drip pan under vehicles to capture fluids.
- When possible, perform all bodywork in enclosed areas. Collect all waste and dispose of it properly.
- All chemicals used to clean parts must be properly managed. Do not discharge to storm drain.
- If any waste enters the street, gutter, or storm drain, report it by calling 877-897-7455 or going to myOCeServices.ocgov.com.
- Most vehicle maintenance byproducts are hazardous waste and must be disposed of in accordance with all local, state, and federal laws.*



USED OIL RECYCLING

Take your used oil to one of the many CalRecycle Certified Used Oil Collection Centers throughout Orange County.** All Certified Centers will accept up to five gallons of uncontaminated used oil from the public absolutely FREE of charge during normal business hours. Here are some tips for utilizing a collection center:

- Drain your oil into a clean container with a tight fitting lid and place the filter in a sealed plastic bag.
- Do not mix oil with other substances.
- Many Certified Centers are now accepting used filters, call the center to confirm.
- There is no I.D. or paperwork required to participate.

Look for a sign like this:



For more information about the used oil program, visit: ocusedoil.com or scan the QR code.

Update Your Irrigation System and Landscape

Switch to Rotating Sprinkler Nozzles: Consider replacing your sprinkler heads with rotating sprinkler nozzles. Rotating nozzles water more uniformly and efficiently, significantly reducing your outdoor water use. Check with your local water agency for available rebates on rotating nozzles, irrigation controllers, and other water efficient devices.

Get Smart: Consider using smart irrigation controllers. Smart irrigation controllers have internal clocks as well as sensors that will turn off the sprinklers in response to environmental changes. If it is raining, too windy, or too cold, the smart irrigation controller will automatically shut off the sprinklers.

Drip don't Douse: Drip irrigation systems prevent runoff from carrying pollutants into the storm drain by watering only the targeted plants using low volumes of water.

Reduce the Need: Replace water "thirsty" plants and grass types with water efficient natives or OC Garden Friendly plants to save water and reduce the need for pesticides and fertilizer. Please see the California Friendly® Landscape Maintenance Guide produced by the Metropolitan Water District of Southern California** and associated Southern California Water Agencies for more information.

Group Plants: When adding to or redesigning your landscaping, plants that require similar watering needs can be planted together. Grouping plants with similar watering needs helps prevent unnecessary watering.

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*__University of California Master Gardeners of Orange County__
ucceocmghotline@ucanr.edu mgorange.ucanr.edu/Gardening_Hotline/

**__Visit bewaterwise.com to learn more__

OVERWATERING IS OUT

TIPS TO PREVENT IRRIGATION RUNOFF



H_2OC® STORMWATER PROGRAM

What is Irrigation Runoff and How Does it Lead to Pollution?

Irrigation runoff is water flowing off landscaped areas, which can carry pollutants to our storm drains and waterways. It is usually the result of landscape overwatering, and mismanaged irrigation systems. Runoff can carry pesticides, fertilizers, pet waste, and other pollutants into our storm drains, which flow untreated to the ocean. Explore the tips below to find out how to prevent irrigation runoff.

RUN YOUR SYSTEM

Run and observe your irrigation system through its entire cycle seasonally (twice a year) to look for leaks, misaligned sprinkler heads, and areas of ponding and/or runoff.



WATER AT SUNRISE

Watering early in the morning before sunrise will reduce water loss due to evaporation. Wind also tends to die down in the early morning, so the water will irrigate the lawn as intended.

WATER BY PLANT TYPE AND SEASON

Different types of grass and plants have differing water needs. This also changes throughout the year, with cooler months typically requiring less water than warmer months. Ask your landscape maintenance provider or contact the University of California Cooperative Extension Master Gardeners* for questions regarding landscape watering needs.



HAND WATER PLANTS

Garden hoses with automatic shutoff nozzles can use less water than sprinkler irrigation systems. Hand watering also ensures only those areas that need water get it and prevents irrigation runoff. An easy alternative to sprinklers, hand watering can help keep our waterways clean!

Know Your Irrigation System and Landscape:



PROPER AIM

Adjust the direction of your sprinkler heads so water does not spray on sidewalks, driveways or roads. By simply adjusting the direction of your sprinklers, you can save water, prevent irrigation runoff, and keep your landscape healthy.



FIX LEAKS

Broken or leaky sprinklers can waste thousands of gallons of water per month and significantly increase the amount of runoff from your yard. Repairing sprinklers can prevent runoff from entering our waterways and save you money.

LEAST TOXIC FIRST

Limit pesticide use by using nonchemical methods, integrated pest management, or least-toxic pesticides whenever possible. Contact the University of California Cooperative Extension Master Gardeners* for alternative suggestions and related guidance.

CYCLE AND SOAK

Running multiple, shorter cycles with an hour break in between allows the water to infiltrate into the ground so it does not run off.

RAIN SKIP

Adjusting your watering schedule when it rains prevents unnecessary watering that can lead to runoff. Keep an eye on the weather forecast and skip your normal watering schedule before, during, and after a rain to help keep our waterways clean and your landscaping looking its best.



SET A TIMER

Use an irrigation timer to minimize runoff and maximize water absorption. Water districts often provide irrigation schedules to determine the best water scheme for your yard. Contact your water provider for a weekly irrigation schedule.

GIVE IT 48 HOURS

Prevent fertilizers and pesticides from entering our waterways by not watering your lawn 48 hours after application and stopping application 48 hours before a forecasted rain event.

MAINTAINING YOUR PROPERTY

Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is **not treated or cleaned** before entering our waterways and should never contain any pollutants. Landscaping and gardening can generate a variety of waste products which can become pollutants like dirt, fertilizers, pesticides, green waste (grass clippings, prunings, branches), and other harmful substances. If not properly managed, these pollutants can be transported to Orange County's creeks, rivers, and ocean through our storm drain system.



Who is H_2OC?

H_2OC is YOU! H_2OC is also a cooperative stormwater program which includes all 34 cities in Orange County, the County of Orange, and Orange County Flood Control District (OCFCD). Clean and healthy beaches, creeks, rivers, bays, wetlands, and ocean are important to Orange County. H_2OC provides resources to residents and businesses to encourage personal action and prevent polluted runoff from entering our waterways.

Join Us

Visit **h2oc.org** to learn more about runoff, water pollution, and how you can be the solution to runoff pollution and protect our water resources.

Contact

24-hour Pollution Reporting Hotline:
1-877-89-SPILL (1-877-897-7455)

24-hour Reporting Website:
myOCeServices.ocgov.com

For emergencies, dial 911

*mwdoc.com/rebates
**oclandfills.com/hazardous

PROPER MAINTENANCE OF LANDSCAPES & GARDENS

TO PROTECT OUR WATERWAYS



H_2OC® STORMWATER PROGRAM

BEST MANAGEMENT PRACTICES

Runoff of anything other than clean rainwater is prohibited from entering the storm drain system. Here's what you can do while maintaining your yard and garden to protect our creeks, rivers, and ocean.

Landscaping

- Regularly inspect your sprinkler system for runoff and leaks and fix immediately. Check backup battery and adjust system regularly.
- Use smart irrigation controllers, drip irrigation, soaker hoses, high-efficiency sprinkler nozzles, or micro spray systems. Check with your local water agency or the Municipal Water District of Orange County (MWDOC) for currently available rebates.*
- Hand water your landscape to reduce overwatering.
- Cover bare soil with groundcover or mulch to prevent erosion and reduce runoff.
- Check the weather forecast and refrain from watering or using chemicals like fertilizers and pesticides 48 hours before or after rain is predicted.
- Sweep hardscapes and rinse patio furniture on permeable surfaces to prevent runoff.

Gardening

- Use integrated pest management (IPM) to target specific pests in problem areas instead of widespread chemical use.
- If pesticides or herbicides are necessary, follow the manufacturer's instructions on the label.
- Plant OC Garden Friendly plants to reduce the amount of water, fertilizers, and pesticides needed.

Containment

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Bulk deliveries of landscape materials such as mulch and soil, should be delivered to driveways and covered with a tarp.
- Store chemicals indoors or in a dry and covered area.

Proper Disposal

- Sweep up solid waste spills immediately. If the spill is liquid, apply an absorbent material then sweep it and dispose of it properly.
- Take unwanted pesticides, fertilizers, and herbicides to a Household Hazardous Waste Collection Center.**
- Dispose of green waste by composting it or placing in your organics waste bin.



For more on waterway-safe landscaping and gardening, please visit https://h2oc.org/resources/pollution-prevention-for-residents/lawn-and-garden-care/ or scan the QR code.









THANK YOU FOR PROTECTING OUR WATERWAYS FROM RUNOFF POLLUTION.

Attachment B: CALCULATIONS AND EXHIBITS



	TOTAL AREA	4.56 AC
	TOTAL PERVIOUS AREA	2.45 AC
	% PERVIOUS	53 %
	% IMPERVIOUS	47 %
	DRAINAGE AREA 1	3.16 AC
	TOTAL PERVIOUS AREA	1.21 AC
	% PERVIOUS	38 %
	% IMPERVIOUS	62 %
	DRAINAGE AREA 2	0.35 AC
	TOTAL PERVIOUS AREA	0.31 AC
	% PERVIOUS	89 %
	% IMPERVIOUS	11 %
	DRAINAGE AREA 3	0.26 AC
	TOTAL PERVIOUS AREA	0.24 AC
	% PERVIOUS	92 %
	% IMPERVIOUS	8 %
	DRAINAGE AREA 4	0.79 AC
	TOTAL PERVIOUS AREA	0.69 AC
	% PERVIOUS	87 %
	% IMPERVIOUS	13 %

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

ADVANCED CIVIL GROUP

ADVANCED CIVIL GROUP INC.
30251 GOLDEN LANTERN,
SUITE E, PMB 251
LAGUNA NIGUEL, CA 92647
(866) 338-5778 PHONE
WWW.ADVANCEDCIVILGROUP.COM

PREPARED BY:

R.C.E. NO. 68795

DATE 3/31/2026

PERVIOUS AREA EXISTING CONDITION 15 ARGONAUT

ALISO VIEJO



	TOTAL AREA	4.56 AC
	TOTAL PERVIOUS AREA	2.36 AC
	% PERVIOUS	52 %
	% IMPERVIOUS	48 %
	DRAINAGE AREA 1	3.16 AC
	TOTAL PERVIOUS AREA	1.12 AC
	% PERVIOUS	35 %
	% IMPERVIOUS	65 %
	DRAINAGE AREA 2	0.35 AC
	TOTAL PERVIOUS AREA	0.31 AC
	% PERVIOUS	89 %
	% IMPERVIOUS	11 %
	DRAINAGE AREA 3	0.26 AC
	TOTAL PERVIOUS AREA	0.24 AC
	% PERVIOUS	92 %
	% IMPERVIOUS	8 %
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80 40 0 80 160 240

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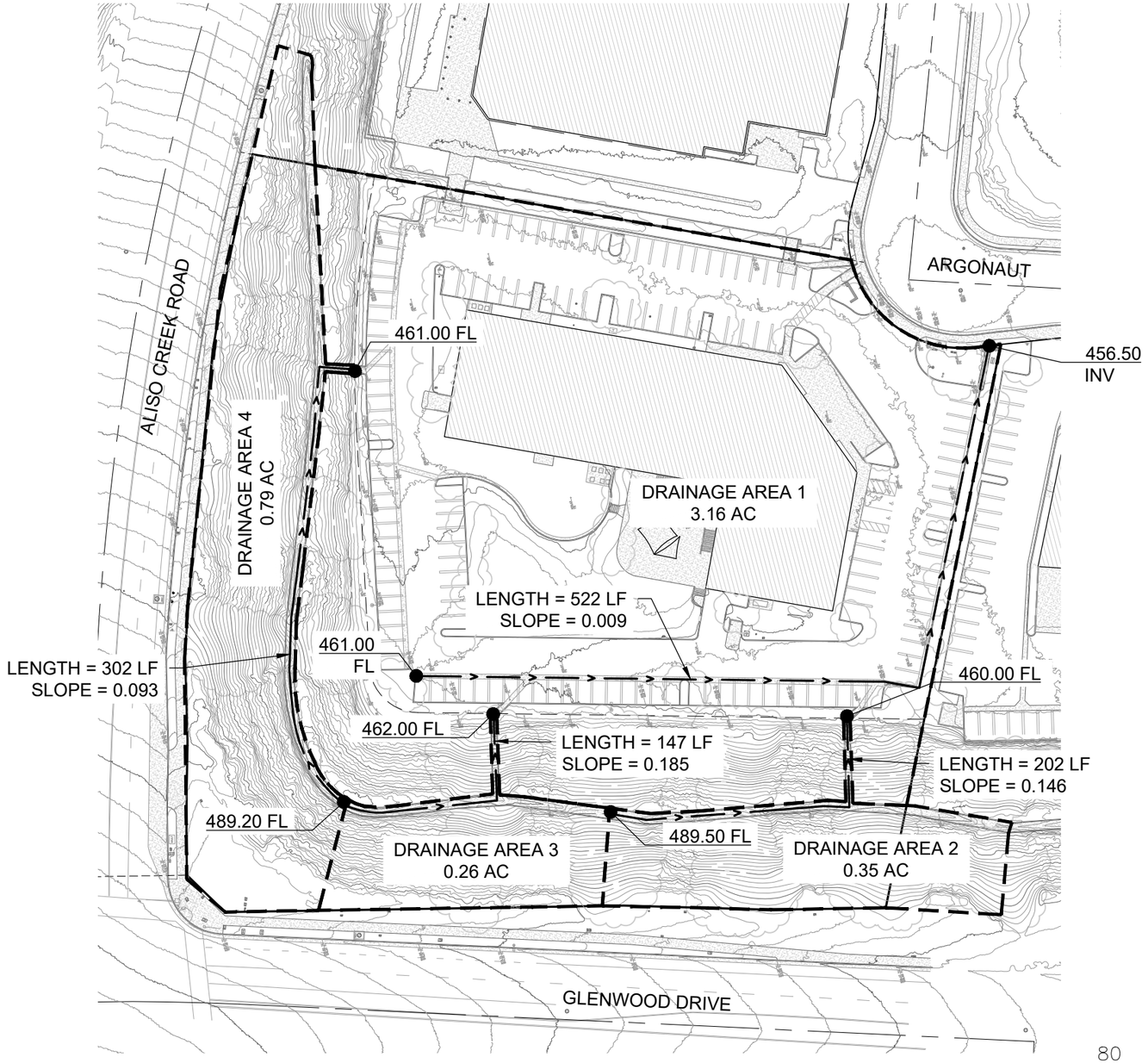
DATE 7/8/2026

PERVIOUS AREA PROPOSED CONDITION 15 ARGONAUT

ALISO VIEJO

EXISTING HYDROLOGY EXHIBIT

IN THE CITY OF ALISO VIEJO,
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

DRAINAGE AREA:

DMA	(AC)
1	3.16
2	0.48
3	0.30
4	0.79

LEGEND:

FLOW PATH

DRAINAGE BOUNDARY

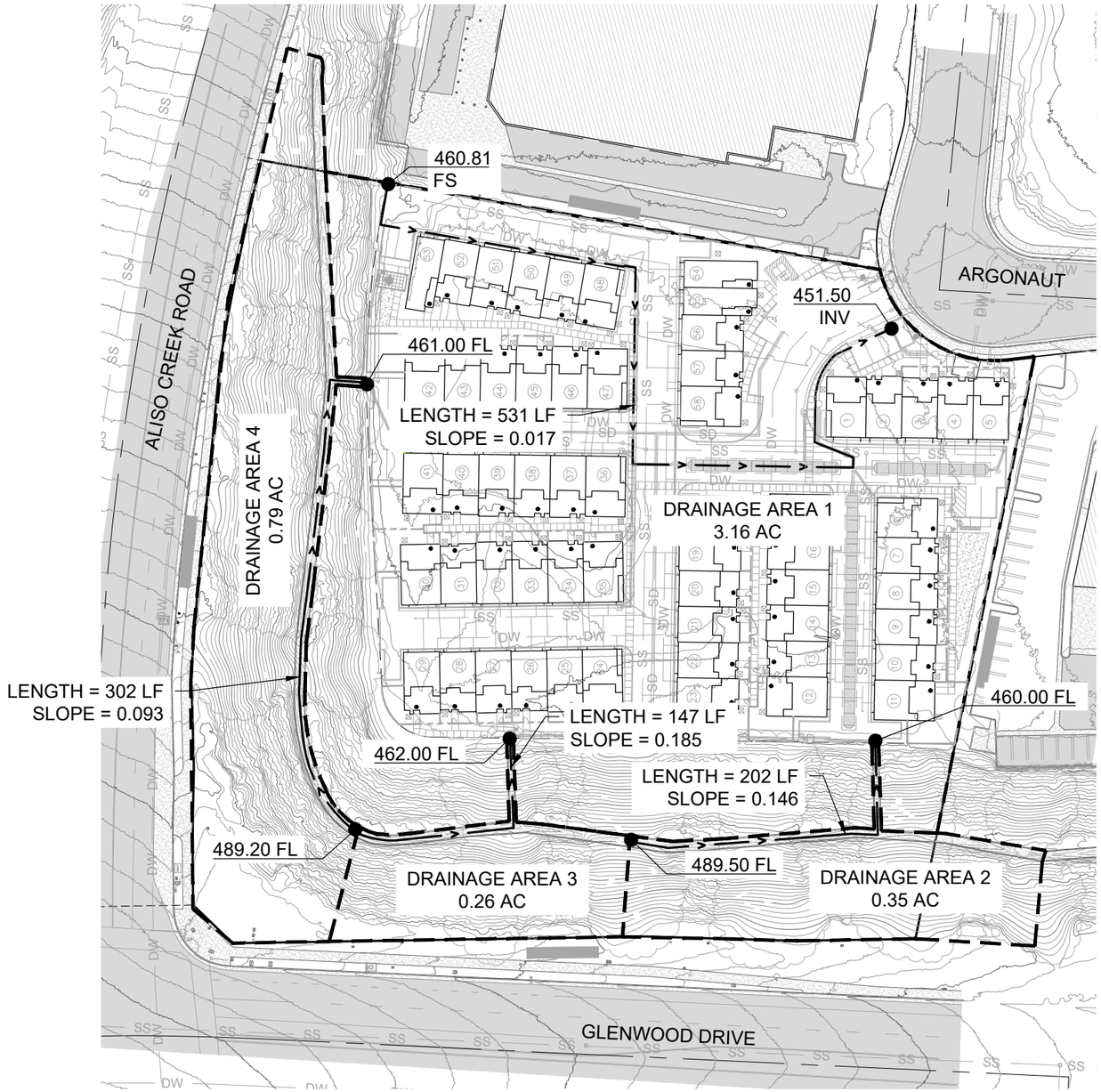
SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

PROPOSED HYDROLOGY EXHIBIT

IN THE CITY OF ALISO VIEJO,
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

DRAINAGE AREA:

DMA	(AC)
1	3.16
2	0.48
3	0.30
4	0.79

LEGEND:

FLOW PATH

DRAINAGE BOUNDARY

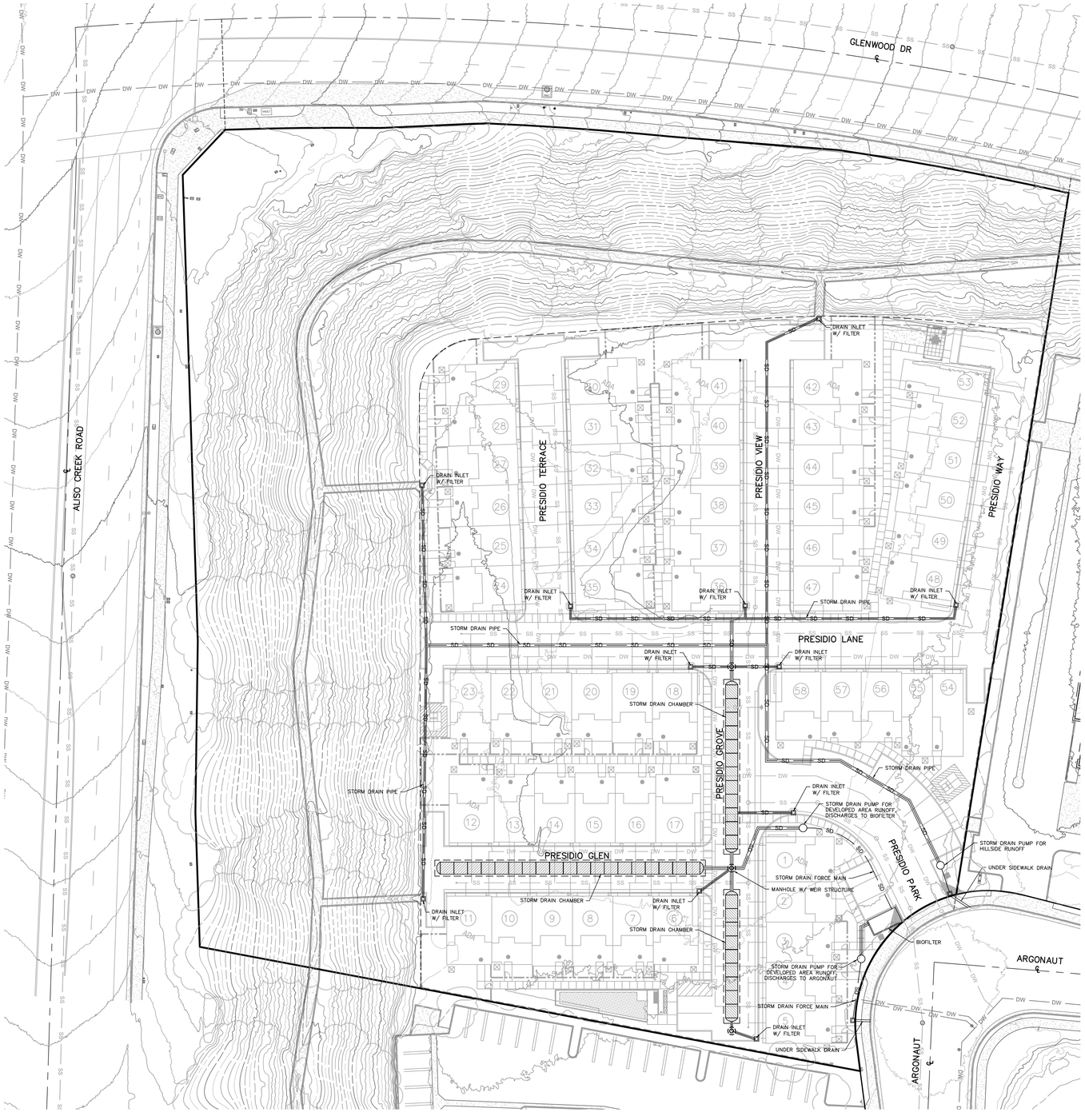
SCALE 1"=80'

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SCALE: 1"=80'

WQMP SITE PLAN

IN THE CITY OF ALISO VIEJO
COUNTY OF ORANGE, STATE OF CALIFORNIA



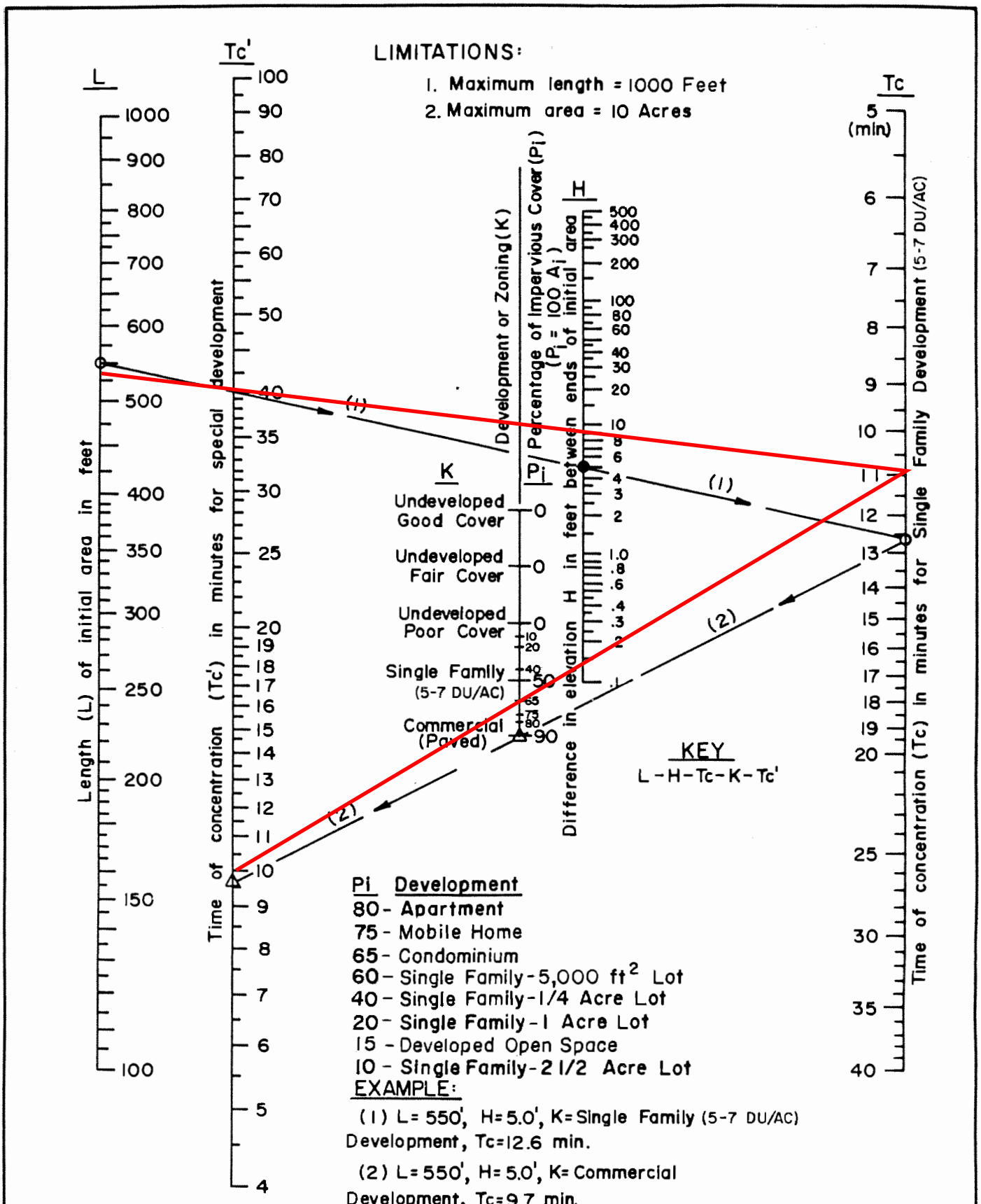
PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

SCALE 1"=30'

30 15 0 30 60 90

SCALE: 1"=30'



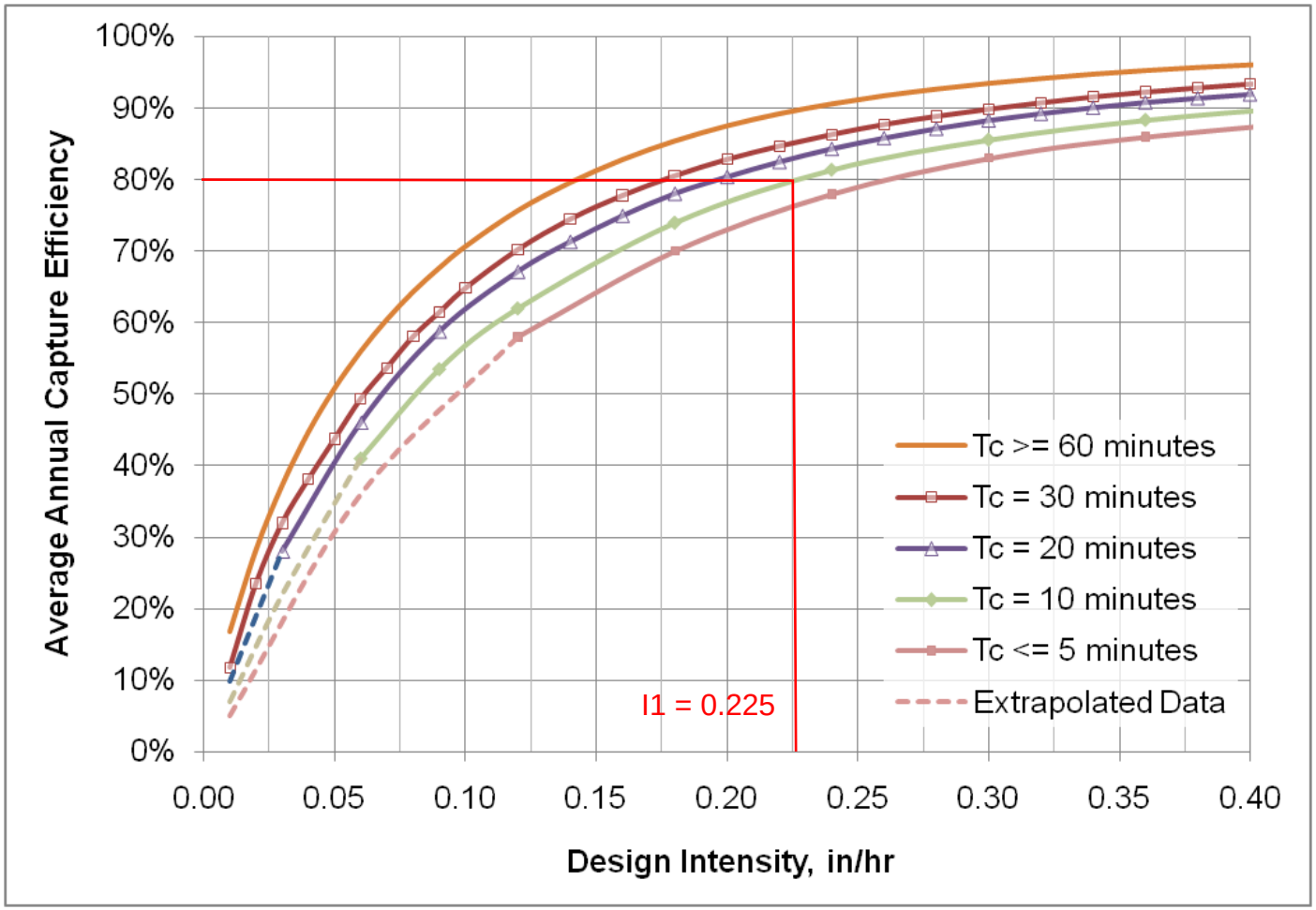
ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



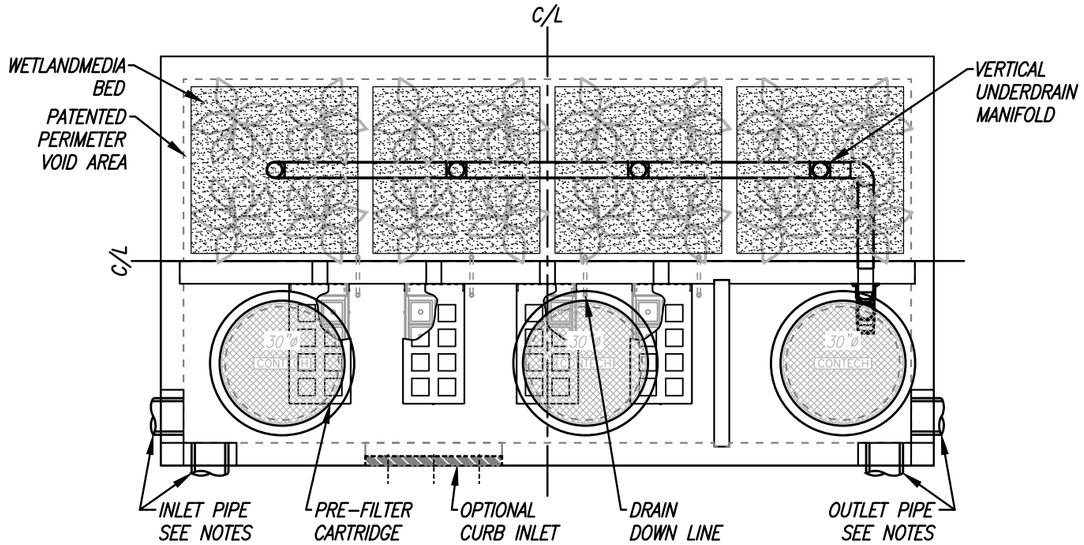
E.3.5.4 Worksheet for Using the Flow-Based Compact Biofiltration with Supplemental Retention Method for Sizing Compact Biofiltration BMPs

Worksheet 9: Flow-Based Compact Biofiltration with Supplemental Retention Method

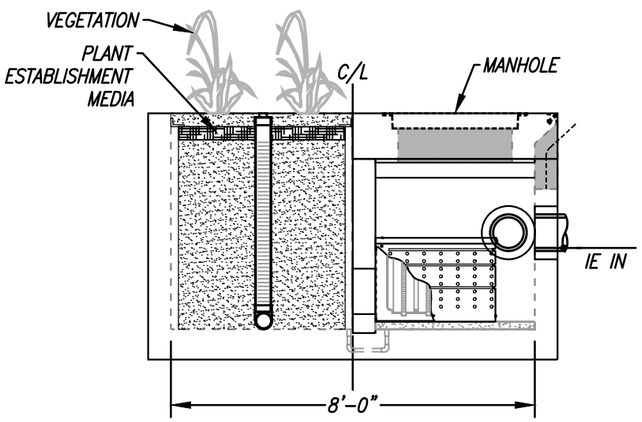
Part 1: Determine the design storm intensity of the compact biofiltration BMP				
1	Enter the time of concentration, T_c (min) (See **E.2.3**) (account for upstream detention by increasing Tc to a maximum 60 minutes per **Section E.3.5.2** if detention is provided)	T_c=	10	min
2	Using **Figure E-7** or the figure included in the worksheet, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	.225	in/hr
3	Enter capture efficiency corresponding to upstream HSCs and/or upstream BMPs, Y_2. Attach associated calculations.	Y_2 =	0	%
4	Using **Figure E-7**, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	.0	in/hr
5	Determine the design intensity that must be provided by BMP to achieve 80 percent capture, $I_{design}= I_1-I_2$	$I_{design\_80\%}$ =	.225	in/hr
Part 2: Calculate the design flowrate of the compact biofiltration BMP (Section E.2.6)				
6a	Enter DMA area tributary to BMP (s), *A* (acres)	A=	3.16	acres
6b	Enter DMA Imperviousness, imp (unitless)	imp=	0.65	
6c	Calculate runoff coefficient, *c= (0.75 x imp) + 0.15*	c=	0.64	
6d	Calculate flowrate to achieve 80 percent capture, $Q_{80\%}$= *(c x* I_{design} *x A)*	$Q_{80\%}$=	0.45	cfs
7	Calculate design flowrate, $Q_{design}= Q_{80\%}$ *x 150%*	Q_{design}=	0.68	cfs
Part 3: Demonstrate that Supplemental Retention BMPs Conform to Volume Reduction Targets (Only DMAs Categorized as "Biotreatment with Partial Infiltration")				
8	Describe system, including features to maximize volume reduction (if applicable):			
9	Summarize calculations to demonstrate that volume reduction targets are met, where feasible and applicable.			

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			_____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



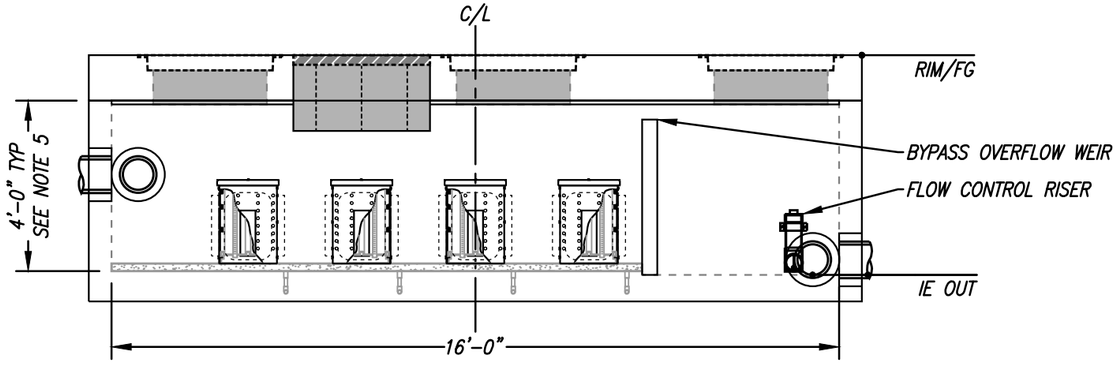
PLAN VIEW



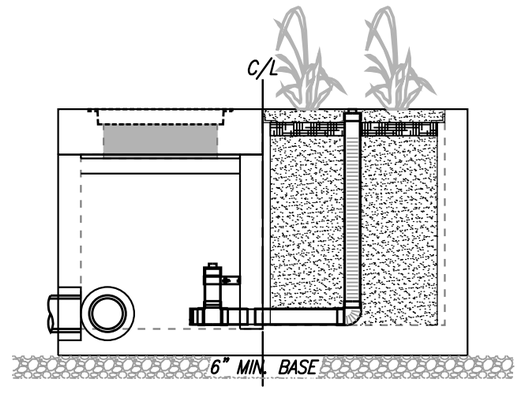
LEFT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

PROPRIETARY AND CONFIDENTIAL:

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www.ContechES.com

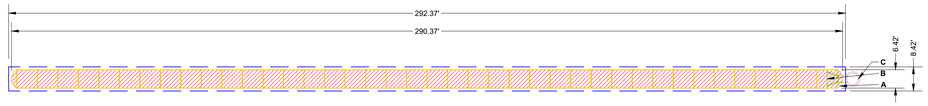
MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

8/14/23SCOTT.SERTICH

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS	
40	STORMTECH MC-3500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.50
2	STORMTECH MC-3500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	6.50
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	6.00
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	6.00
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	6.00
8070	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	5.50
		TOP OF MC-3500 CHAMBER:	4.50
		24" ISOLATOR ROW PLUS INVERT:	0.92
		BOTTOM OF MC-3500 CHAMBER:	0.75
2461	SYSTEM AREA (SF)	BOTTOM OF STONE:	0.00
601.6	SYSTEM PERIMETER (ft)		

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM PRE-CORED END CAP. PART#: MC3500IEPP24BC / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS		
	B	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
CONCRETE STRUCTURE	C	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		



ISOLATOR ROW PLUS (SEE DETAIL)

NO WOVEN GEOTEXTILE

BED LIMITS

NOTES

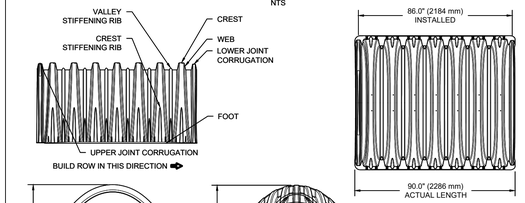
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION**: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

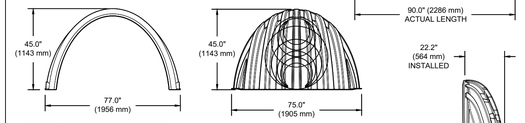
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MC-3500 TECHNICAL SPECIFICATION

NTS





NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

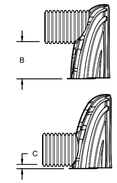
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

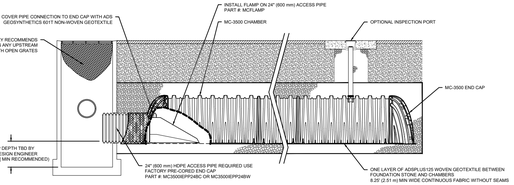
PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-3500 TECHNICAL SPECIFICATION



MC-3500 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

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

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

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

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

NOTES

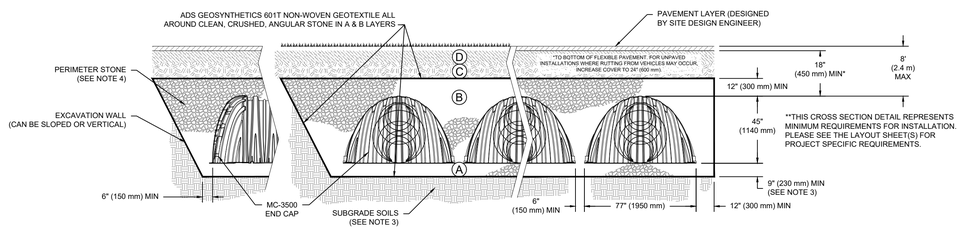
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-3500 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145⁴ A-1, A-2-4, A-3 OR AASHTO M43⁴ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE⁵	AASHTO M43⁴ 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE⁵	AASHTO M43⁴ 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE; "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".

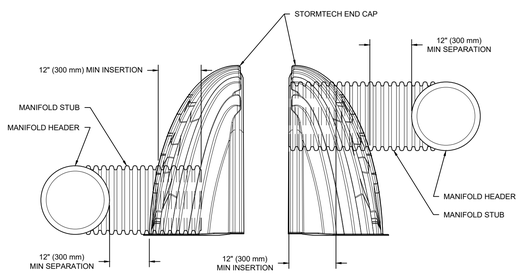


NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 500 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-3500 CROSS SECTION DETAIL

SPACE INTENTIONALLY LEFT BLANK



MC-SERIES END CAP INSERTION DETAIL

NTS

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

4 MC-SERIES END CAP INSERTION DETAIL

DRAWN: CK | DATE: 07/08/2026
CHECKED: N/A | PROJECT #:
REV: | NOT TO SCALE

PRESIDIO

ALISO VIEJO, CA, USA

StormTech® Chamber System

WWW.ADSPIPE.COM

ADS

SHEET 1 OF 1

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS/STORMTECH UNDER THE DIRECTION OF THE PROJECT'S ENGINEER OF RECORD ("EOR") OR OTHER PROJECT REPRESENTATIVE. THIS DRAWING IS NOT INTENDED FOR USE IN BIDDING OR CONSTRUCTION WITHOUT THE EOR'S PRIOR APPROVAL. EOR SHALL REVIEW THIS DRAWING PRIOR TO BIDDING AND/OR CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE EOR TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

0.65
0.7
0.75
0.8
0.85
0.9
0.95
1
1.05

Project

0 3 6 12 Kilometers

0 1.8 3.6 7.2 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

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

Conventional Biotreamtent Sizing Calculation

South Orange County WQMP TGD
E.3.3.1 Biofiltration Routing Method Stepwise Instructions for Sizing Biofiltration BMPs

1. Determine 85th Percentile, 24-Hour Design Storm

85th Percentile, 24-Hour Storm	0.80	in
Area	3.16	ac

2. Reduce design storm depth based on upstream HSCs

HSC-1: Not applicable due to the lack of infiltration potential at the site.
HSC-2: Not applicable due to the lack of infiltration potential at the site.
HSC-3: Not feasible because the required 20- to 30-foot tree canopy diameter cannot be achieved within the site constraints.
HSC-4: Not feasible because overflow dispersion requires a minimum 8-foot separation from buildings, which cannot be accommodated by the proposed site layout.
HSC-5: Not feasible due to the significant cost impacts to the project.
HSC-6: Not applicable due to the lack of infiltration potential at the site.

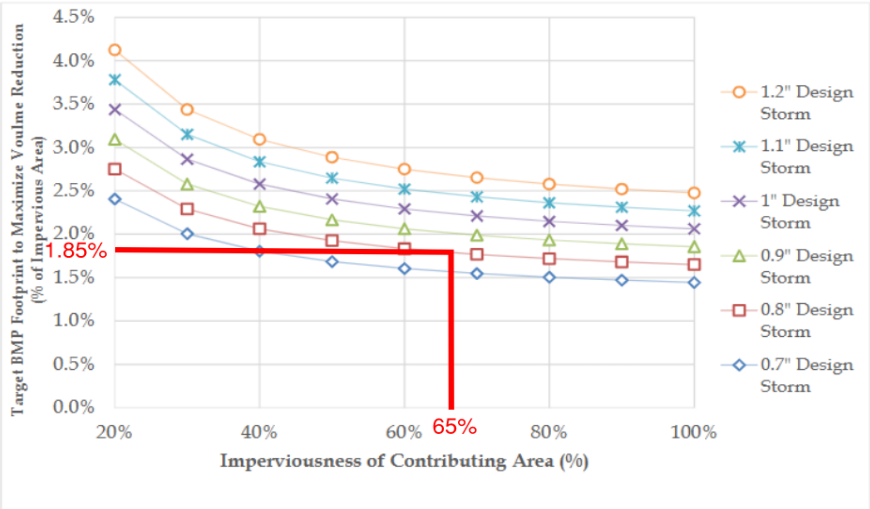
3. Convert the remaining design storm to a runoff volume

E.2.2 Runoff Volume
V=C x d x A x 43560 sf/ac x 1/12 in/ft

Impervious Ratio	65	%
C=0.75 x imp + 0.15	0.64	
Volume	5850	ft3

4. Select a BMP footprint area

Impervious Area	2.04	ac
Target BMP Footprint	1.85	%
	0.038	ac
	1644	sf



5. Not applicable since partial infiltration is not feasible

6. Not applicable since partial infiltration is not feasible

7. Select a media depth

Media Depth	24	in
Effective Retention Depth	2.4	in
Volume Retained	329	ft3

8. Calculate remaining portion of DCV

Initial Design Volume	5850	ft3
Volume Retained	329	ft3
Remaining DCV	5521	ft3

9. Multiply reamining DCV by 1.5

1.5x DCV	8282	ft3

10. Calculate Total Effective Biofiltration Storage

$$D_{biofilter\_effective} = \text{ponding depth} + 0.2 * \text{media depth}$$

Ponding Depth	12	in
Media Depth	24	in
D	16.8	in

11. Calculate the Volume Biofiltered

$$V_{treated} = (D_{biofilter\_effective} + K_{media} * T_{rout}) * A_{BMP\_EFF} * (1ft/12\ inches)$$

D	16.8	in
K	2.5	in/hr
A	1644	ft2
T	5	hr
V	3329	ft3

12. Adjust Surface Area until Vtreated is larger than 1.5x DCV in step 9 (8282 ft3)

BMP Footprint (Adjusted)	4090	ft2

Media Depth	24	in
Effective Retention Depth	2.4	in
Volume Retained	0	ft3

$$D_{biofilter\_effective} = \text{ponding depth} + 0.2 * \text{media depth}$$

Ponding Depth	12	in
Media Depth	24	in
D	16.8	in

$$V_{treated} = (D_{biofilter\_effective} + K_{media} * T_{rout}) * A_{BMP\_EFF} * (1ft/12\ inches)$$

D	16.8	in

K	2.5	in/hr
A	4090	ft2
T	5	hr
V	8282	ft3

There is insuffcient room on the project site to install a 4,090 ft2 bioretention area.

Attachment C: HARVEST AND REUSE DETERMINATION

Design Capture Volume (DCV) Calculation

85th Percentiel, 24-hr Storm Depth	0.8	inches
Drainage Area	3.16	acres
Imperviousness	65%	
HSCs	0	inches
Design Infiltration Rate	0.02	in/hr
Estimated DCV	**4,955**	**cu-ft**

Harvest and Reuse Determination

Step 1 - Calculate the Design Capture Volume in Gallons		
DCV (cu-ft)	4,955	cu-ft
DCV (gallons)	37,066	gallons

Step 2 - Estimate Planted Area		
Planter Factor (PF) for low water use	0.12	
Panted Area	48,787	sf
Planted Area w/ PF	5,854	sf

Step 3 - Est.e Net Wet Season Est. Total Water Use (ETWU 7-months)		
Eto (Oct-Apr) from CIMIS Monthly Ave Rpt	19.18	in
Mean Avg Rainfall	12.9	in
Net ETWU (7 mnths)	22,917	gallons

DCV is greater than the Net ETWU, so Harvest and Resuse is not feasible.

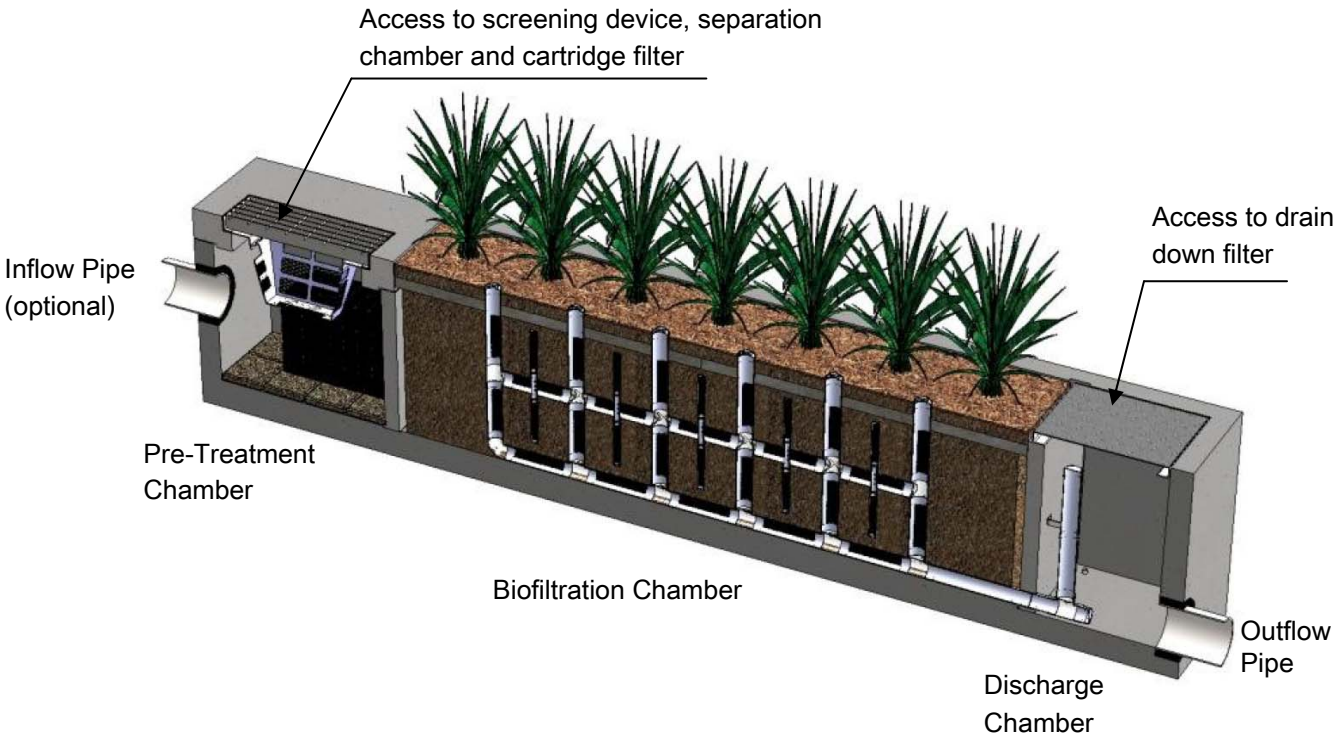
Attachment D: OPERATIONS AND MAINTENANCE PLAN

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.



Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.







Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.







Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.



Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.









Inspection Form



Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes:

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report



Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

Isolator® Row Plus
O&M Manual



ADS StormTech™

The Isolator® Row Plus

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS), Total Phosphorus (TP), Total Petroluem Hydrocarbons (TPH) and Total Nitrogen (TN) removal with easy access for inspection and maintenance.

The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, DC-780, SC-800, MC-3500, MC-4500 or MC-7200 models, are lined with filter fabric and connected to a closely located manhole for easy access. The fabric lined chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers allow stormwater to flow vertically out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS Isolator Row and Plus fabric are placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting.

The Isolator Row Plus is designed to capture the “first flush” runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row Plus Flamp™ is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end, or more difficult to remove and require confined space entry into the chamber area. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

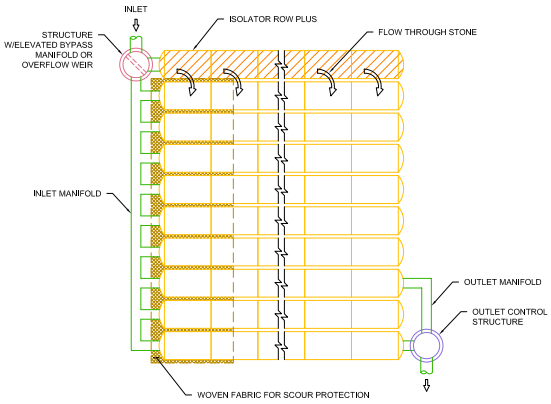
Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.*



Looking down the Isolator Row Plus from the manhole opening, ADS Plus Fabric is shown between the chamber and stone base.



StormTech Isolator Row Plus with Overflow Structure (not to scale)



Isolator Row Plus Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

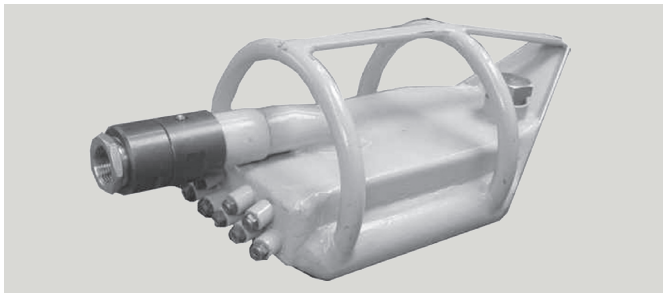
The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3" (75 mm) throughout the length of the Isolator Row Plus, clean-out should be performed.

Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entry.

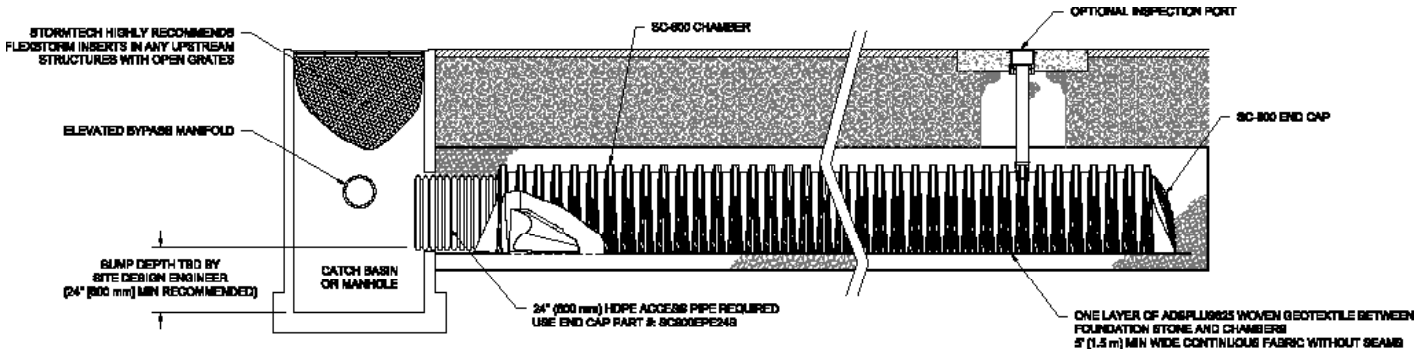
Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**







StormTech Isolator Row Plus (*not to scale*)



Isolator Row Plus Step By Step Maintenance Procedures

Step 1

Inspect Isolator Row Plus for sediment.

A) Inspection ports (if present)
- i. Remove lid from floor box frame
- ii. Remove cap from inspection riser
- iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
- iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

B) All Isolator Row Plus
- i. Remove cover from manhole at upstream end of Isolator Row Plus
- ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe
  1. Mirrors on poles or cameras may be used to avoid a confined space entry
  2. Follow OSHA regulations for confined space entry if entering manhole
- iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2.
  If not, proceed to Step 3.

Step 2

Clean out Isolator Row Plus using the JetVac process.

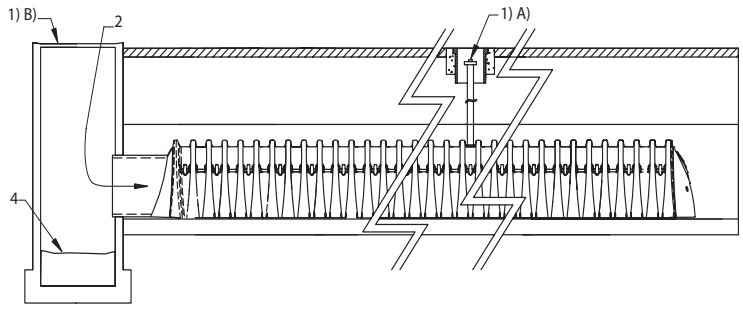
A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

Step 3

Replace all caps, lids and covers, record observations and actions.

Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sedi-ment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row Plus, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

adspipe.com
800-821-6710

ADS "Terms and Conditions of Sale" are available on the ADS website, www.adspipe.com
The ADS logo, StormTech®, the Isolator® Row Plus and the Green Stripe are registered trademarks of Advanced Drainage Systems, Inc.
© 2025 Advanced Drainage Systems, Inc. #11081 5/25 CS

PSI Pacific Southwest Industries

ENGINEERED - PUMPS/FLUID HANDLING & DISPOSAL SYSTEMS - PACKAGED LIFT STATIONS

LIFT STATION REQUIRED MAINTENANCE

The lift station should be inspected twice a year for proper operation, and should be checked for overabundance of solid matter such as grease and soap buildup.

Proper operation and inspection would include the following:

1) Automatic operation of the system by float activation. One pump starting at lead on levels, second pump starting at high level conditions; manual operation by use of the selector switches.

2) Inspect floats for proper elevation and for proper movement. Correct any obstructions.

3) Check incoming power for proper voltage. Check voltage at motor connections.

4) Check amperage of each motor.

5) Hose down lift station to clean the walls of the wet well, pumps and floats.

MECHANICAL SEAL INSPECTION OF PUMPS

Inspection of the mechanical seals should be done every two years.

The inspection will include the following:

Pull pump out of wet well. Remove oil seal plug and inspect the oil for clarity. Clear oil indicates no water intrusion and chamber is to be topped off with 30 weight turbine oil. If oil is cloudy the mechanical seal and oil needs to be replaced.

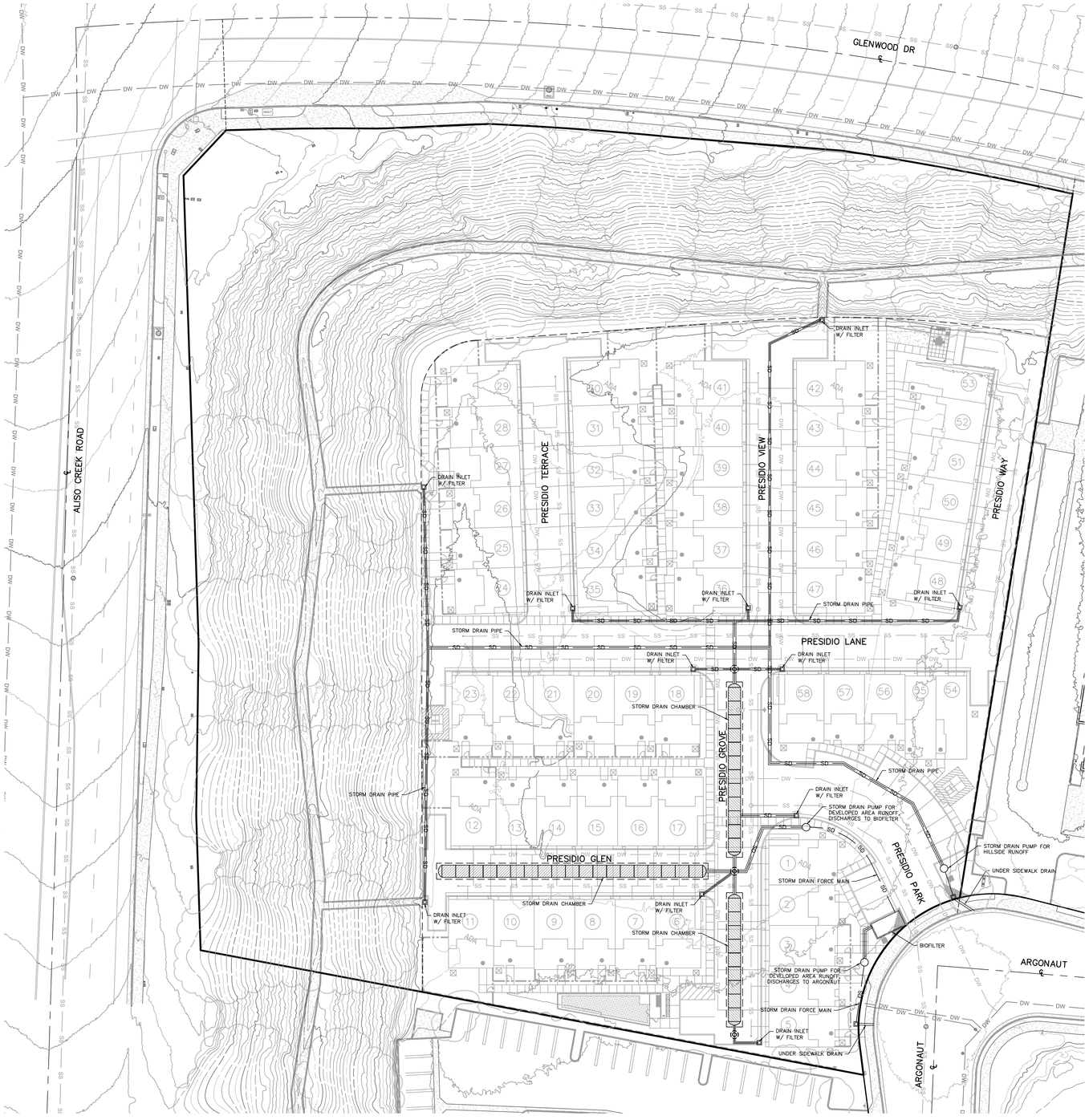
Note: Your lift station is designed to pump raw unscreened sewage. Refrain from putting the following into your sewage system: tampons, feminine napkins, condoms, handy wipes, baby wipes, paper towels, diapers, plastic bags, q-tips, etc., and food grease. Although grease will be pumped, grease will cause problems eventually and will not be covered under the manufacturer's warranty. Dispose of the above items in a trash can.

PSI recommends that preventive maintenance and service be performed by a qualified technician.
Any question regarding your lift station should be directed to Scott Richardson at 800-358-9095.

18541 Collier Ave Lake Elsinore, CA 92530
(800) 358-9095 (951) 674-2144 fax (951) 674-9444 CSL #583052
www.psipumps.com Email: info@psipumps.com

WQMP SITE PLAN

IN THE CITY OF ALISO VIEJO
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

SCALE 1"=30'

30 15 0 30 60 90

SCALE: 1"=30'

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes	**Education for Property Owners, Tenants and Occupants** Educational pamphlets	Provide to home owner at time of occupancy / once	HOA
No	**Activity Restriction**		
Yes	**Common Area Landscape Management** Maintain, clean, trim, etc all landscape areas	Weekly	HOA
Yes	**BMP Maintenance** Storm drain and catch basins	Twice per year	HOA
No	**Title 22 CCR Compliance**		
No	**Spill Contingency Plan** .		
No	**Underground Storage Tank Compliance**		
No	**Hazardous Materials Disclosure Compliance**		
No	**Uniform Fire Code Implementation**		
Yes	**Common Area Litter Control** Trash pickup	Weekly	HOA / Homeowner
No	**Employee Training**		
No	**Housekeeping of Loading Docks**		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**Common Area Catch Basin Inspection**		
No	**Street Sweeping Private Streets and Parking Lots**		
No	**Retail Gasoline Outlets**		
	Structural Source Control BMPs		
Yes	**Provide Storm Drain System Stenciling and Signage** Catch basin inlets	Yearly	HOA
No	**Design and Construct Outdoor Material Storage Areas to Reduce Pollutant Introduction**		
No	**Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction**		
Yes	**Use Efficient Irrigation Systems & Landscape Design** Irrigation and landscape	Twice per Year	HOA
No	**Protect Slopes and Channels and Provide Energy Dissipation**		
No	**Loading Docks**		
No	**Maintenance Bays**		
No	**Vehicle Wash Areas**		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**Outdoor Processing Areas**		
No	**Equipment Wash Areas**		
No	**Fueling Areas** .		
No	**Hillside Landscaping**		
No	**Wash Water Controls for Food Preparation Areas**		
No	**Community Car Wash Racks**		
Treatment Control BMPs			
Yes	**Treatment Control BMP # 1** Biomedia Filter	See attached Modular Wetlands Maintenance Guidelines	HOA
LID BMPs			
Hydromodification Control BMPs			

Exhibit A, Operations and Maintenance Plan

Required Permits

This section must list any permits required for the implementation, operation, and maintenance of the BMPs. Possible examples are:

- Permits for connection to sanitary sewer
- Permits from California Department of Fish and Game
- Encroachment permits

If no permits are required, a statement to that effect should be made.

Responsible Party

The owner is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the LID Plan. The contact information for the entity responsible is below:

Name:	Alex Hernandez
Company:	Whittier 25, LLC
Title:	Vice President
Address 1:	2355 Main Street
Address 2:	Irvine, CA 92614
Phone Number:	949-296-2400
Email:	alex@brandywine-homes.com

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached. All records must be made available for review upon request.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Attachment E: GEOTECHNICAL REPORT

ALTA CALIFORNIA
GEOTECHNICAL INC.

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

BRANDYWINE HOMES
2355 Main Street
Irvine, CA 92614

September 26, 2025
Project No. 1-0631

Attention: Mr. Emmanuel Robinson

Subject: **GEOTECHNICAL INVESTIGATION**
15 Argonaut,
City of Aliso Viejo, County of Orange, California

References: Appendix A

Dear Mr. Robinson:

Alta California Geotechnical, Inc. (Alta) is pleased to present this geotechnical investigation for the proposed residential development of 15 Argonaut, located in the City of Aliso Viejo, County of Orange, California. This report is based on a recent subsurface investigation conducted by Alta, laboratory testing, and Alta's staff's experience with similar projects in this vicinity.

Alta's review of the data indicates that the proposed development is feasible, from a geotechnical perspective, provided that the recommendations presented in this report are incorporated into the grading and improvement plans and implemented during site development.

Included in this report are:

- Discussion of the site geotechnical conditions.
- Recommendations for remedial and site grading, including unsuitable soil removals.
- Geotechnical site construction recommendations.
- Foundation design parameters.

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

Sincerely,
Alta California Geotechnical, Inc.

YOUSSEF F. HIJAZI
Engineering Geology Associate

LOGAN A. MARQUETTE
Civil Engineering Associate

Reviewed By:

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-26
Registered Geotechnical Engineer
President

FRANK J. ECHENIQUE/CEG 2134
Reg. Exp.: 7-31-26
Engineering Geologist
Manager of Geologic Services

Distribution: (1) Addressee

YFH:LAM:SAG:FJE -1-0631, September 26, 2025 (Geotechnical Investigation, 15 Argonaut, Aliso Viejo)

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1.0 INTRODUCTION

This report presents Alta's findings, conclusions, and geotechnical recommendations for the proposed development of 15 Argonaut, located in the City of Aliso Viejo, County of Orange, California.

1.1 Purpose

The purpose of this report is to examine the existing onsite geotechnical conditions and assess the impacts that the geotechnical conditions may have on the proposed development. This report is suitable for use in developing grading plans and engineer's cost estimates.

1.2 Scope of Work

Alta's *Scope of Work* for this geotechnical investigation included the following:

- Reviewing the referenced reports and air photos (Appendix A).
- Site geologic mapping.
- Excavating, logging, and sampling four (4) hollow stem auger borings to a maximum depth of 51.5-feet below the existing surface (Appendix B).
- Conducting laboratory testing on samples obtained during our investigation (Appendix C).
- Conducting two (2) infiltration tests in two (2) additional borings at a maximum depth of 5.0-feet below the ground surface.
- Evaluating engineering geologic and geotechnical engineering data, including laboratory data, to develop recommendations for site remedial grading, import soil, foundations, and utilities.
- Preparing this report and accompanying exhibits.

1.3 Report Limitations

The conclusions and recommendations presented in this report are based on the field and laboratory information generated during this investigation, and a review of the referenced reports. The information contained in this report is intended to be used for development of grading plans and preliminary construction cost estimates.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Background

The irregular-shaped, approximately 4.6-acre site is bounded to the north by Glenwood Drive, to the west by Aliso Creek Road, and to the east and south by existing developments. The site is currently occupied by a commercial building and associated parking.

Historic aerial images are available as far back as 1938 and indicate the site was originally vacant. By 1992, the commercial building was constructed along with associated parking. The site has remained relatively unchanged since (Historic Aerials, 2025).

2.2 Proposed Development

The site will be redeveloped to support a residential development consisting of 58 single-family residential structures and associated improvements. Alta anticipates that conventional cut-and-fill grading techniques will be used to develop the site for the support of wood-frame construction with shallow foundations and reinforced concrete slabs-on-grade, and associated improvements.

3.0 SITE INVESTIGATION AND LABORATORY TESTING

3.1 Subsurface Investigation

Alta conducted a subsurface investigation on August 27th, 2025, consisting of the drilling, logging, and select sampling of four (4) hollow stem auger borings up to a maximum depth of 51.5-feet below the ground surface. The locations of the exploratory borings and excavations are shown on Plate 1 and the logs are presented in Appendix B.

Laboratory testing was performed on bulk samples obtained during the field investigation. A brief description of the laboratory test procedures and the test results are presented in Appendix C.

3.2 Infiltration Testing

It is Alta's understanding that the project may utilize infiltration systems for storm water disposal. Details of the system are not known at this time.

Infiltration testing was conducted in two (2) boring wells at a depth of 5.0-feet below the ground surface at specified locations. The testing was performed in general conformance with the County of Orange WQMP specifications. The testing wells were presoaked for more than 24 hours prior to testing. During testing, the water level readings were recorded every 10 to 30 minutes until the readings stabilized.

The data was then adjusted to provide an infiltration rate utilizing the Porchet Method. The resulting field infiltration rates, with no factor of safety, are summarized below in Table 3-1.

Table 3-1
Summary of Infiltration Testing
(No Factor of Safety)

Test Designation	P-1	P-2
Approximate Depth of Test	5.0 ft	5.0 ft
Final Time Interval	10 minutes	10 minutes
Radius of Test Hole	4 inches	4 inches
Tested Infiltration Rate	0.03 in/hr	0.00 in/hr

4.0 GEOLOGIC CONDITIONS

4.1 Geologic and Geomorphic Setting

Regionally, the subject site is located in the Peninsular Ranges geomorphic province, which characterizes the southwest portion of southern California where right-lateral major active fault zones predominately trend northwest-southeast. The Peninsular Ranges province is composed of plutonic and metamorphic rock, with lesser amounts of Tertiary volcanic and sedimentary rock, Quaternary drainage in-fills and sedimentary veneers.

4.2 Stratigraphy

Based on our literature review and subsurface investigation, the subject site is underlain by the Monterey Formation (CDC, 2001, Figure 1). The geologic unit is briefly described below.

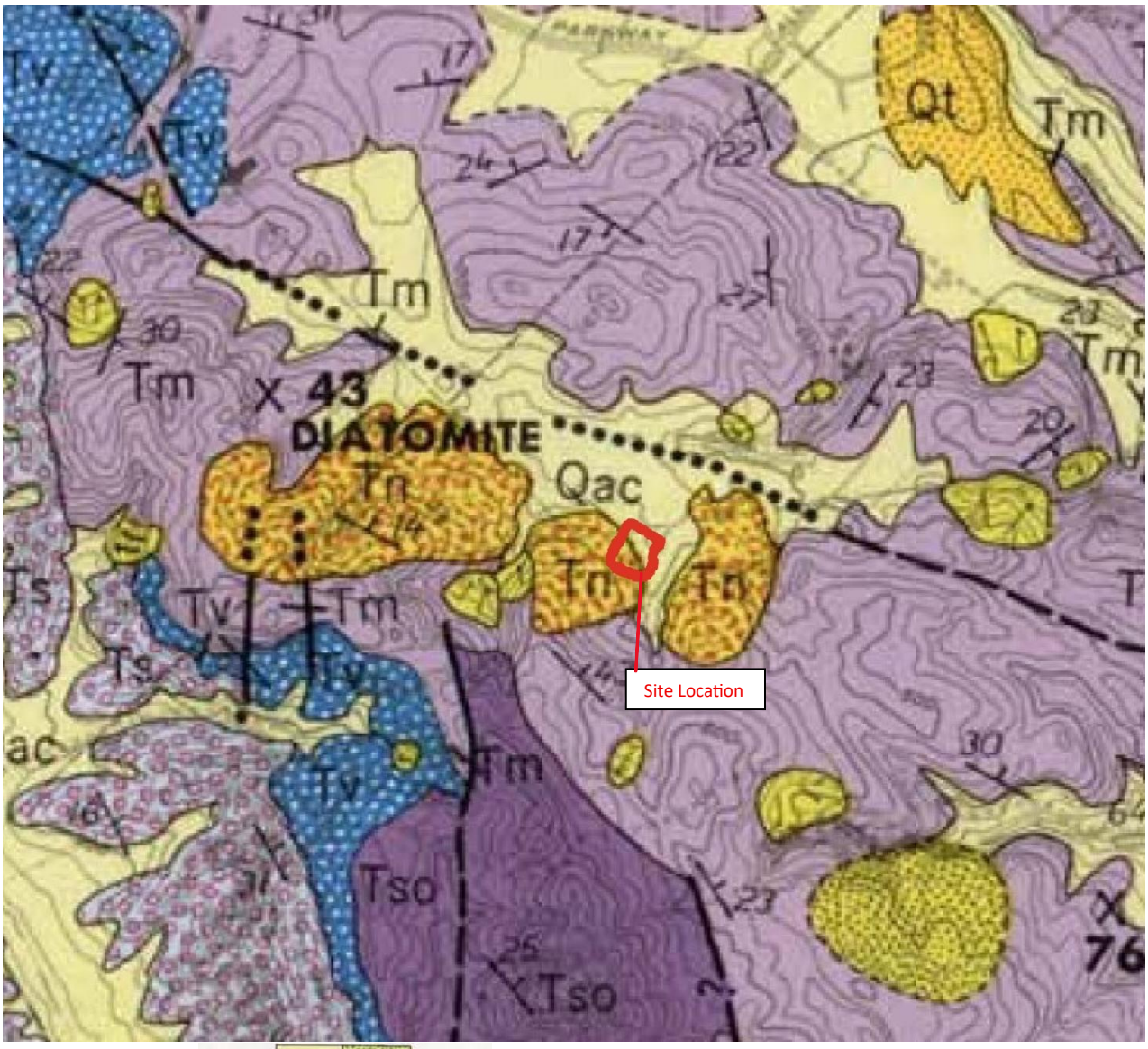
4.2.1 Monterey Formation (map symbol Tmy)

The Miocene-age Monterey Formation observed onsite primarily consists of silty sandstone, clayey sandstone, sandy claystone, sandstone, and claystone. The fine grained silty sandstone onsite is pale brown, white, dark yellowish brown, and brown in a slightly moist to moist and medium dense to very dense condition. The fine grained clayey sandstone onsite is pale brown, white, dark brown, brown, gray, light gray, dark grayish brown, and bluish gray in a slightly moist to moist and medium dense to dense condition. The sandy claystone onsite is dark brown, brown, and gray in a moist and stiff to very stiff condition. The very fine to fine grained sandstone onsite is pale brown, yellowish brown, grayish pale brow, and orange in a slightly moist and medium dense to very dense condition. The claystone onsite is dark brown to brown in a moist and very stiff condition. This unit was logged to a depth of 51.5 feet below the ground surface and is overlain by a thin layer of asphalt.

4.3 Geologic Structure

4.3.1 Tectonic Framework

Jennings (1985) defined eight structural provinces within California that have been classified by predominant regional fault trends and similar fold structure. These provinces are in turn divided into blocks and sub-blocks that are defined by “major Quaternary faults.” These blocks and sub-blocks exhibit similar structural features. Within this framework, the subject site is located within Structural Province I, which is controlled by



GEOLOGIC MAP OF ORANGE COUNTY CALIFORNIA,
SHOWING MINES AND MINERAL DEPOSITS

Compiled by P. K. Morton and R. V. Miller
1981

ALTA CALIFORNIA GEOTECHNICAL INC.	Figure 1	Project Name:	15 Argonaut
		Project No.:	1-0631
		Date:	9/26/2025

the dominant northwest trend of the San Andreas Fault and is divided into two blocks, the Coast Range Block and the Peninsular Block. The Peninsular Range Block, on which this site is located, is characterized by a series of parallel, northwest trending faults that exhibit right-lateral strike-slip movement. These faults are terminated by the Transverse Range block to the north and extend southward into the Baja Peninsula. These northwest trending faults divide the Peninsular Range block into eight sub-blocks. The site is located in the northwestern portion of the Santa Ana sub-block, one of the eight sub-blocks, which is bound on the east by the Elsinore fault zone and on the west by the Newport-Inglewood fault zone.

4.3.2 Regionally Mapped Active Faults

Several large, active fault systems including the Elsinore and Newport-Inglewood faults occur in the region surrounding the site. These fault systems have been studied extensively and in a large part control the geologic structure of southern California.

4.3.3 Geologic Structure

Based upon our literature review, the younger fan deposits are of Quaternary age and are not folded or faulted.

4.4 Groundwater

Groundwater was not encountered during our subsurface investigation. Based on state-provided information, the historic-high groundwater is greater than 20.0 feet below the ground surface (CGS, 2001). The most recent groundwater data retrieved from the nearest groundwater monitoring site, site ID 336555N1176965W001, was recorded in 2024 and indicates groundwater was approximately greater than 60.0-feet at that time (CDWR, 2025).

4.5 Earthquake Hazards

The subject site is located in southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting a site are dependent on the distance to the causative fault and the intensity and magnitude of the seismic event. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction and/or ground lurching.

4.5.1 Local and Regional Faulting

The site is located in the northwestern portion of the Santa Ana sub-block. The closest known active faults and their distances to the site are presented on Table 4-1 below.

TABLE 4-1
Local and Regional Faulting

Fault Zone	Distance to Fault Zone
San Joaquin Hills	2.2 miles
Newport-Inglewood	7.1 miles
Elsinore	18.0 miles
Chino	18.4 miles
Palos Verdes	21.7 miles
Puente Hills (Coyote Hills)	22.1 miles
Coronado Bank	24.2 miles
Puente Hills (Santa Fe Springs)	28.6 miles

4.5.2 Surface Rupture

Active faults are not known to exist within the project and a review of Special Publication 42 indicates the site is not within a California State designated earthquake fault zone. Accordingly, the potential for fault surface rupture on the subject site is very low.

4.5.3 Seismicity

Ground shaking hazards caused by earthquakes along other active regional faults do exist. The 2022 California Building Code requires use-modified spectral accelerations and velocities for most structural designs. Seismic design parameters using soil profile types identified in the 2022 California Building Code are presented in Section 7.3.

4.5.4 Landslide Potential

Based on a review of the Seismic Hazard Zone Report for the San Juan Capistrano Quadrangle, the slope superjacent to the site is within an area with landslide potential. Further discussion into this hazard and its effects on the proposed project are presented in Section 6.3.

4.5.5 Liquefaction

Seismic agitation of relatively loose saturated sands, silty sands, and some silts can result in a buildup of pore pressure. If the pore pressure exceeds the overburden stresses, a temporary quick condition known as liquefaction can occur. Liquefaction effects can manifest in several ways including: 1) loss of bearing; 2) lateral spread; 3) dynamic settlement; and 4) flow failure. Lateral spreading has typically been the most damaging mode of failure.

In general, the more recent that a sediment has been deposited, the more likely it will be susceptible to liquefaction. Other factors that must be considered are groundwater, confining stresses, relative density, and the intensity and duration of seismically induced ground shaking.

Based on State provided information, the site is not located within a liquefaction zone. Groundwater was not encountered during our investigation to a depth of 51.5-feet bgs. Based on density of the

underlying formation, it is anticipated that the potential for liquefaction is nil.

5.0 ENGINEERING PROPERTIES AND ANALYSIS

5.1 Materials Properties

Presented herein is a general discussion of the engineering properties of the onsite materials that will be encountered during construction of the proposed project. Descriptions of the soil (Unified Soil Classification System) are presented on the logs in Appendices B.

5.1.1 Excavation Characteristics

Based on the data provided from the subsurface investigation, it is our opinion that the majority of the onsite materials possess favorable excavation characteristics such that conventional equipment can be utilized. Considerations should be given to the high moisture content of the diatomaceous soils encountered, as presented in the boring logs (Appendix B).

5.1.2 Compressibility

The upper portions of the Monterey Formation onsite are considered compressible and unsuitable to support the proposed improvements. Recommended removal depths are presented in Section 6.1.2.

As noted in the boring logs (Appendix B), the onsite soils are diatomaceous. Considerations should be given to the low dry density and high moisture content.

5.1.3 Hydro-Consolidation

Hydro-consolidation is the effect of introducing water into soil that is prone to collapse. Upon loading and initial wetting, the soil structure and apparent strength are altered resulting in almost immediate settlement.

That settlement can have adverse impacts on engineered structures, particularly in areas where it is manifested differentially. Differential settlements are typically associated with differential wetting, irregularities in the subsurface soil conditions, or irregular loading patterns.

Based on laboratory testing (Appendix C), there is minimal potential for hydro-collapse in the Monterey Formation onsite.

5.1.4 Expansion Potential

Expansion index testing was performed on samples taken during our subsurface investigation. Based on laboratory results, it is anticipated that the majority of materials onsite are "low" to "medium" in expansion potential (21≤EI≤90, Appendix C) when tested per ASTM D: 4829.

5.1.5 Earthwork Adjustments

The values presented in Table 5-2 are deemed appropriate for estimating purposes and may be used in an effort to balance earthwork quantities. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in-progress and actual conditions are better defined.

TABLE 5-2
Earthwork Adjustment Factors

Geologic Unit	Adjustment Factor Range	Average
Monterey Formation	Shrink 4% to 8%	6%

5.1.6 Chemical Analyses

Chemical testing was performed on samples of material underlying the proposed site. Soluble sulfate test results indicate that the soluble sulfate concentrations of the soils tested are classified as negligible (Category S0) per ACI 318-14.

Negligible chloride levels were detected in the onsite soils. Based on laboratory results of soluble sulfate, chloride, and pH testing as presented in Appendix C, the onsite soils are classified as "non-corrosive" to buried metals and concrete (Caltrans, 2022). Additional discussions on corrosion are presented in Section 7.9. Corrosion tests results are presented in Appendix C.

5.2 Engineering Analysis

Presented below is a general discussion of the engineering analysis methods that were utilized to develop the conclusions and recommendations presented in this report.

5.2.1 Bearing Capacity and Lateral Earth Pressures

Ultimate bearing capacity values were obtained using the graphs and formula presented in NAVFAC DM-7.1. Allowable bearing was determined by applying a factor of safety of at least 3 to the ultimate bearing capacity. Static lateral earth pressures were calculated using Rankine methods for active and passive cases. If it is desired to use Coulomb forces, a separate analysis specific to the application can be conducted.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on Alta's findings during our subsurface investigation, the laboratory test results, and our staff's previous experience in the area, it is Alta's opinion that the development of the site is feasible from a geotechnical perspective. Presented below are recommendations that should be incorporated into site development and construction plans.

6.1 Remedial Grading Recommendations

All grading shall be accomplished under the observation and testing of the project geotechnical consultant in accordance with the recommendations contained herein and the City of Santa Ana criteria.

6.1.1 Site Preparation

Vegetation, construction debris, and other deleterious materials are unsuitable as structural fill material and should be disposed of offsite prior to commencing grading/construction. Any septic tanks, seepage pits or wells should be abandoned as per the County of Orange Department of Health Services.

Existing concrete should be removed prior to the placement of engineered fill. The demolished concrete may be incorporated into compacted, engineered fills after it is crushed to a maximum size of six (6) inches. Prior to placement as engineered fill any protruding steel rebar should be cut from the concrete pieces and disposed of offsite.

Existing asphaltic concrete should be removed prior to the placement of engineered fill. From a geotechnical perspective, this material may be incorporated into compacted, engineered fills after it is ground down to passing the #4 sieve.

6.1.2 Unsuitable Soil Removals

The upper portions of alluvium are compressible and as such, are not suitable to support the proposed structures. Therefore, it is anticipated that, on average, the upper five (5) feet of existing soils will require removal and recompaction, extending a minimum of five (5) feet horizontally outside of the structures. This recommended removal combined with the foundation recommendations presented in Section 7.1 should provide suitable support for the proposed structures.

Footings for structures should be underlain by a minimum of three (3) feet of compacted fill. As such, for building pads where unsuitable soil removals do not provide the minimum depth of compacted fill, or where design grades and/or remedial grading activities create cut/fill transitions, the cut and shallow fill portions of the building pads should be over-excavated during grading and replaced with compacted fill. This condition shall be reviewed as foundation plans become available. The intent of this recommendations if for foundation loads to be encompassed within the engineered fill.

The Project Geotechnical Consultant should observe the removal bottom prior to placing fill. If unsuitable soils such as undocumented artificial fill is exposed upon the completion of the removals recommended above, additional removals may be required.

For fill areas in parking lots/drive aisles, in general, a minimum removal and recompaction of the upper two (2) feet is recommended, however all undocumented artificial fill shall be removed and recompacted. For cuts greater than two (2) feet in street areas, removals are not required. For

cuts less than two (2) feet, the two (2) foot removal and recompaction applies.

6.2 General Earthwork Recommendations

6.2.1 Compaction Standards

All fill and processed natural ground shall be compacted to a minimum relative compaction of 90 percent, as determined by ASTM Test Method: D-1557. Fill material should be moisture conditioned to optimum moisture or above, and as generally discussed in Alta's Earthwork Specification Section presented in Appendix E. Compaction shall be achieved with the use of heavy earthwork equipment. Mixing and moisture conditioning will be required in order to achieve the recommended moisture conditions.

As noted in the boring logs (Appendix B), the onsite soils are diatomaceous. Considerations should be given to the low dry density and high moisture content. It is recommended to utilize a contractor familiar with the difficulty of conducting grading operations within diatomaceous soil. Slower production rates should be anticipated.

6.2.2 Groundwater/Seepage

Groundwater was not encountered during the subsurface investigation. It is not anticipated that groundwater will be encountered during construction. It is possible that perched groundwater conditions could be encountered depending on the time of year construction occurs.

6.2.3 Documentation of Removals

All removal/over-excavation bottoms should be observed and approved by the project Geotechnical Consultant prior to fill placement. Consideration should be given to surveying the removal bottoms and undercuts after approval by the geotechnical consultant and prior to the

placement of fill. Staking should be provided in order to verify undercut locations and depths.

6.2.4 Treatment of Removal Bottoms

At the completion of removals/over-excavation, the exposed removal bottom should be ripped to a minimum depth of eight (8) inches, moisture-conditioned to above optimum moisture content and compacted in-place to the project standards.

6.2.5 Fill Placement

After removals, scarification, and compaction of in-place materials are completed, additional fill may be placed. Fill should be placed in eight-inch bulk maximum lifts, moisture conditioned or dried back so as to achieve optimum moisture content or above, compacted and tested as grading progresses until final grades are attained.

6.2.6 Mixing

Mixing of materials may be necessary to prevent layering of different soil types and/or different moisture contents. The mixing should be accomplished prior to and as part of compaction of each fill lift.

6.2.7 Import Soils

Import soils, if necessary, should consist of clean, structural quality, compactable materials similar to the on-site soils and should be free of trash, debris, or other objectionable materials. The project Geotechnical Consultant should be notified not less than 72 hours in advance of the locations of any soils proposed for import. Import sources should be sampled, tested, and approved by the project Geotechnical Consultant at the source prior to the importation of the soils to the site. The project Civil Engineer should include these requirements on plans and specifications for the project.

6.2.8 Utility Trenches

6.2.8.1 Excavation

Utility trenches should be supported, either by laying back excavations or shoring, in accordance with applicable OSHA standards. In general, existing site soils are classified as Soil Type “B” and "C" per OSHA standards. Upon completion of the recommended removals and recompaction, the artificial fill will be classified as Soil Type "B". The Project Geotechnical Consulting should be consulted if geologic conditions vary from what is presented in this report.

6.2.8.2 Backfill

Trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D-1557. Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill provided oversized materials are removed. Although suitable for backfill, consideration should be given to utilizing imported materials as backfill materials. If native soils are to be used, slower production rates should be anticipated. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks, or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils. Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

Under-slab trenches should also be compacted to project specifications. If select granular backfill (SE > 30) is used, compaction by flooding will be acceptable.

6.3 Slope Stability

Surrounding the western and northern boundary of the site, adjacent to Glenwood Drive and Aliso Creek Road, is an approximately 50 foot slope ascending from the site. Within this slope is a landslide hazard mapped by the California Department of Conservation (CDMG, 2001). Based on a review of available data, the construction of the slope was completed during the grading of the existing structures or adjacent streets. Reports pertaining to this grading and any geologic / geotechnical reports pertaining to the hazard are not available from the City or the County. No visible instabilities were observed during our investigation. V-ditches are currently in place, and the existing slope is planted.

In consideration of the existing slope, the proposed structures have been setback from the toe of the slope in accordance with the requirements of the CBC.

Further review should be done as the project progresses. Additional recommendations pertaining to the grading and mitigation of the mapped hazard may be required based on conditions exposed during grading.

7.0 DESIGN CONSIDERATIONS

7.1 Structural Design

It is anticipated that multi-story residential structures with slab on-grade and shallow foundations will be constructed. Upon the completion of rough grading, finish grade samples should be collected and tested in order to provide specific recommendations as they relate to the individual building pads. These test

results and corresponding design recommendations should be presented in a final rough grading report. Final slab and foundation design recommendations should be made based upon specific structure sitings, loading conditions, and as-graded soil conditions.

It is anticipated that the majority of onsite soils will possess "low" to "medium" expansion potential when tested in general accordance with ASTM Test Method D: 4829. Due to the inherent characteristics of diatomaceous soils, it is recommended to utilize post-tensioned foundations in the design of the project.

7.1.1 Foundation Design

Foundations may be preliminary designed based on the values presented in Table 7-1 below.

Table 7-1
Foundation Design Parameters*

Allowable Bearing	1500 lbs/ft^2 (assuming a minimum embedment depth and width of 12 inches)
Lateral Bearing	250 lbs/ft^2 at a depth of 12 inches plus 250 lbs/ft^2 for each additional 12 inches of embedment to a maximum of 2000 lbs/ft^2.
Sliding Coefficient	0.30
Settlement	Static Settlement – 0.5 inch in 40 feet Dynamic Settlement – 0.5 inch in 40 feet

*These values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern depth and reinforcement requirements and should be evaluated.

7.1.2 Post-Tensioning Slabs/Foundation Design Recommendations

Post-tensioned slabs for the project may be designed utilizing the parameters presented in Tables 7-1 and 7-2. The parameters presented herein are based on methodology provided in the Design of Post-Tensioned Slabs-On-Ground, Third Edition, by the Post-Tensioning Institute, in accordance with the 2022 CBC.

TABLE 7-2
POST-TENSION SLAB DESIGN PARAMETERS

Category	Expansion Potential	Minimum Embedment*	Edge Lift		Center Lift	
			Em (ft)	Ym (inch)	Em (ft)	Ym (inch)
I	Low	12 inches	5.4	0.61	9.0	0.26
II	Medium	18 inches	5.0	1.10	9.0	0.46
Slab Subgrade Moisture						
Category I	Minimum 110% of optimum moisture to a depth of 12 inches prior to pouring concrete					
Category II	Minimum 120% of optimum moisture to a depth of 12 inches prior to pouring concrete					
Embedment* The minimum footing embedments presented herein are based on expansion indexes. The structural engineer should determine minimum embedments based on the number of floors supported by the footings, the structural loading, and the requirements of the latest California Building Code. If mat slabs are utilized, alternate embedment depths can be provided.						
Moisture Barrier A moisture barrier should be provided in accordance with the recommendations presented in Section 7.2						
The parameters presented herein are based on procedures presented in the Design of Post-Tensioned Slabs-On-Ground, Third Edition. No corrections for vertical barriers at the edge of the slab, or for adjacent vegetation have been assumed. The design parameters are based on a Constant Suction Value of 3.9 pF.						

7.2 Moisture Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive and should be capable of effectively preventing the migration of water and reducing the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as Visqueen, placed between two to four inches of clean sand, has been used for this purpose. The use of this system or other systems can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

7.3 Seismic Design

The site classes were determined based on the referenced reports and published geologic maps in the area in general conformance with Chapter 20 of ASCE 7-16. Based on the density of the underlying soils, a Site Class of D (shear wave velocity of 259 m/s) was selected. The seismic design parameters were calculated using a program based on the USGS website and ASCE 7-16 procedures. The resulting values are presented in Table 7-3. These values are applicable providing the exceptions presented in Supplements 2 and 3 of ASCE 7-16 are utilized in the design of the structure. If the design does not include the exception methodology, then a site-specific analysis shall be conducted.

TABLE 7-3 Seismic Ground Motion Values
2022 CBC and ASCE 7-16

Parameter	*Value*
Site Class	D
Site Latitude	33.5937
Site Longitude	-117.7272
Spectral Response Acceleration Parameter, S_S	1.22
Spectral Response Acceleration Parameter, S_1	0.438
Site Coefficient, F_a	1.012
Site Coefficient, F_v	1.85
MCE Spectral Response Acceleration Parameter, S_{MS}	1.235
MCE Spectral Response Acceleration Parameter, S_{M1}	0.810
Design Spectral Response Acceleration Parameter, S_{DS}	0.823
Design Spectral Response Acceleration Parameter, S_{D1}	0.540
Peak Ground Acceleration, PGA_M	0.568

7.4 Fence and Garden Walls

Block walls, if used, should be embedded a minimum of 2 feet below the lowest adjacent grade. Construction joints (not more than 20 feet apart) should be included in the block wall construction. Side yard walls should be structurally separated from the rear yard wall.

7.5 Footing Excavations

Soils from the footing excavations should not be placed in slab-on-grade areas unless properly compacted and tested. The excavations should be cleaned of all loose/sloughed materials and be neatly trimmed at the time of concrete placement. The Project Geotechnical Consultant should observe the footing excavations prior to the placement of concrete to determine that the excavations are founded in suitably compacted material.

7.6 Retaining Walls

Retaining walls should be founded on engineered fill and should be backfilled with granular soils that allow for drainage behind the wall. Foundations may be designed in accordance with the recommendations presented in Table 7-1, above. Unrestrained walls, free to horizontally move 0.0005H (for dense cohesionless backfill), may be designed to resist lateral pressures imposed by a fluid with a unit weight determined in accordance with the Table 7-4 below. The table also presents design parameters for restrained (at-rest) retaining walls. These parameters may be used to design retaining walls that may be considered as restrained due to the method of construction or location (corner sections of unrestrained retaining walls).

TABLE 7-4
Equivalent Fluid Pressures for 90% Compacted Fill (Select Material)

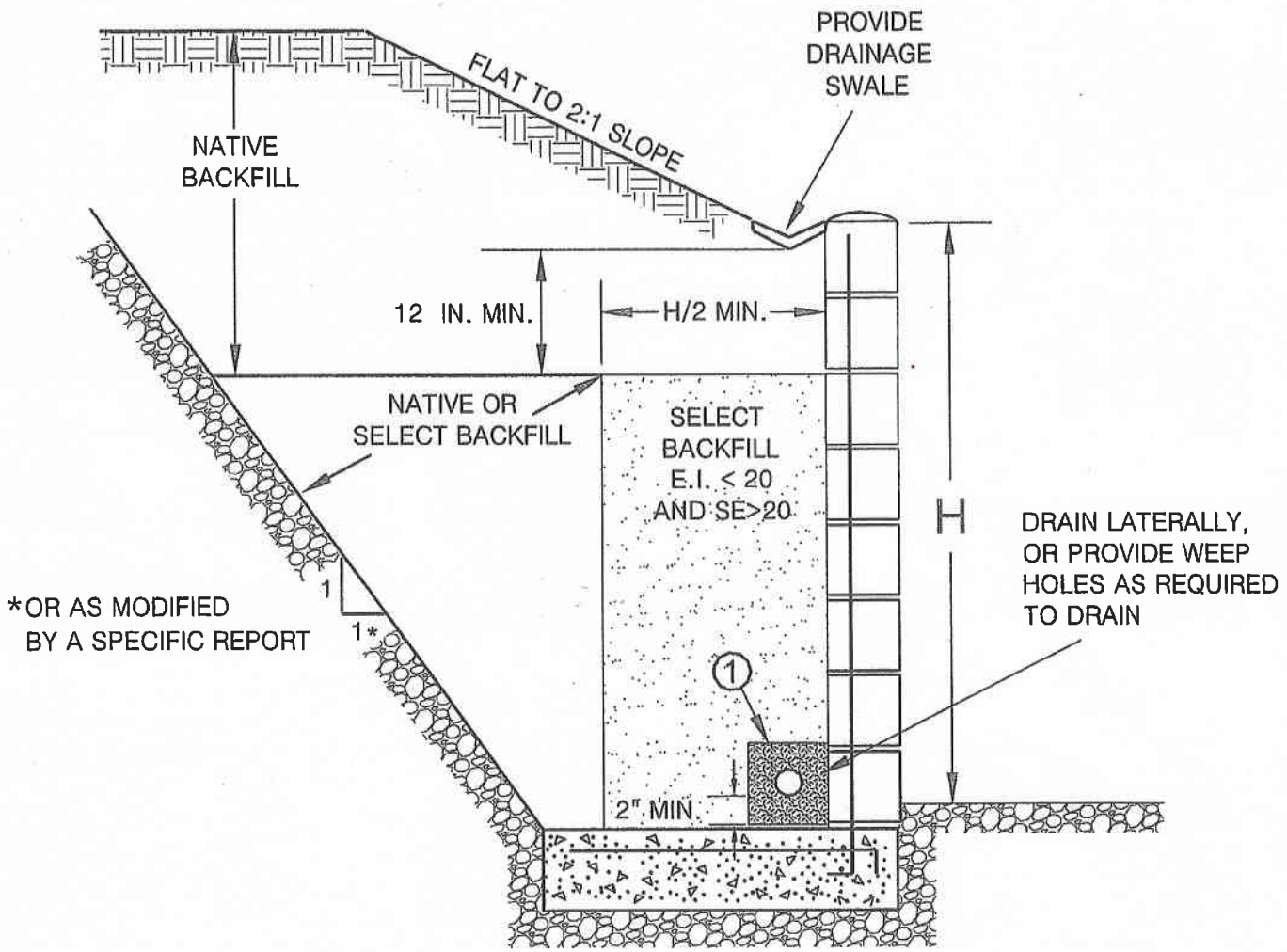
Backfill	Active Pressure (psf/ft)	At-Rest Pressure (psf/ft)
Level	35	55

Per the requirements of the 2022 CBC, the seismic force acting on the retaining walls with backfill exceeding 6-feet in height may be resolved utilizing the formula $12.5H^2$ lb/lineal ft (H=height of the wall). This force acts at approximately 0.6H above the base of the wall. The seismic value can be converted as required by the retaining wall engineer. Retaining walls should be designed in general accordance with Section 1807A.2 of the 2022 CBC.

- Restrained retaining walls should be designed for "at-rest" conditions.
- The design loads presented in the above table are to be applied on the retaining wall in a horizontal fashion and as such friction between wall and retained soils should not be allowed in the retaining wall analyses.
- Additional allowances should be made in the retaining wall design to account for the influence of construction loads, temporary loads, and possible nearby structural footing loads.
- Select backfill should be granular, structural quality backfill with a Sand Equivalent of 20 or better and an ASCE Expansion Index of 20 or less. The backfill must encompass the full active wedge area. The upper one foot of backfill should be comprised of native on-site soils (see Plate A).
- The wall design should include waterproofing (where appropriate) and backdrains or weep holes for relieving possible hydrostatic pressures. The backdrain should be comprised of a 4-inch perforated PVC pipe in a 1 ft. by 1 ft., ¾-inch gravel matrix, wrapped with a geofabric. The backdrain should be installed with a minimum gradient of 2 percent and should be outletted to an appropriate location. For subterranean walls this may include drainage by sump pumps.
- No backfill should be placed against concrete until minimum design strengths are achieved.

It should be noted that the allowable bearing and lateral bearing values presented in Table 7-1 are based on level conditions at the toe. Modified design parameters can be presented for retaining walls with sloping condition at the toe. Other conditions should be evaluated on a case-by-case basis.

RETAINING WALL BACKFILL DETAIL



(1)

PIPE: 4-INCH PERFORATED PVC, SCHEDULE 40, SDR35 OR APPROVED ALTERNATE MINIMUM 8 PERFORATIONS (1/4-IN. DIA.) PER LINEAL FT. IN BOTTOM HALF OF PIPE

ROCK: MINIMUM VOLUME OF 1 CU. FT. OF 3/4-IN. MAX. ROCK PER. LINEAL FOOT OF PIPE, OR APPROVED ALTERNATE

FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT

7.7 Exterior Slabs and Walkways

Exterior concrete slabs and walkways should be designed and constructed in consideration of the following recommendations.

7.7.1 Subgrade Compaction

The subgrade below exterior concrete slabs should be compacted to a minimum of 90 percent relative compaction as determined by ASTM Test Method: D 1557.

7.7.2 Subgrade Moisture

The subgrade below concrete slabs should be moisture conditioned to a minimum of 110 percent (low expansion potential) or 120 percent (medium expansion potential) of optimum moisture prior to concrete placement

7.7.3 Concrete Slab Thickness

Concrete flatwork and driveways should be designed utilizing four-inch minimum thickness.

7.7.4 Concrete Slab Reinforcement

Utilization of reinforcement for flatwork and driveways is subject to a cost/benefit analysis. Reinforcement will decrease the amount of cracking that may occur in flatwork, however, planning for occasional repairs may be more cost effective. Utilizing closely spaced control joints is likely more cost-effective than utilizing reinforcement. The majority of the soils onsite are classified as very low in expansion potential. Consideration should be given to reinforcing flatwork with irregular (non-square/rectangular) shapes or flatwork underlain by medium expansive soils. Reinforcement may consist of 6x6 W.14/W1.4 welded wire mesh or an equivalent section of rebar.

7.7.5 Control Joints

Weakened plane joints should be installed on walkways at intervals of approximately eight feet (maximum) or less. Exterior slabs should be designed to withstand shrinkage of the concrete.

7.8 Concrete Design

As stated in Section 5.1.7, negligible concentrations of sulfates were detected in the onsite soils (Class S0). Therefore, the use of sulfate resistant concrete is not required per ACI 318-14 at this time. Post-grading conditions should be evaluated, and final recommendations made at that time.

7.9 Corrosion

Based on laboratory results of soluble sulfate, chloride, and pH testing as presented in Appendix C, the onsite soils are classified as “non-corrosive” to buried metals and concrete (Caltrans, 2022). Buried ferrous metals should be protected against the effects of corrosive soils in accordance with the manufacturer’s recommendations. Typical measures may include using non-corrosive backfill, protective coatings, wrapping, plastic pipes, or a combination of these methods. A corrosion engineer should be consulted if specific design recommendations are required by the improvement designer.

Per ACI 318-14, an exposure class of C1 would be applicable to metals encased in concrete (rebar in footings) due to being exposed to moisture from surrounding soils. Per Table 19.3.2.1 of ACI 318-14, the requirements for concrete with an exposure class of C1 are a minimum compressive strength of 2500 psi and a maximum water-soluble chloride ion content in concrete of 0.30 (percent by weight of cement).

7.10 Pavement Design

Pavement sections for the proposed streets shall be designed based on laboratory testing conducted on samples taken from the soil subgrade. Preliminarily, based on an assumed R-Value of 30, the pavement may be designed utilizing the sections presented in Table 7-5. These sections should be verified upon the completion of grading, based on R-Value testing. The ultimate pavement section design for public streets is under the City of Aliso Viejo's purview.

Table 7-5
Preliminary Pavement Sections

Traffic Index	Pavement Section Options OR	
5.0	3-inch AC on 6-inch AB	4-inch AC on 4-inch AB
5.5	3-inch AC on 7-inch AB	4-inch AC on 5-inch AB

AC-Asphalt Concrete
AB-Caltrans Class II Base

Construction of the streets should be accomplished in accordance with the current criteria of the City of Aliso Viejo. Prior to the placement of base material, the subgrade should be suitably moisture conditioned, processed and compacted to a minimum 95 percent of the laboratory maximum density (ASTM: D 1557) to at least twelve (12) inches below subgrade. After subgrade compaction, the exposed grade should then be "proof"-rolled with heavy equipment to ensure the grade does not "pump" and is verified as non-yielding. Aggregate base material should be placed on the compacted subgrade and compacted in-place to a minimum 95 percent of the laboratory standard obtained per ASTM: D 1557.

8.0 LOT MAINTENANCE

Ongoing maintenance of the improvements is essential to the long-term performance of structures. As such, the owners must implement certain maintenance procedures. The attached " Maintenance and Improvement Considerations" presented in the Appendix E may be included as part of the sales packet to educate the owners in issues related to drainage, maintenance, improvements, etc. The following recommendations should also be implemented.

8.1 Lot Drainage

Roof, pad, and lot drainage should be collected and directed away from structures and slopes and toward approved disposal areas. Design fine grade elevations should be maintained throughout the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from structures and slopes. Residents should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, down drains, and other devices that have been installed to promote structure and slope stability.

8.2 Burrowing Animals

Owners should undertake a program for the elimination of burrowing animals.

9.0 FUTURE PLAN REVIEWS

This report represents a geotechnical review of the site. As the project design for the project progresses, site specific geologic and geotechnical issues should be considered in the design and construction of the project. Consequently, future plan reviews may be necessary. These reviews may include reviews of:

- Grading Plans
- Foundation Plans
- Utility Plans

These plans should be forwarded to the project Geotechnical Consultant for review.

10.0 CLOSURE

10.1 Geotechnical Review

For the purposes of this report, multiple working hypotheses were established for the project, utilizing the available data and the most probable model is used for the analysis. Future information collected during the proposed grading operations is intended to evaluate the hypothesis and as such, some of the assumptions summarized in this report may need to be changed. Some modifications of the grading recommendations may become necessary, should the conditions encountered in the field differ from the conditions hypothesized in this report.

Plans and sections of the project specifications should be reviewed by Alta to evaluate conformance with the intent of the recommendations contained in this report. If the project description or final design varies from that described in herein, Alta must be consulted regarding the applicability of the recommendations contained herein and whether any changes are required. Alta accepts no liability for any use of its recommendations if the project description or final design varies and Alta is not consulted regarding the alterations.

10.2 Limitations

This report is based on the following: 1) the project as presented on the attached plan; 2) the information obtained from Alta's laboratory testing included herein; and 3) from the information presented in the referenced reports. The findings and recommendations are based on the results of the subsurface investigation, laboratory testing, and office analysis combined with an interpolation and extrapolation of conditions between and beyond the subsurface excavation locations. However, the materials adjacent to or beneath those observed may have different characteristics than those observed, and no precise representations are made as to the quality or extent of the materials not

observed. The results reflect an interpretation of the direct evidence obtained. Work performed by Alta has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by a geotechnical consultant who is familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report.

The conclusions and recommendations included in this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of Alta.

Alta has no responsibility for construction means, methods, techniques, sequences, procedures, safety precautions, programs in connection with the construction, acts or omissions of the CONTRACTOR or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

APPENDIX A

REFERENCES

APPENDIX A

Selected References

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APPENDIX B

Subsurface Investigation

APPENDIX B

Subsurface Investigation

Alta's subsurface investigation consisted of excavating, logging, and sampling four (4) hollow-stem auger borings. Details of the subsurface investigation are presented in Table B. The approximate location of the exploratory excavation is shown on the accompanying Plate 1 and the Geotechnical Logs are attached.

TABLE B
SURFACE INVESTIGATION DETAILS

Equipment	Range of Depths	Sampling Methods	Sample Locations
8" Hollow-Stem Auger	Up to 51.5 feet	1. Bulk 2. Ring	1. Bulk-Select Depths. 2. Ring-Every 2.5 or 5 feet.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravel and Gravelly Soils: More than 50% of coarse fraction retained on No. 4 sieve		GW	Well-graded gravels or gravel sand mixtures, little or no fines
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines
			GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and Sandy Soils: More than 50% of coarse fraction passes on No. 4 sieve		SW	Well-graded sands or gravelly sands, little or no fines
			SP	Poorly-graded sands or gravelly sands, little or no fines
			SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, and-clay mixtures

Major Divisions		grf	ltr	
Fine Grained Soils: More than 50% passes on No. 200 sieve	Silts And Clays LL,<50		ML	Inorganic silts and 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 silt-clays of low plasticity
	Silts And Clays LL,<50		MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
			VH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat and other highly organic soils

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

PARTICLE SIZE LIMITS

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4"	3"	12"	
Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot (SPT)
Very Loose	<4
Loose	4-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

CONSISTENCY CLASSIFICATION

Silts and Clays	Criteria
Very Soft	Thumb penetrates soil >1 in.
Soft	Thumb penetrates soil 1 in.
Firm	Thumb penetrates soil 1/4 in.
Stiff	Readily indented with thumbnail
Very Stiff	Thumbnail will not indent soil

HARDNESS

Bedrock
Soft
Moderately Hard
Hard
Very Hard

LABORATORY TESTS

Symbol	Test
DS	Direct Shear
DSR	Direct Shear (Remolded)
CON	Consolidation
SA	Sieve Analysis
MAX	Maximum Density
RV	Resistance (R) Value
EI	Expansion Index
SE	Sand Equivalent
AL	Atterberg Limits
CHEM	Chemical Analysis
HY	Hydrometer Analysis

SOIL MOISTURE

Increasing Visual Moisture Content

Dry - Dry to touch

Moist - Damp, but no visible free water

wet - Visible free water

SIZE PROPORTIONS

Trace - <5%

Few - 5 to 10%

Some - 15 to 25%

KEY TO EXPLORATORY BORING LOGS

ALTA CALIFORNIA GEOTECHNICAL INC.

PLATE B

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	460	BORING DESIG.	B-1
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	140 lbs	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	460				SM	**MONTEREY FORMATION** (Tm): SILTY SANDSTONE, fine grained, pale brown to white, slightly moist, medium dense, diatomaceous.				
		R	26		SC	@2.5 ft. CLAYEY SANDSTONE, pale brown to white, moist, medium dense, diatomaceous.	34.7	78	83	MAX, EI, HY, CHEM
5	455	R	43			@5.0 ft. white, slightly moist, dense, diatomaceous, some clay.	40.9	37	31	CON, HY
10	450	R	36			@10.0 ft. dark brown, moist, dense.	42.1	74	90	
15	445	R	33			@15.0 ft. dark brown to bluish gray, slightly moist, dense.	6.6	105	30	
20	440	R	22		CL	@20.0 ft. SANDY CLAYSTONE, gray, moist, stiff, fine grained sand.	66.6	56	91	
25	435	R	83		SM	@25.0 ft. SILTY SANDSTONE, fine grained, yellowish dark brown, slightly moist, very dense.	7.6	110	40	
30	430	S	10,9,8		SC	@30.0 ft. CLAYEY SANDSTONE, fine grained, dark brown to brown, moist, medium dense.	17.4			
35	425	S	17,40,50 for 4"		SP	@35.0 ft. SANDSTONE, very fine to fine grained, pale brown, slightly moist, very dense.	8.6			
	420					Continued;				

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

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

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-1

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	460	BORING DESIG.	B-1
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	140 lbs	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	420	S	26,50 for 5"			Continued; **MONTEREY FORMATION** (Tm) SANDSTONE, very fine to fine grained, pale brown, slightly moist, very dense.	10.0			
45	415	S	29,50 for 5"				8.7			
50	410	S	23,50 for 4"			@50.0 ft. yellowish brown.	20.1			
						TOTAL DEPTH 51.5 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

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

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

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-1

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	461	BORING DESIG.	B-2
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	140 lbs	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	460				SP	**MONTEREY FORMATION** (Tm): SANDSTONE, fine grained, grayish pale brown, slightly moist, dense.				
		R	41				9.0	107	43	
5	455	R	27			@5.0 ft. medium dense, trace gravel.	7.2	102	30	
10	450	R	53			@10.0 ft. very dense, some gravel.	8.7	105	41	
15	445	R	50 for 5"			@15.0 ft. very fine to fine grained, pale brown.	6.5	90	21	
20	440	R	50 for 5"				5.3	92	18	
25	435	R	50 for 4"			@25.0 ft. yellowish gray, some iron oxide staining.	5.7	94	20	
30	430	S	40,50 for 2"			@30.0 ft. pale brown, some iron oxide staining.	7.3			
35	425	S	47,50 for 3"			@35.0 ft. trace silt.	6.9			
						Continued;				

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

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

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-2

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	461	BORING DESIG.	B-2
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	140 lbs	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	420	S	36,50 for 3"			Continued; **MONTEREY FORMATION** (Tm): SAND, very fine to fine grained, pale brown, slightly moist, very dense, trace silt, some iron oxide staining.	9.6			
45	415	S	33, 50 for 4"				13.2			
50	410	S	32,50 for 4"				9.4			
						TOTAL DEPTH 51.5 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

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

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

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-2

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	458	BORING DESIG.	B-3
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	140 lbs	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					SC	**MONTEREY FORMATION** (Tm): CLAYEY SANDSTONE, fine grained, gray to white, moist, medium dense, diatomaceous.				
	455	R	24				61.0	57	84	
5		B R	24			@5.0 ft. dark brown to grayish white.	35.7	75	78	CON, HY MAX, EI, HY, CHEM
	450									
10		R	21			@10.0 ft. some iron oxide staining.	58.9	59	87	
	445									
15		R	26				50.4	68	93	
	440									
20		R	25			@20.0 ft. dark grayish brown.	30.5	87	89	
	435									
25		R	26		SM	@25.0 ft. SILTY SANDSTONE, fine grained, brown, moist, medium dense.	11.5	106	55	
						TOTAL DEPTH 26.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

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

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

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-3

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	459	BORING DESIG.	B-4
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	140 lbs	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					SC	**MONTEREY FORMATION** (Tm): CLAYEY SANDSTONE, fine grained, pale brown to white, moist, medium dense, diatomaceous.				
		R	21				68.4	55	90	
	455									
5		R	24				76.8	50	87	CON, HY
	450									
10		R	20		CL	@10.0 ft. CLAYSTONE TO SANDY CLAYSTONE, dark brown to brown, moist, very stiff.	34.9	77	81	CON, HY
	445									
15		R	30		CL	@15.0 ft. SANDY CLAYSTONE, dark brown to brown, moist, very stiff.	64.4	54	82	
	440									
20		R	23		SC	@20.0 ft. CLAYEY SANDSTONE, very fine to fine grained, bluish gray, moist, medium dense.	49.1	68	92	
	435									
25		R	20		CL	@25.0 ft. SANDY CLAYSTONE, brown to dark brown, moist, very stiff, some iron oxide staining.	41.8	73	87	
						TOTAL DEPTH 26.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

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

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

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-4

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	458	BORING DESIG.	P-1
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	N/A	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	N/A		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	455				SC	**MONTEREY FORMATION** (Tm): CLAYEY SANDSTONE, fine grained, pale brown to white, moist, medium dense, diatomaceous.				
5						TOTAL DEPTH 5.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

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

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
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S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-5

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0631	PROJECT NAME	15 Argonaut		
DATE STARTED	8/27/25	GROUND ELEV.	460	BORING DESIG.	P-2
DATE FINISHED	8/27/25	GW DEPTH (FT)		LOGGED BY	YH
DRILLER	2R Drilling Inc.	DRIVE WT.	N/A	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	N/A		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	460				SC	**MONTEREY FORMATION** (Tm): CLAYEY SANDSTONE, fine grained, pale brown to white, moist, medium dense, diatomaceous.				
5	455					TOTAL DEPTH 5.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

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

GROUNDWATER
SEEPAGE
J: JOINTING C: CONTACT
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Alta California Geotechnical, Inc.

P.N. 1-0631 PLATE B-6

APPENDIX C

Laboratory Testing

LABORATORY TESTING

The following laboratory tests were performed on a representative sample in accordance with the applicable latest standards or methods from the ASTM, California Building Code (CBC) and California Department of Transportation.

Classification

Soils were classified with respect to the Unified Soil Classification System (USCS) in accordance with ASTM D-2487 and D-2488.

Particle Size Analysis

Modified hydrometer testing was conducted to aid in classification of the soil. The results of the particle size analysis are presented in Table C.

Maximum Density/Optimum Moisture

The maximum dry density and optimum moisture content of two representative bulk samples were evaluated in accordance with ASTM D-1557. The results are summarized in Table C.

Expansion Index Tests

Two (2) expansion index test was performed to evaluate the expansion potential of typical on-site soil. Testing was carried out in general conformance with ASTM Test Method D-4829. The results are presented in Table C.

Chemical Analyses

Chemical testing was performed on two select samples by Alta. The results of these tests (sulfate content, resistivity, chloride content and pH) are presented on Table C.

Consolidation Tests

Consolidation testing was performed on four (4) relatively “undisturbed” soil samples at their natural moisture content in accordance with procedures outlined in ASTM D-2435. The samples were placed in a consolidometer and loads were applied incrementally in geometric progression. The samples (2.42-inches in diameter and 1-inch in height) were permitted to

consolidate under each load increment until the slope of the characteristic linear secondary compression portion of the thickness versus log of time plot was apparent. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation test results are shown on Plates C-1 through C-4.

Atterberg Limits

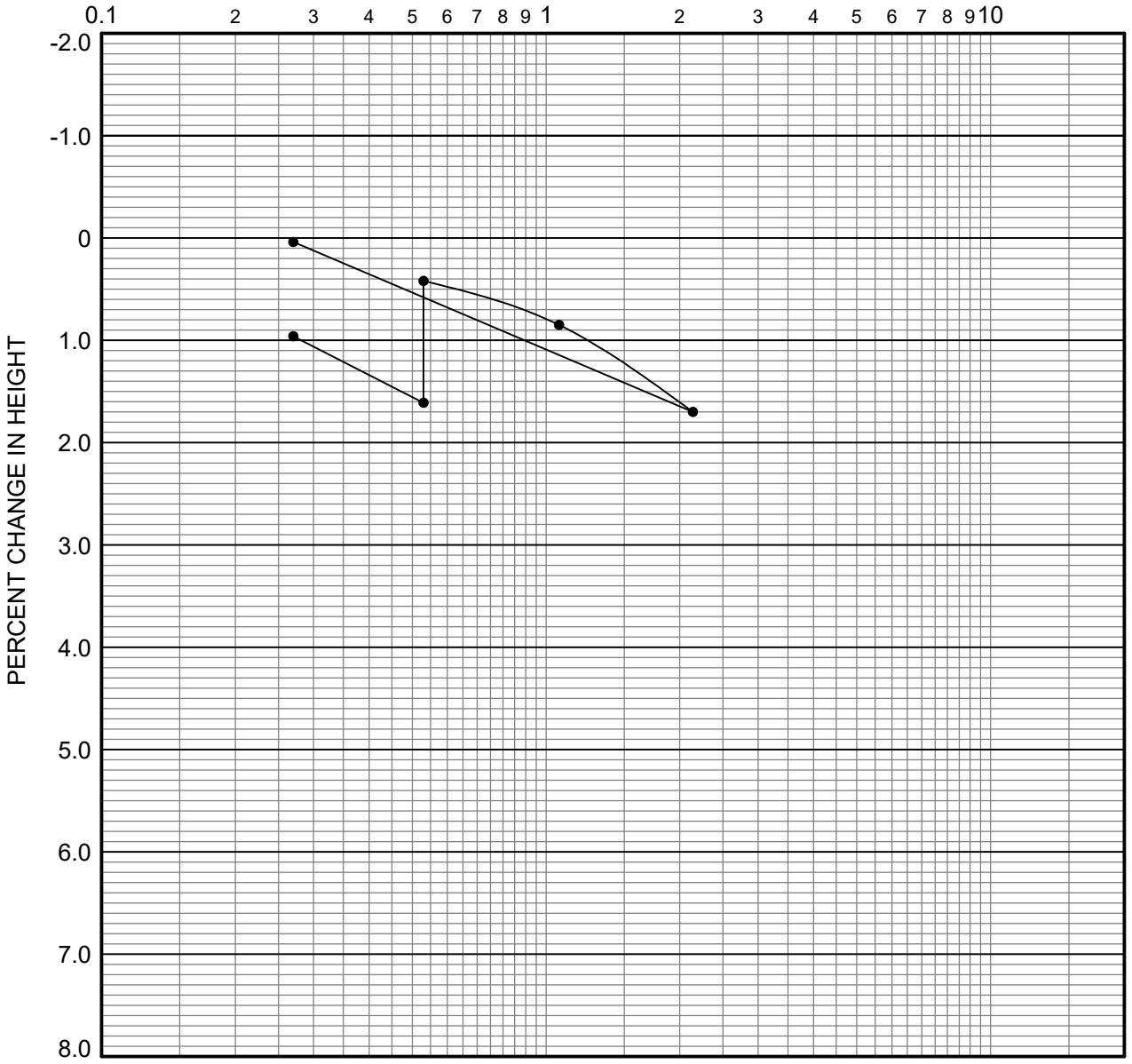
Atterberg limits testing was performed on two select samples by Alta. The results of these tests are presented on Table C

TABLE C
SUMMARY OF LABORATORY TEST DATA
P.N. 1-0631

Trench No.	Depth (Feet)	Soil Description	Group Symbol - Unified Soil Classification System	Maximum Dry Density		Direct Shear	Grain Size Analysis				Expansion Index	Sulfate Content (%)	Consolidation	Other Tests Remarks
				Maximum Density (pcf)	Optimum Moisture (%)		Gravel (% + No. 4 Screen)	% Sand	%Silt (0.074 to 0.005mm)	% Clay (-0.005 mm)				
B-1	2.5	Clayey Sandstone (Tm)	SC	114.4	12.5	-	2	60	12	26	8		-	MinResist: 1,619Ohm-cm pH:7.4,Cl:115ppm,SO4:0.012% LL:26,PL:16,PI:10
B-1	5	Claystone (Tm)	CL	-	-	-	0	14	34	52	-		**SEE PLATE C-1**	
B-3	5	Claystone with Sand (Tm)	CL	-	-	-	1	24	32	43	-		**SEE PLATE C-2**	
B-3 (Bulk)	5	Claystone with Sand (Tm)	CL	77.0	35.6	-	5	20	23	52	38			MinResist: 1,485Ohm-cm pH:7.4,Cl:195ppm,SO4:0.006% LL:67,PL:44,PI:23
B-4	5	Claystone (Tm)	CL	-	-	-	1	10	34	55	-		**SEE PLATE C-3**	
B-4	10	Claystone (Tm)	CL	-	-	-	0	12	34	54	-		**SEE PLATE C-4**	

Alta California Geotechnical, Inc.

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-1	5.0	37	40.9	31	86	CL	Claystone (Tm)

REMARKS: WATER ADDED AT 1.07 TSF

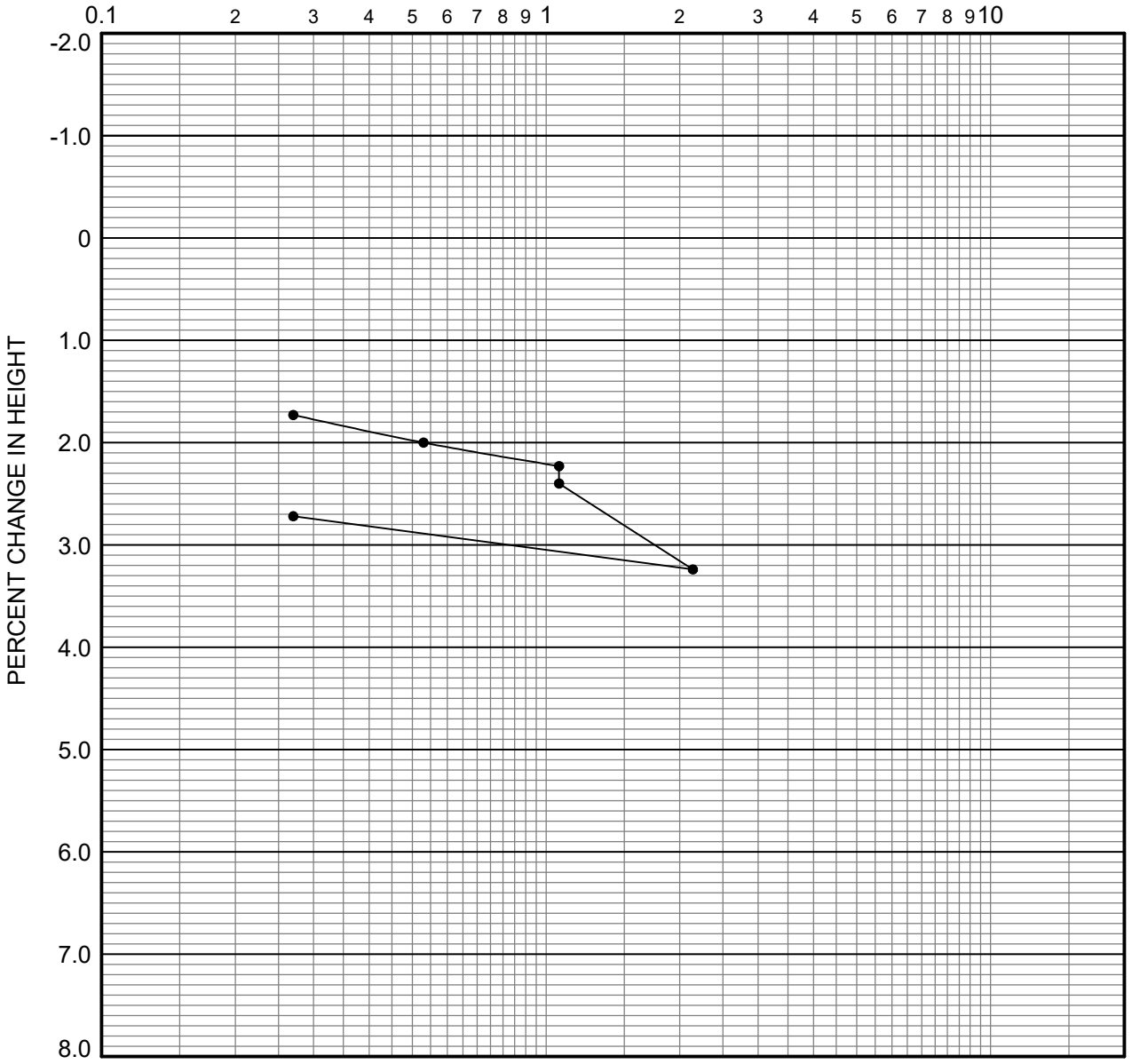
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0631

PLATE C-1

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-3	5.0	75	35.7	78	75	CL	Claystone with Sand (Tm)

REMARKS: WATER ADDED AT 1.07 TSF

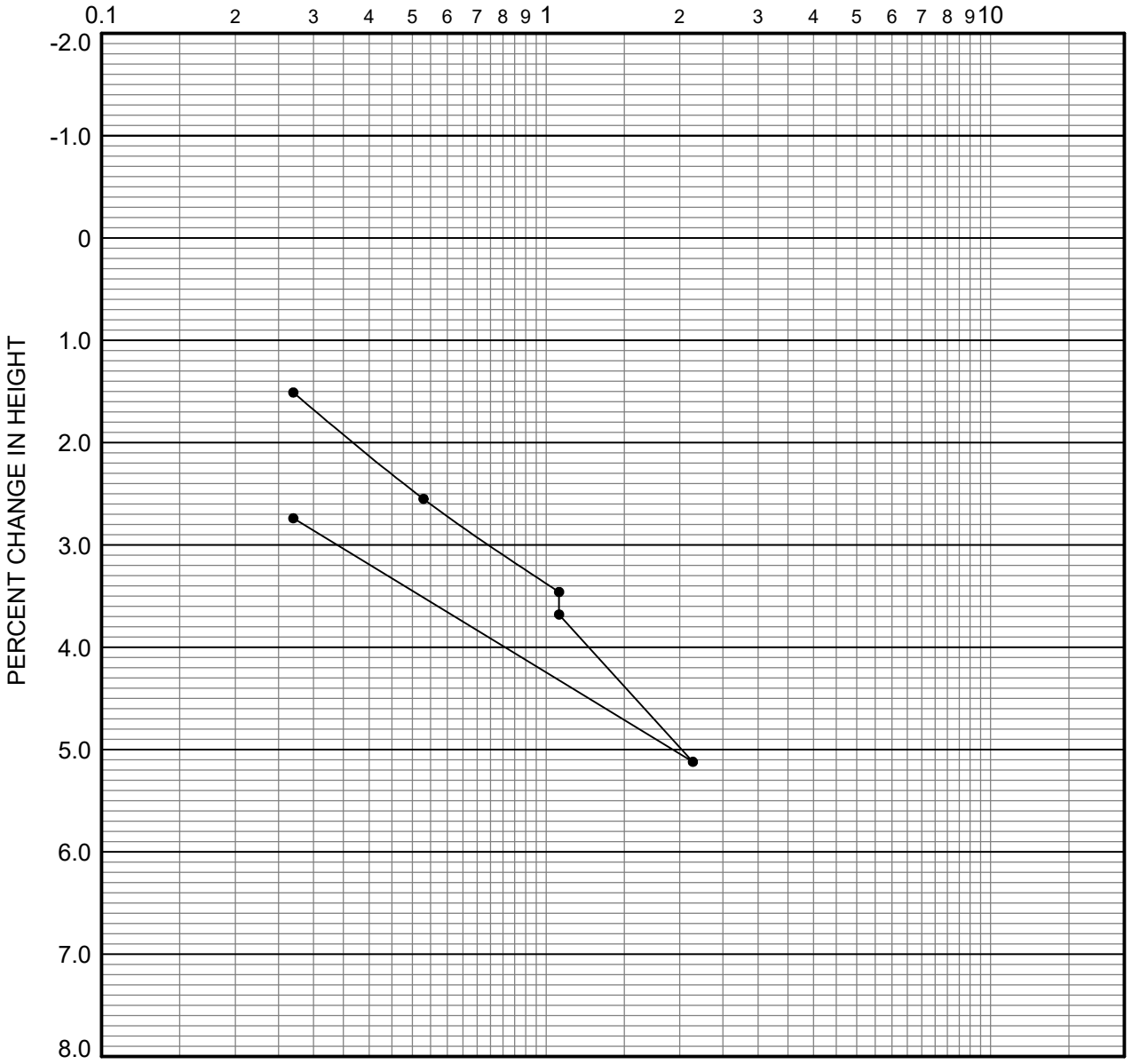
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0631

PLATE C-2

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-4	5.0	50	76.8	87	89	CL	Claystone (Tm)

REMARKS: WATER ADDED AT 1.07 TSF

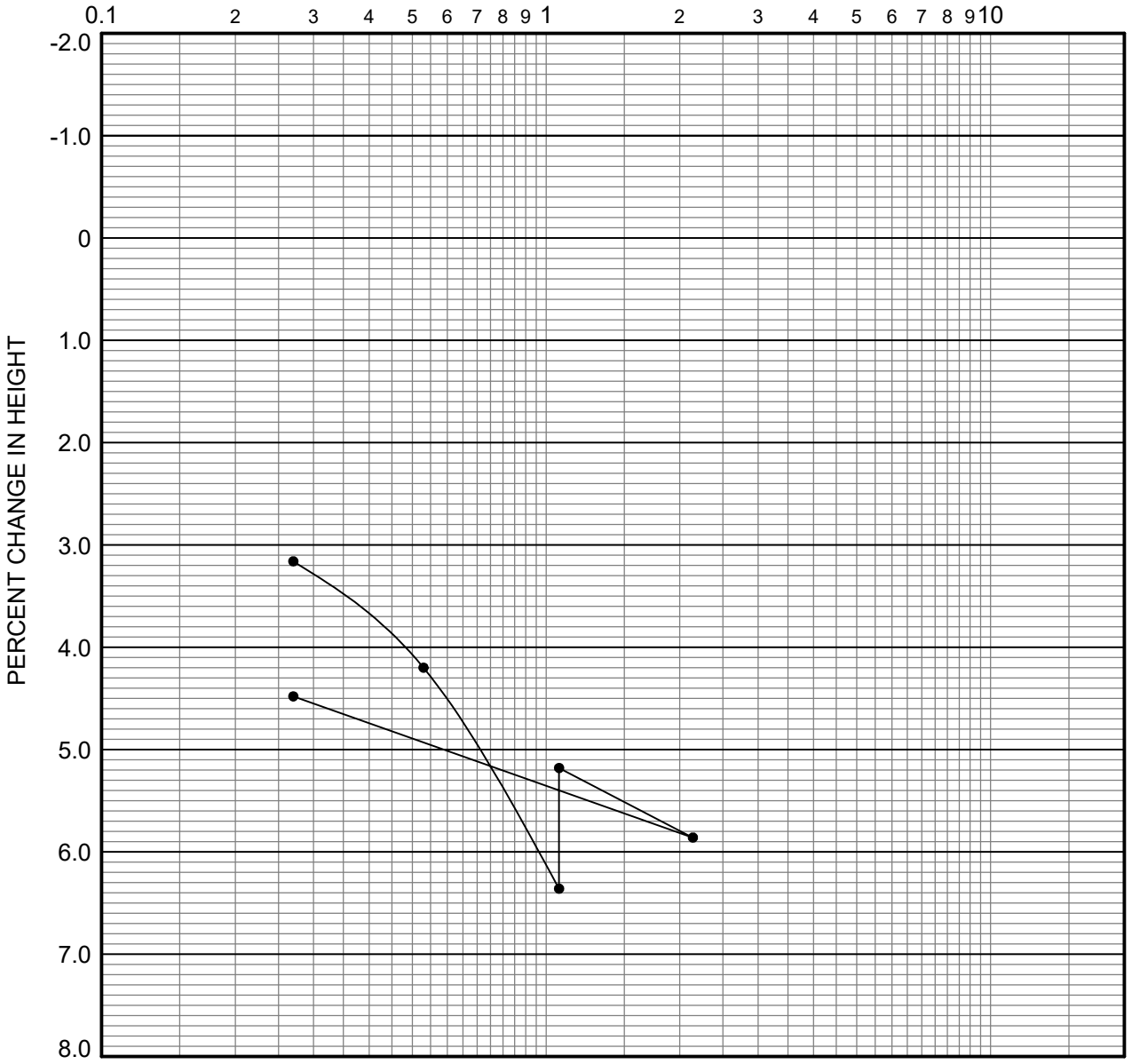
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0631

PLATE C-3

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-4	10.0	77	34.9	81	88	CL	Claystone (Tm)

REMARKS: WATER ADDED AT 1.07 TSF

CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0631

PLATE C-4

APPENDIX D

Maintenance and Improvement Considerations

MAINTENANCE AND IMPROVEMENT CONSIDERATIONS

General

Owners purchasing property must assume a certain degree of responsibility for improvements and for maintaining conditions around their home. Of primary importance from a geotechnical standpoint are maintaining drainage patterns and minimizing the soil moisture variation below all improvements. Such design, construction and owner maintenance provisions may include:

- Employing contractors for improvements who design and build in recognition of local building codes and specific site soils conditions.
- Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other improvements.
- Avoiding the construction of planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.
- Utilizing landscaping schemes with vegetation that requires minimal watering. Watering should be done in a uniform manner, as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.
- Maintaining positive drainage away from structures and providing roof gutters on all structures with downspouts that are designed to carry roof runoff directly into area drains or discharged well away from the foundation areas.
- Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree.
- Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively uniform moisture conditions.

Sulfates

Owners should be cautioned against the import and use of certain inorganic fertilizers, soil amendments, and/or other soils from offsite sources in the absence of specific information relating to their chemical composition. Some fertilizers have been known to leach sulfate compounds into soils and increase the sulfate concentrations to potentially detrimental levels.

Site Drainage

- The owners should be made aware of the potential problems that may develop when drainage is altered through construction of hardscape improvements. Ponded water, drainage over the slope face, leaking irrigation systems, overwatering, or other conditions which could lead to ground saturation must be avoided.
- No water should be allowed to flow over the slopes. No alteration of pad gradients should be allowed that would prevent pad and roof runoff from being directed to approved disposal areas.
- Drainage patterns have been established at the time of the fine grading should be maintained throughout the life of the structure. No alterations to these drainage patterns should be made unless designed by qualified professionals in compliance with local code requirements and site-specific soils conditions.

Slope Drainage

- Residents should be made aware of the importance of maintaining and cleaning all interceptor ditches, drainage terraces, down drains, and any other drainage devices, which have been installed to promote slope stability.
- Subsurface drainage pipe outlets may protrude through slope surfaces and/or wall faces. These pipes, in conjunction with the graded features, are essential to slope and wall stability and must be protected in-place. They should not be altered or damaged in any way.

Planting and Irrigation of Slopes

- Seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well-established and deep-rooted vegetal cover requiring minimal watering.
- It is the responsibility of the landscape architect to provide such plants initially and of the residents to maintain such planting. Alteration of such a planting scheme is at the resident's risk.
- The resident is responsible for proper irrigation and for maintenance and repair of properly installed irrigation systems. Leaks should be fixed immediately.

- Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap. Overwatering with consequent wasteful runoff and serious ground saturation must be avoided.
- If automatic sprinkler systems are installed, their use must be adjusted to account for seasonal and natural rainfall conditions.

Burrowing Animals

- Residents must undertake a program to eliminate burrowing animals. This must be an ongoing program in order to promote slope stability.

Owner Improvement

Owner improvements (pools, spas, patio slabs, retaining walls, planters, etc.) should be designed to account for the terrain of the project, as well as expansive soil conditions and chemical characteristics. Design considerations on any given lot may need to include provisions for differential bearing materials, ascending/descending slope conditions, bedrock structure, perched (irrigation) water, special geologic surcharge loading conditions, expansive soil stresses, and long-term creep/settlement.

All owner improvements should be designed and constructed by qualified professionals utilizing appropriate design methodologies, which account for the on-site soils and geologic conditions. Each lot and proposed improvement should be evaluated on an individual basis.

Setback Zones

Manufactured slopes maybe subject to long-term settlement and creep that can manifest itself in the form of both horizontal and vertical movement. These movements typically are produced as a result of weathering, erosion, gravity forces, and other natural phenomenon. A setback adjacent to slopes is required by most building codes, including the California Building Code. This zone is intended to locate and support the residential structures away from these slopes and onto soils that are not subject to the potential adverse effects of these natural phenomena.

The owner may wish to construct patios, walls, walkways, planters, swimming pools, spas, etc. within this zone. Such facilities may be sensitive to settlement and creep and should not be

constructed within the setback zone unless properly engineered. It is suggested that plans for such improvements be designed by a professional engineer who is familiar with grading ordinances and design and construction requirements. In addition, we recommend that the designer and contractor familiarize themselves with the site specific geologic and geotechnical conditions on the specific lot.

APPENDIX E

Earthwork Specifications

ALTA CALIFORNIA GEOTECHNICAL, INC.
EARTHWORK SPECIFICATIONS

These specifications present the generally accepted standards and minimum earthwork requirements for the development of the project. These specifications shall be the project guidelines for earthwork except where specifically superseded in preliminary geology and soils reports, grading plan review reports or by the prevailing grading codes or ordinances of the controlling agency.

A. GENERAL

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

2. The project Geotechnical Engineer and Engineering Geologist, or their representatives, shall provide observation and testing services, and Geotechnical consultation for the duration of the project.

3. All clearing, grubbing, stripping and site preparation for the project shall be accomplished by the Contractor to the satisfaction of the Geotechnical Engineer/Engineering Geologist.

4. It is the Contractor's responsibility to prepare the ground surface to receive fill to the satisfaction of the Geotechnical Engineer and to place, spread, mix, moisture condition, and compact the fill in accordance with the job specifications and as required by the Geotechnical Engineer. The Contractor shall also remove all material considered by the Geotechnical Engineer to be unsuitable for use in the construction of engineered fills.

5. The Contractor shall have suitable and sufficient equipment in operation to handle the amount of fill being placed. When necessary, equipment will be shut down temporarily in order to permit the proper preparation of fills.

B. PREPARATION OF FILL AREAS

1. Excessive vegetation and all deleterious material should be disposed of offsite as required by the Geotechnical Engineer.

   Existing fill, soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and hauled from the site. Where applicable, the Contractor may obtain the

approval of the Soils Engineer and the controlling authorities for the project to dispose of the above described materials, or a portion thereof, in designated areas onsite.

After removal of the deleterious materials have been accomplished, earth materials deemed unsuitable in their natural, in-place condition, shall be removed as recommended by the Geotechnical Engineer/Engineering Geologist.

2. Upon achieving a suitable bottom for fill placement, the exposed removal bottom shall be disced or bladed by the Contractor to the satisfaction of the Geotechnical Engineer. The prepared ground surfaces shall then be brought to the specified moisture content mixed as required, and compacted and tested as specified. In localities where it is necessary to obtain the approval of the controlling agency prior to placing fill, it will be the Contractor's responsibility to contact the proper authorities to visit the site.

3. Any underground structure such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other structures not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer and/or the controlling agency for the project.

C. ENGINEERED FILLS

1. Any material imported or excavated on the property may be utilized as fill, provided the material has been determined to be suitable by the Geotechnical Engineer. Deleterious materials shall be removed from the fill as directed by the Geotechnical Engineer.

2. Rock or rock fragments less than twelve inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets and the distribution of the rocks is approved by the Geotechnical Engineer.

3. Rocks greater than twelve inches in the largest dimension shall be taken offsite, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal.

4. All materials to be used as fill, shall be tested in the laboratory by the Geotechnical Engineer. Proposed import materials shall be approved by the Geotechnical Engineer 48 hours prior to importation.

5. The fill materials shall be placed by the Contractor in lifts, that when compacted, shall not exceed six inches. Each lift shall be spread evenly and shall be

thoroughly mixed to achieve a near uniform moisture condition and a uniform blend of materials.

All compaction shall be achieved at or above the optimum moisture content, as determined by the applicable laboratory standard. The Contractor will be notified if the fill materials are too wet or too dry to achieve the required compaction standard.

6. When the moisture content of the fill material is below the limit specified by the Geotechnical Engineer, water shall be added and the materials shall be blended until a uniform moisture content, within specified limits, is achieved. When the moisture content of the fill material is above the limits specified by the Geotechnical Engineer, the fill materials shall be aerated by discing, blading, mixed with dryer fill materials, or other satisfactory methods until the moisture content is within the specified limits.

7. Each fill lift shall be compacted to the minimum project standards, in compliance with the testing methods specified by the controlling governmental agency, and in accordance with recommendations of the Geotechnical Engineer.

   In the absence of specific recommendations by the Geotechnical Engineer to the contrary, the compaction standard shall be the most recent version of ASTM:D 1557.

8. Where a slope receiving fill exceeds a ratio of five-horizontal to one-vertical, the fill shall be keyed and benched through all unsuitable materials into sound bedrock or firm material, in accordance with the recommendations and approval of the Geotechnical Engineer.

9. Side hill fills shall have a minimum key width of 15 feet into bedrock or firm materials, unless otherwise specified in the soil report and approved by the Geotechnical Engineer in the field.

10. Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency and/or with the recommendations of the Geotechnical Engineer and Engineering Geologist.

11. The Contractor shall be required to maintain the specified minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as directed by the Geotechnical Engineer and/or the governing agency for the project. This may be achieved by either overbuilding the slope and cutting

back to the compacted core; by direct compaction of the slope face with suitable equipment; or by any other procedure which produces the required result.

12. The fill portion of fill-over-cut slopes shall be properly keyed into rock or firm material; and the fill area shall be stripped of all soil or unsuitable materials prior to placing fill.

    The design cut portion of the slope should be made first and evaluated for suitability by the Engineering Geologist prior to placement of fill in the keyway above the cut slope.

13. Pad areas in cut or natural ground shall be approved by the Geotechnical Engineer. Finished surfaces of these pads may require scarification and recompaction, or over excavation as determined by the Geotechnical Engineer.

D. CUT SLOPES

1. The Engineering Geologist shall observe all cut slopes and shall be notified by the Contractor when cut slopes are to be started.

2. If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the Engineering Geologist and Soil Engineer shall investigate, analyze and make recommendations to remediate these problems.

3. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the superjacent, prevailing drainage.

4. Unless otherwise specified in specific geotechnical reports, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

5. Drainage terraces shall be constructed in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the Geotechnical Engineer or Engineering Geologist.

E. GRADING CONTROL

1. Fill placement shall be observed and tested by the Geotechnical Engineer and/or his representative during grading.

   Field density tests shall be made by the Geotechnical Engineer and/or his representative to evaluate the compaction and moisture compliance of each fill lift. Density tests shall be conducted at intervals not to exceed two feet of fill

height. Where sheepsfoot rollers are used, the fill may be disturbed to a depth of several inches. Density determinations shall be taken in the compacted material below the disturbed surface at a depth determined by the Geotechnical Engineer or his representative.

2. Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture content is in evidence, that particular layer or portion thereof shall be reworked until the required density and/or moisture content has been attained. Additional fills shall not be placed over an area until the previous lift of fill has been tested and found to meet the density and moisture requirements for the project and the previous lift is approved by the Geotechnical Engineer.

3. When grading activities are interrupted by heavy rains, fill operations shall not be resumed until field observations and tests by the Geotechnical Engineer indicate the moisture content and density of the fill are within the specified limits.

4. During construction, the Contractor shall properly grade all surfaces to maintain good drainage and prevent the ponding of water. The Contractor shall take remedial action to control surface water and to prevent erosion of graded areas until such time as a permanent drainage and erosion devices have been installed.

5. Observation and testing by the Geotechnical Engineer and/or his representative shall be conducted during filling and compacting operations in order that he will be able to state in his opinion that all cut and filled areas are graded in accordance with the approved specifications.

6. Upon the completion of grading activities and after the Geotechnical Engineer and Engineering Geologist have finished their observations of the work, final reports shall be submitted. No further excavation or fill placement shall be undertaken without prior notification of the Geotechnical Engineer and/or Engineering Geologist.

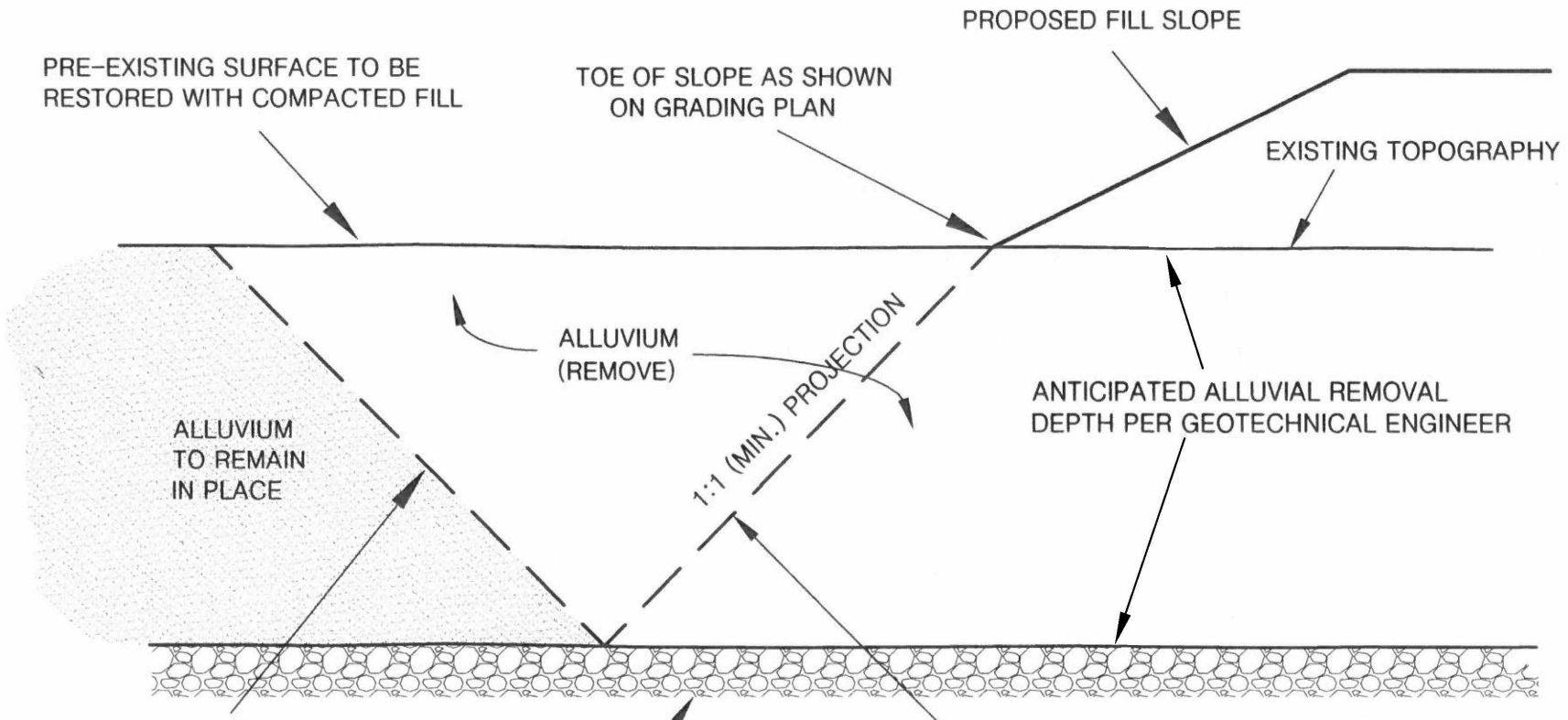
F. FINISHED SLOPES

All finished cut and fill slopes shall be planted and irrigated and/or protected from erosion in accordance with the project specifications, governing agencies, and/or as recommended by a landscape architect.

APPENDIX F

Grading Details

DETAIL FOR FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON

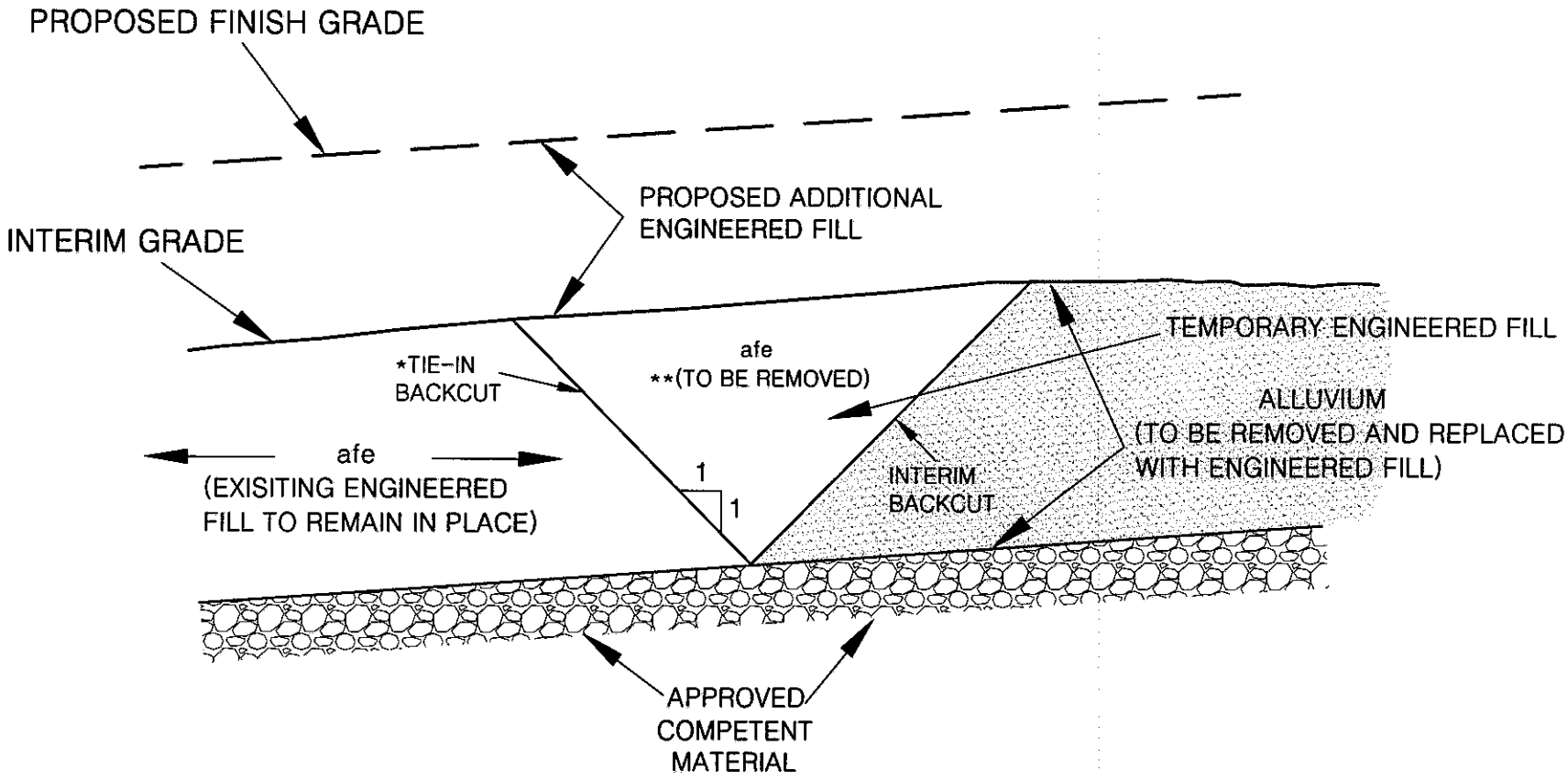


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PLATE G-1

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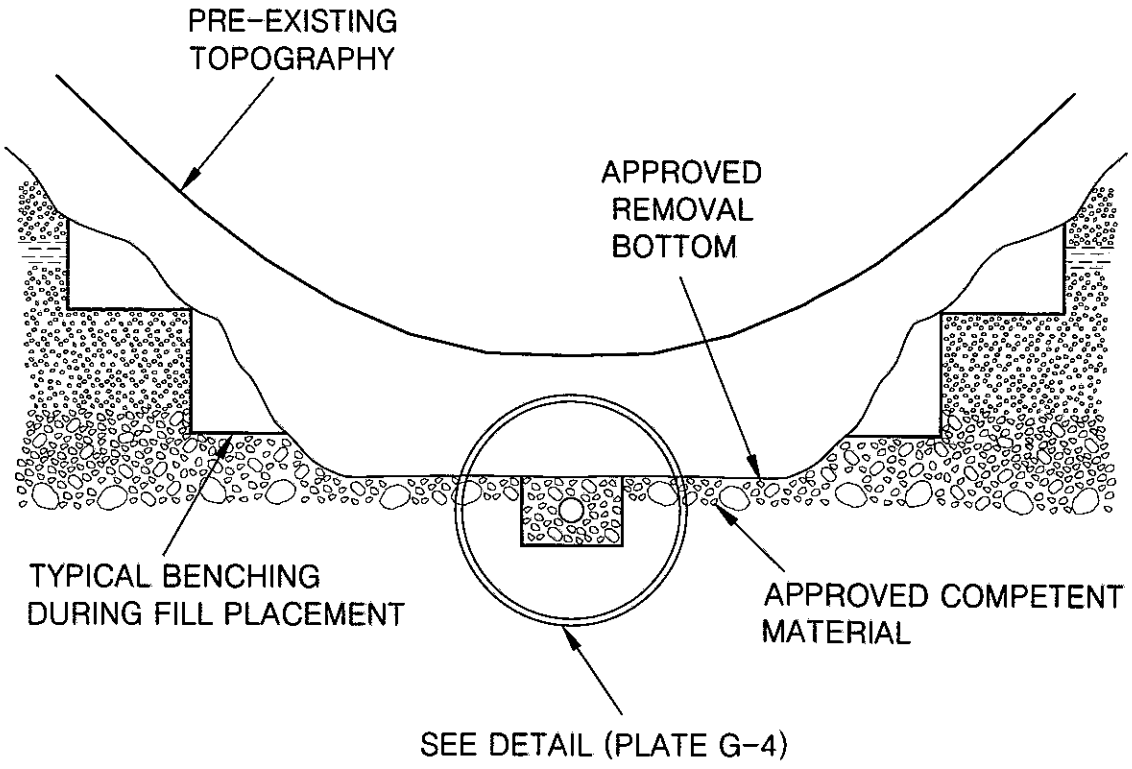
REMOVAL ADJACENT TO EXISTING FILL



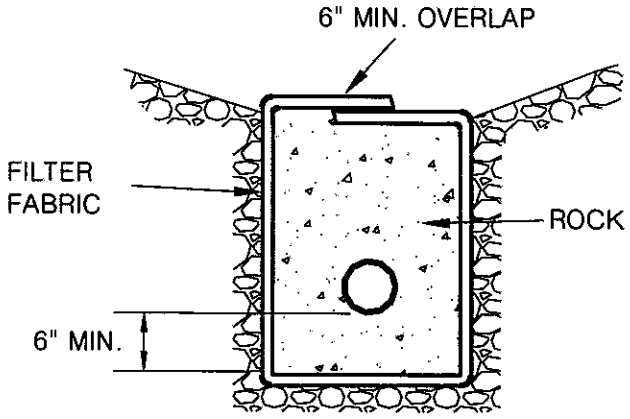
*INITIATE 1:1 TIE-IN BACKCUT TO INTERCEPT TOE OF INTERIM BACKCUT

**AS PART OF TIE-IN FOR ADDITIONAL ENGINEERED FILL

CANYON SUBDRAIN



CANYON SUBDRAIN DETAIL



PERFORATED PIPE SURROUNDED WITH ROCK AND FILTER FABRIC

ROCK: MIN. VOLUME OF 9 CU.FT. PER LINEAR FT. OF 3/4 IN. MAX. ROCK

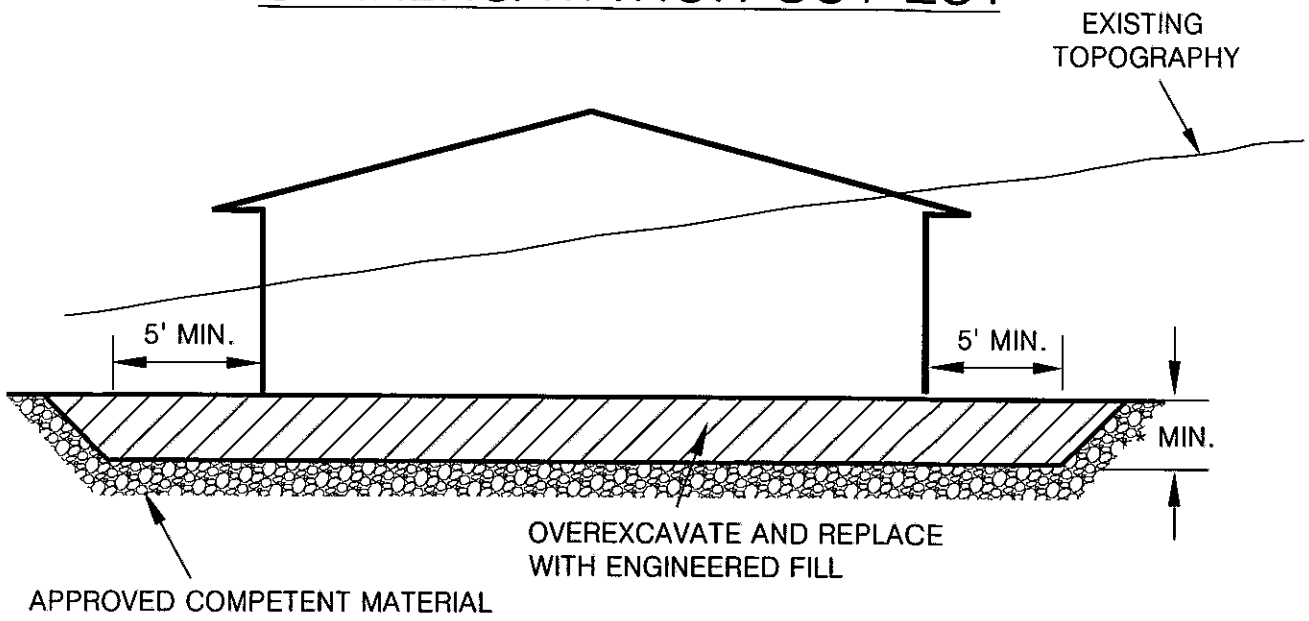
PIPE: 6 IN. ABS OR PVC PIPE WITH A MINIMUM OF 8 PERFORATIONS (1/4-IN. DIA.) PER LINEAL FT. IN BOTTOM HALF OF PIPE ASTM D2751, SDR 35, OR ASTM D3034 OR ASTM D1527, SCHD. 40 ASTM D1785, SCHD. 40

FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT

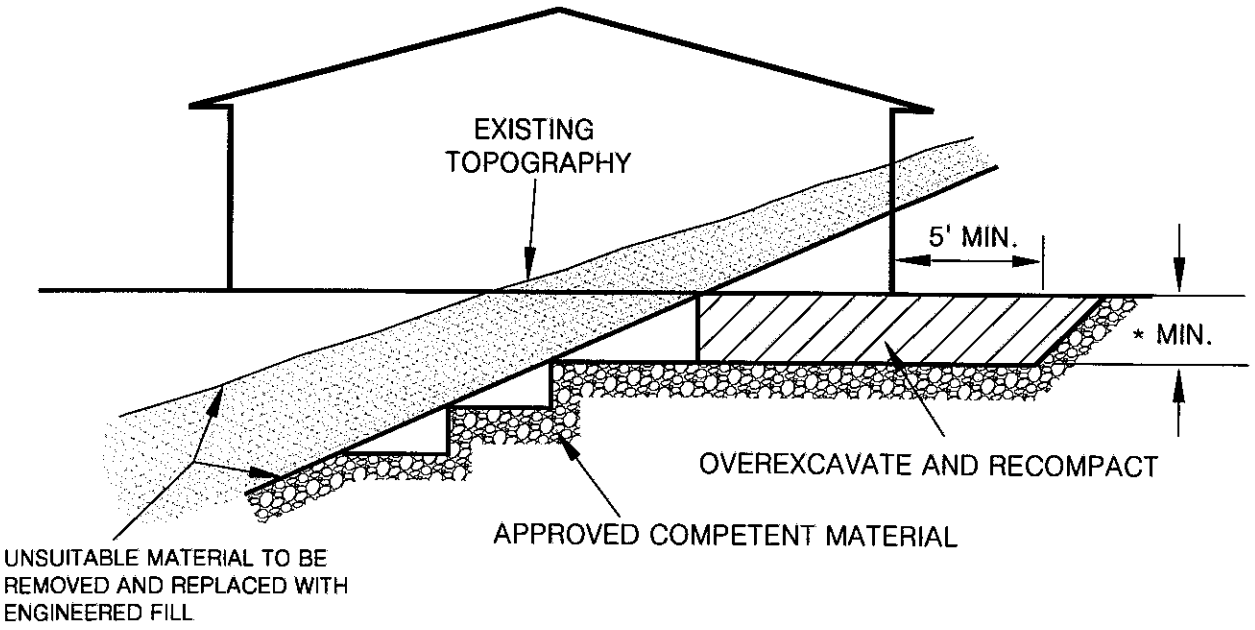
NOTES:

1. FOR CONTINUOUS RUN IN EXCESS OF 500. FT USE 8 IN. DIA. PIPE
2. ENGINEERED FILL PLACED BELOW DRAINS SHALL BE COMPACTED TO 93% OF THE LABORATORY MAXIMUM DRY DENSITY (ASTM:D1557)

OVEREXCAVATION CUT LOT



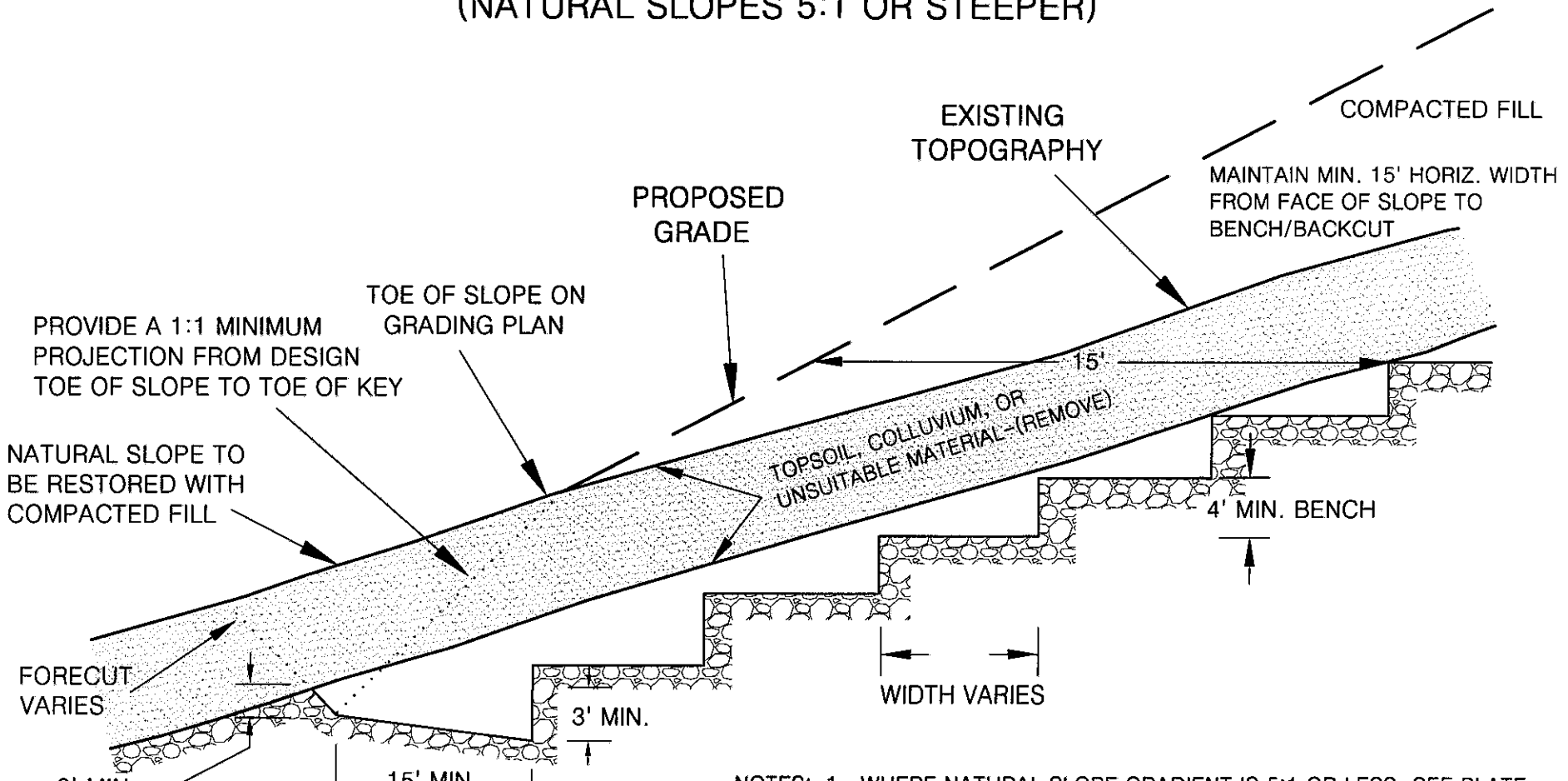
CUT-FILL LOT (TRANSITION)



*NOTE ALL BUILDING PADS SHALL BE OVER EXCAVATED TO A MINIMUM OF 1/3 OF THE MAXIMUM DEPTH OF FILL BELOW THE BUILDING PAD TO A MAXIMUM OF 17 FEET (SEE PLATE G-16)

SIDE HILL SLOPE FILL DETAIL

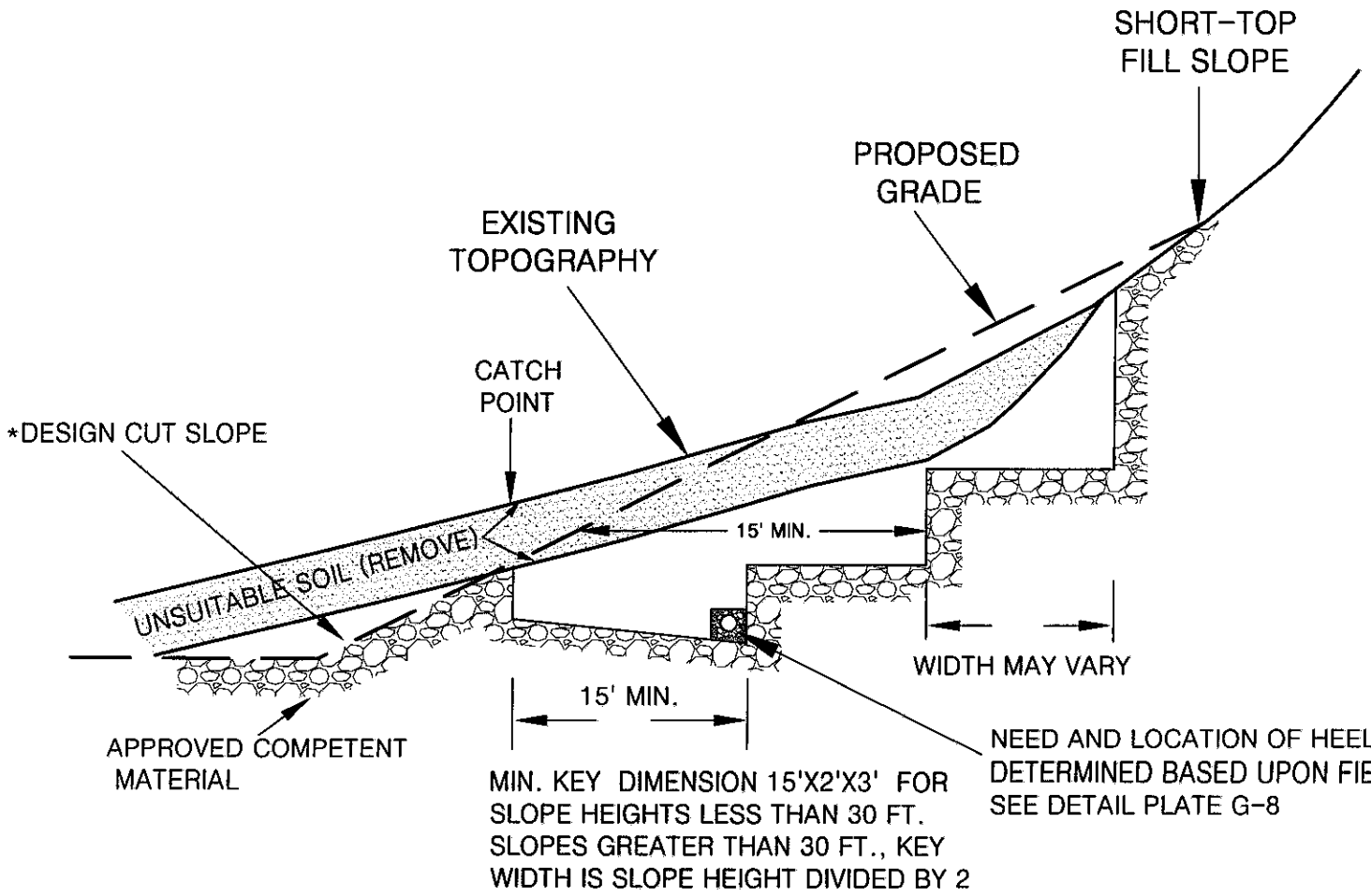
(NATURAL SLOPES 5:1 OR STEEPER)



NOTES:

1. WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, SEE PLATE G-1. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.
2. THE NEED FOR AND PLACEMENT OF DRAINS WILL BE DETERMINED BY THE GEOTECHNICAL ENGINEER OR GEOLOGIST BASED UPON EXPOSED FIELD CONDITIONS.

FILL OVER CUT SLOPE DETAIL



*THE CUT PORTION OF THE SLOPE SHOULD BE EXCAVATED AND EVALUATED BY THE ENGINEERING GEOLOGIST/GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTING THE FILL SLOPE

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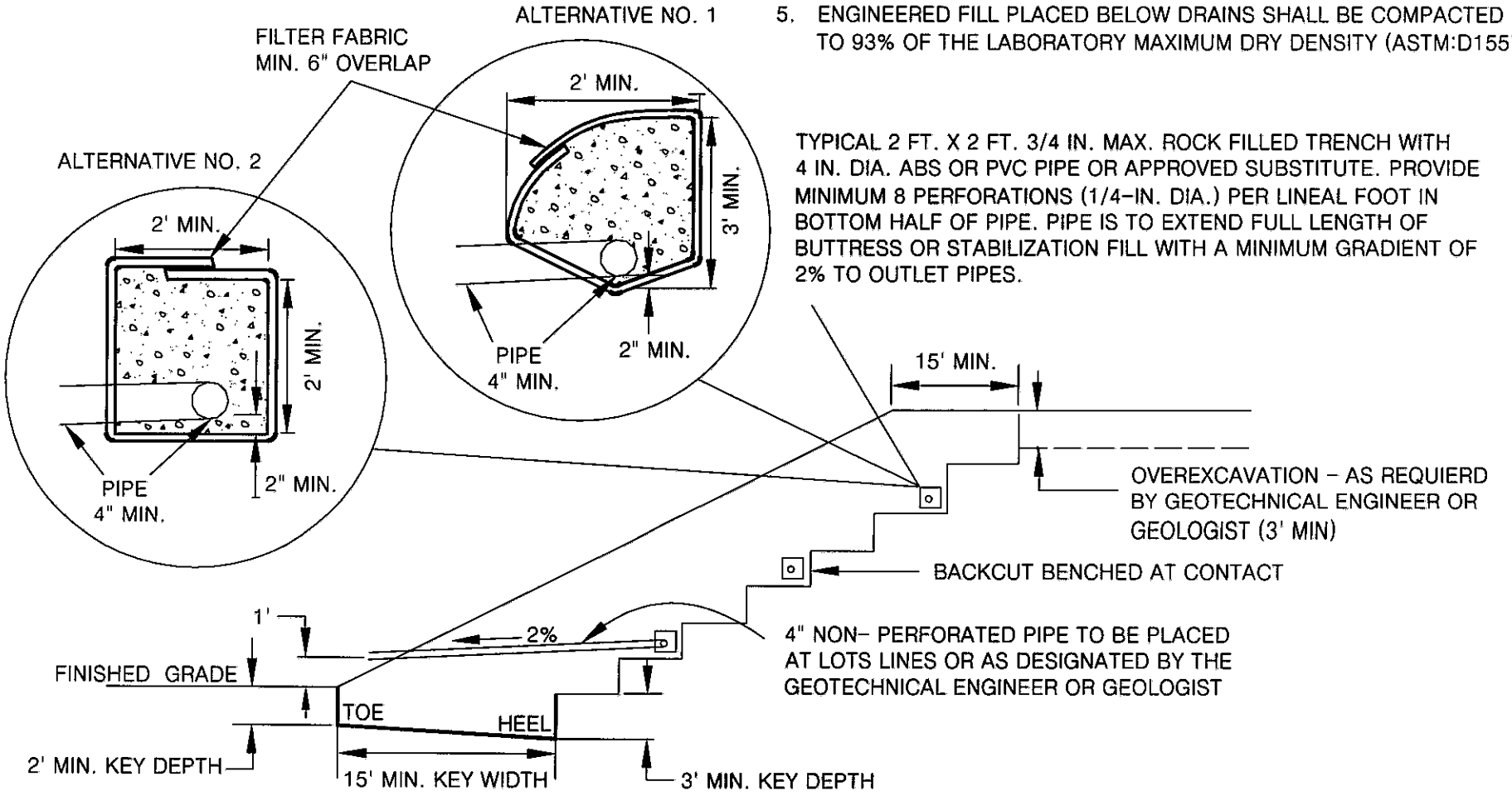
PLATE G-7

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STABILIZATION/BUTTRESS FILL BACKDRAIN

NOTE:

1. ASTM D2751, SDR 35, OR ASTM D3034 OR ASTM D1527, SCHD. 40 ASTM D1785, SCHD. 40
2. SOLID PIPE OUTLETS TO BE PROVIDED EVERY 100 FT. AND JOINED TO PERFORATED BACKDRAIN PIPE WITH "L" OR "T"s. MIN. 2% GRADIENT.
3. GRAVEL TRENCH TO BE FILLED WITH 3/4 IN. MAXIMUM ROCK
4. THE NECESSITY FOR UPPER TIER BACKDRAINS SHALL BE DETERMINED IN THE FIELD BY THE GEOTECHNICAL ENGINEER OR GEOLOGIST. UPPER TIER OUTLETS SHOULD DRAIN INTO PAVED TERRACE DRAINS.
5. ENGINEERED FILL PLACED BELOW DRAINS SHALL BE COMPACTED TO 93% OF THE LABORATORY MAXIMUM DRY DENSITY (ASTM:D1557)



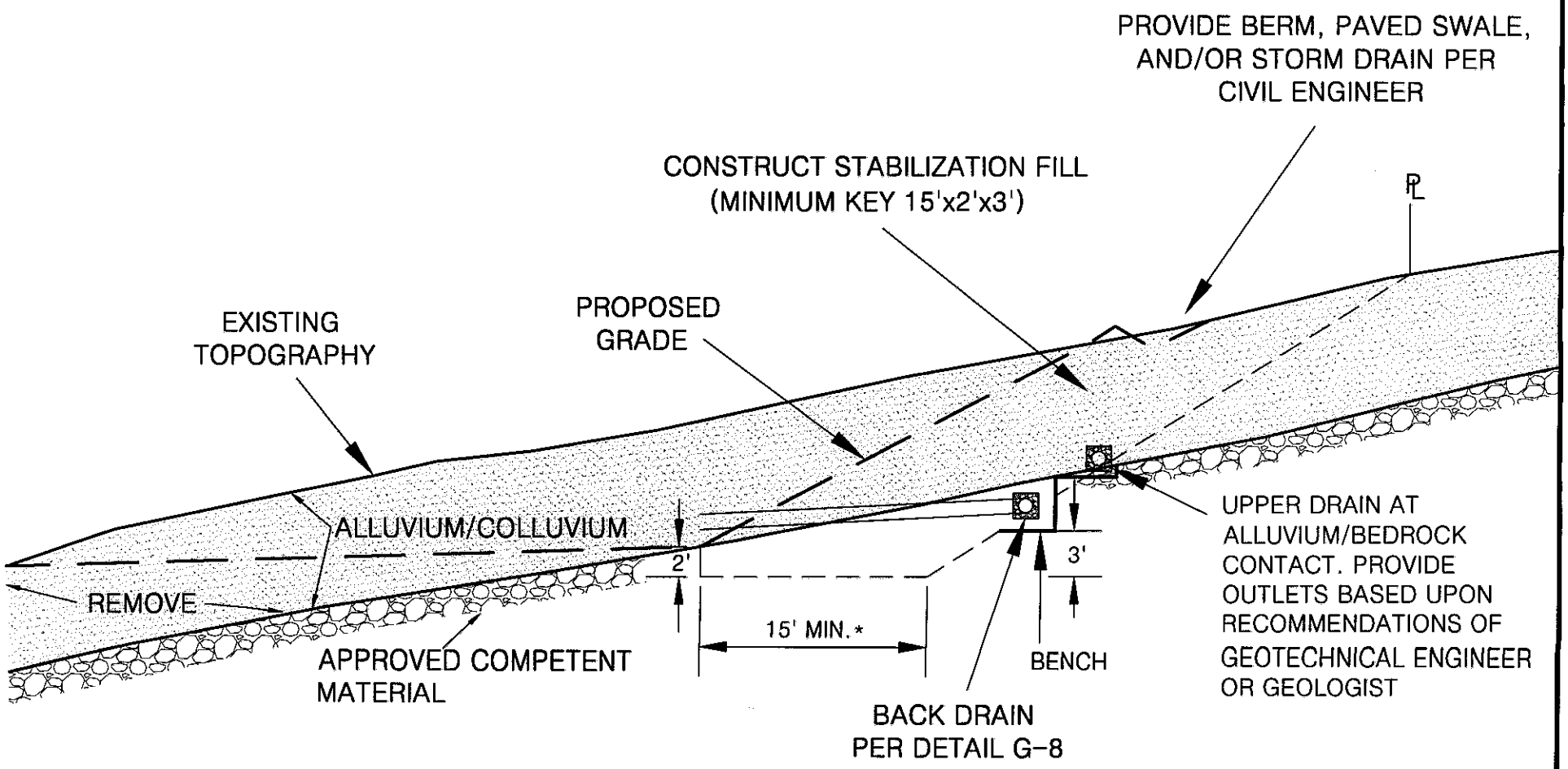
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PLATE G-8

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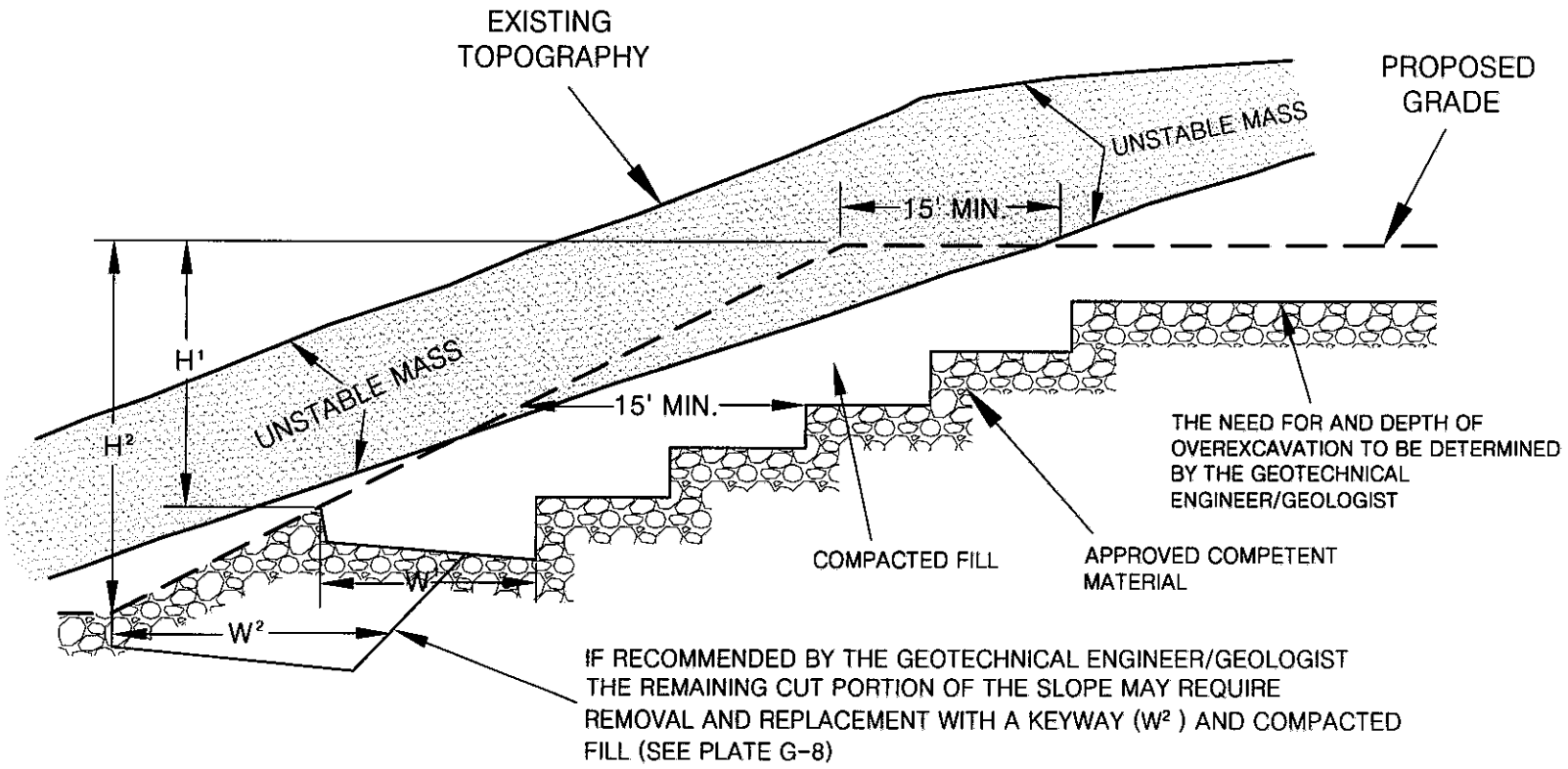
STABILIZATION FILL

(UPSLOPE ALLUVIATED AREA)



* FOR SLOPE HEIGHTS LESS THAN 30 FT. SLOPES GREATER THAN 30 FT., KEY WIDTH IS SLOPE HEIGHT DIVIDED BY 2

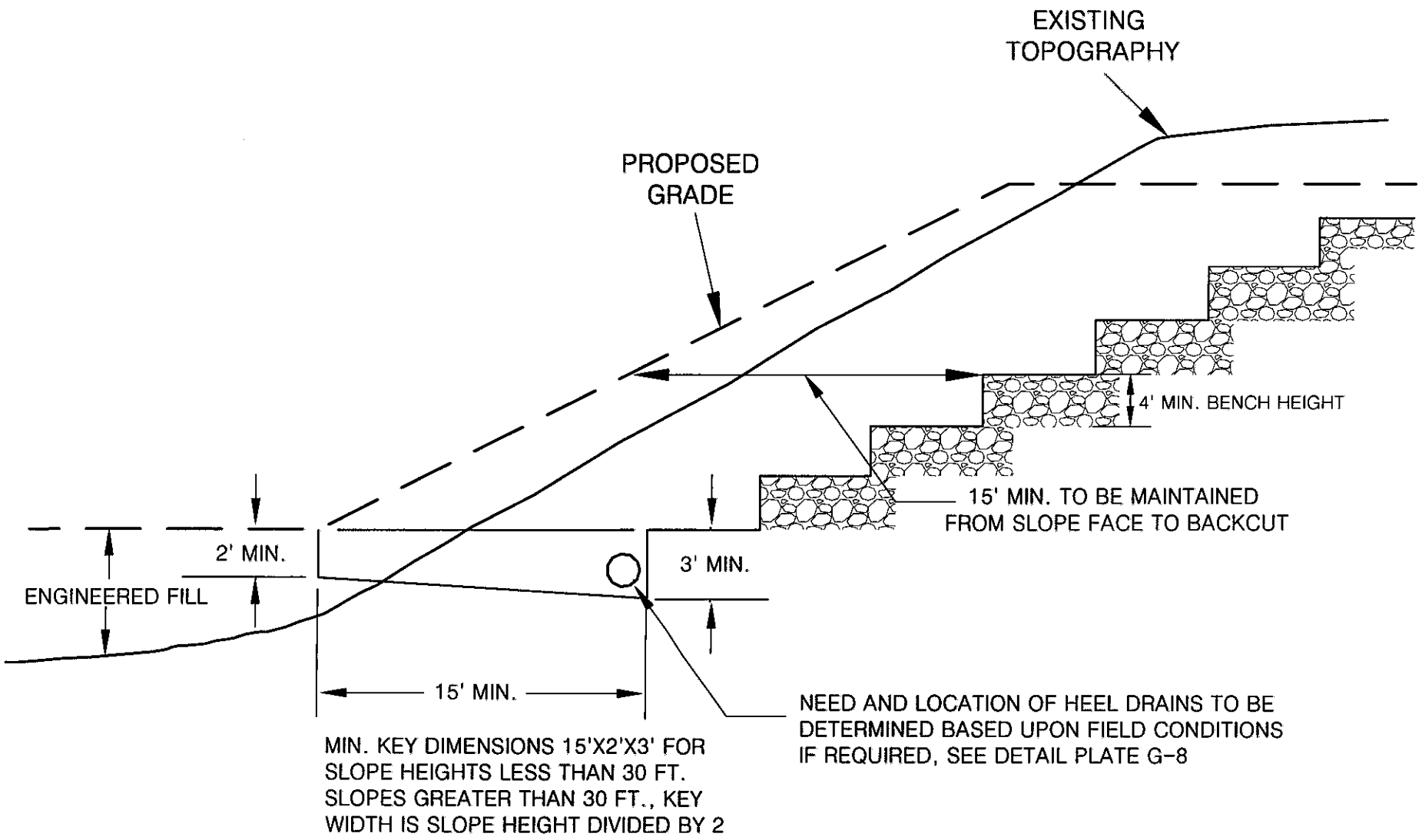
SELECTIVE GRADING DETAIL FOR STABILIZATION FILL
UNSTABLE MATERIAL EXPOSED IN PORTION OF CUT SLOPE



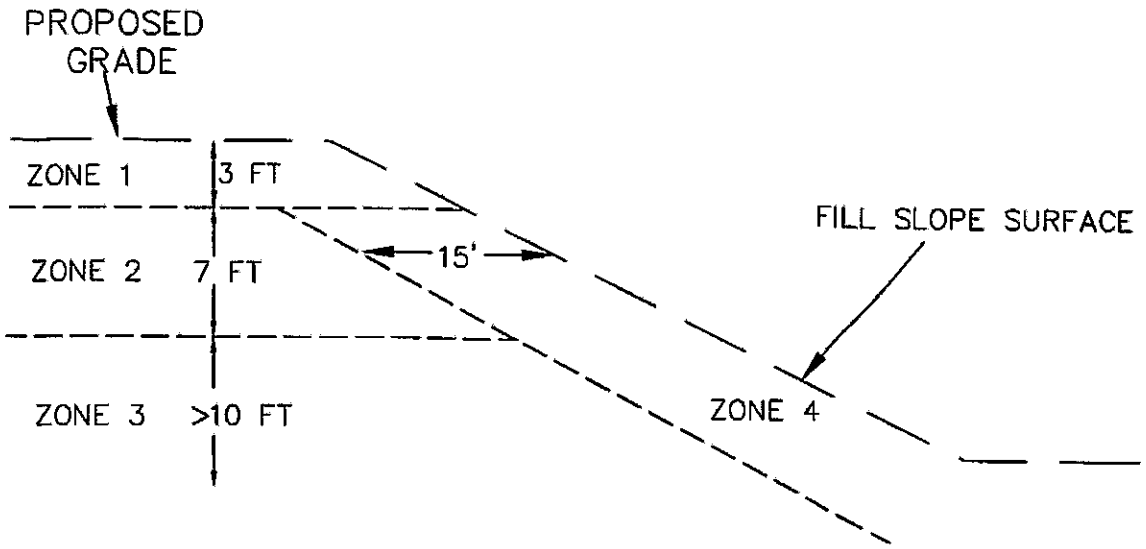
NOTES: 1. BACKDRAINS ARE NOT REQUIRED UNLESS SPECIFIED.

2. "W" SHALL BE EQUIPMENT WIDTH (15') FOR SLOPE HEIGHT LESS THAN 25 FEET. FOR SLOPES GREATER THAN 25 FEET, "W" SHALL BE DETERMINED BY THE PROJECT GEOTECHNICAL ENGINEER/GEOLOGIST. AT NO TIME SHALL "W" BE LESS THAN H/2.

SKIN FILL SLOPE OVER NATURAL GROUND



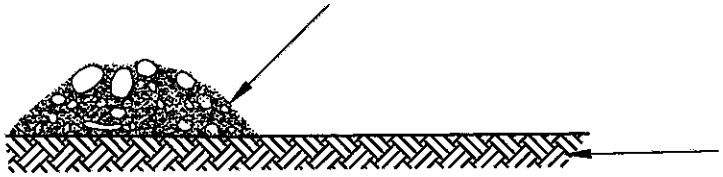
DETAIL FOR MAXIMUM PARTICLE DIMENSION



ZONE	DEPTH	PARTICLE MAX. DIMENSION	PLACEMENT METHOD
1	0-3 ft.	≤1.0 ft.	STANDARD OR CONVENTIONAL COMPACTION METHODS (SEE EARTHWORK SPECIFICATIONS)
2	3-10 ft.	≤2.0 ft.	ROCK BLANKETS (SEE PLATE G-13)
3	>10 ft.	≤8.0 ft.	ROCK BLANKETS (PLATE G-13) ROCK WINDROW (PLATE G-14) INDIVIDUAL ROCK BURIED (PLATE G-15)
4	15 HORIZONTAL FEET FROM FILL SLOPE FACE	≤1.0 ft.	STANDARD OR CONVENTIONAL COMPACTION METHODS (SEE EARTHWORK SPECIFICATIONS)

ROCK BLANKET DETAILS

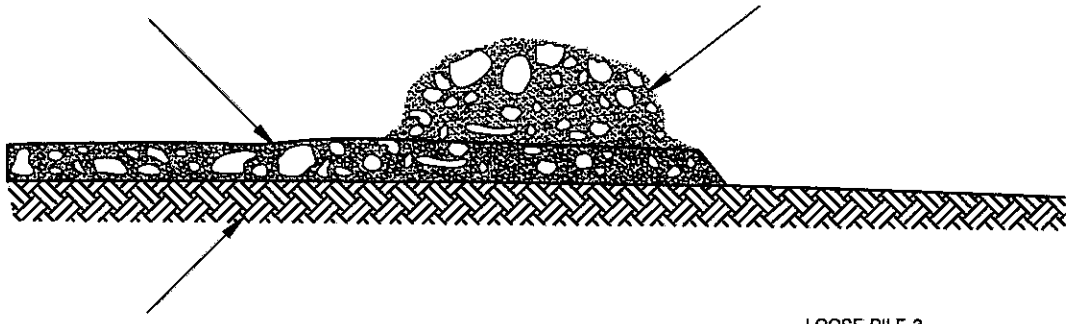
LOOSE PILE 1
LOOSE, DUMPED ROCK, GRAVEL AND SAND MIXTURE REMOVE FRAGMENTS LARGER THAT 2 FEET FOR ISOLATED BURIAL (PLATE G-15) OR WINDROW (PLATE G-10)



APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

COMPACT PILE 1
SPREAD LOOSE PILE FORWARD WITH HEAVY TRACKED DOZER (D-8 OR LARGER). HEAVILY WATER, TRACK, AND APPLY ADDITIONAL SAND AND GRAVEL AS NECESSARY TO FILL VOIDS AND CREATE A DENSE MATRIX OF ROCK, COBBLES, GRAVEL AND SAND (2 FOOT MAXIMUM THICKNESS)

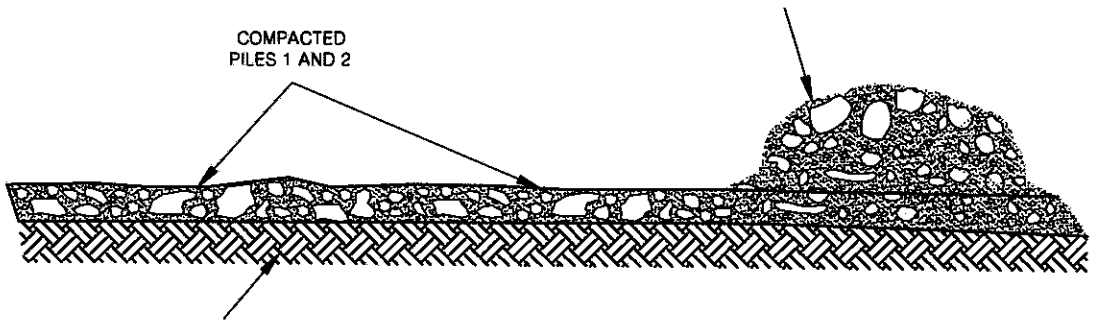
LOOSE PILE 2
DUMP SUCCESSIVE PILES OF LOOSE ROCK, GRAVEL AND SAND MIXTURE ON FORWARD EDGE OF PREVIOUSLY COMPACTED LIFT WITH TRUCKS AND/OR SCRAPERS. USE PREVIOUS LIFT TO ACCESS AND FURTHER COMPACT PILE 1.



APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

LOOSE PILE 3
DUMP SUCCESSIVE PILES OF LOOSE ROCK, GRAVEL AND SAND MIXTURE ON FORWARD EDGE OF PREVIOUSLY COMPACTED LIFT WITH TRUCKS AND/OR SCRAPERS. USE PREVIOUS LIFT TO ACCESS AND FURTHER COMPACT EXISTING BLANKET.

COMPACTED PILES 1 AND 2

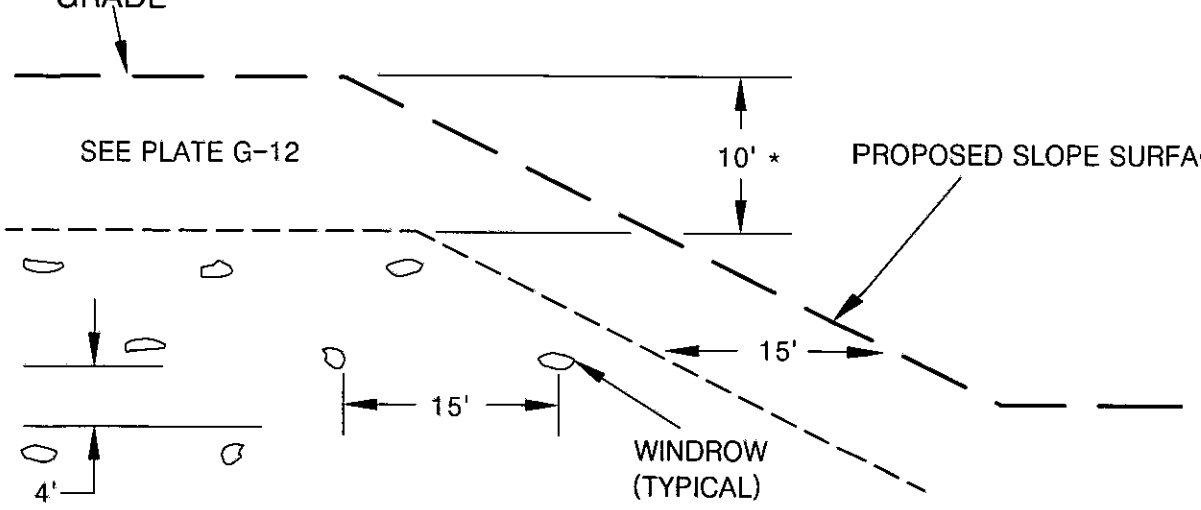


APPROVED BOTTOM, OR TOP OF PREVIOUSLY APPROVED BLANKET FILL

OBSERVATION TESTING AND APPROVAL PROCEDURES

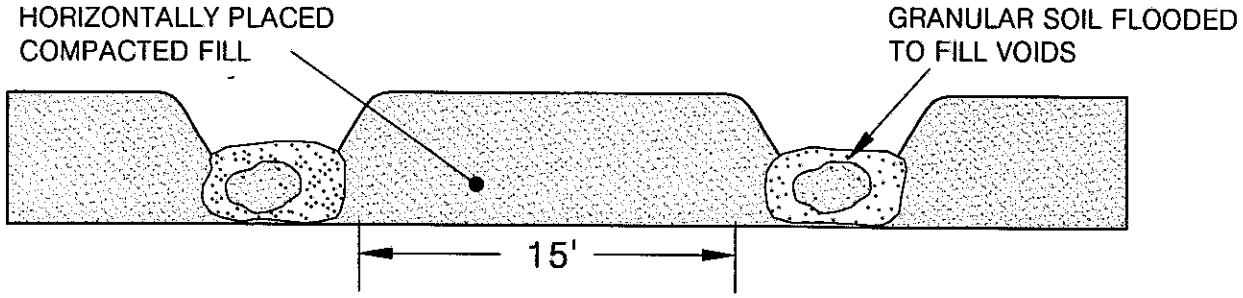
OBSERVE EQUIPMENT. SCRAPERS AND TRUCKS SHOULD BE FULLY SUPPORTED ON BLANKET WITHOUT SIGNIFICANT YIELDING. EXCAVATE TEST/OBSERVATION PITS TO CONFIRM EXISTENCE OF MIXTURE OF VARIOUS PARTICLE SIZES, WITHOUT SIGNIFICANT VOIDS, AND FORMING A DENSE, COMPACTED FILL MATRIX. TEST BY ASTM D1556, D2922 AND/OR D3017 WHEN APPROPRIATE. RECORD LIMITS AND ELEVATION OF BLANKET. ALL FILL AND COMPACTION OPERATIONS TO BE CONDUCTED UNDER THE OBSERVATION OF THE GEOTECHNICAL ENGINEER. SUBSEQUENT LIFTS TO BE APPLIED ONLY AFTER OBSERVATION AND CONFIRMATION OF SUITABILITY OF FILL AND RELEASE BY THE GEOTECHNICAL ENGINEER. BLANKETS TO BE CONSTRUCTED IN ACCORDANCE WITH PLATE G-12.

ROCK WINDROW DETAIL



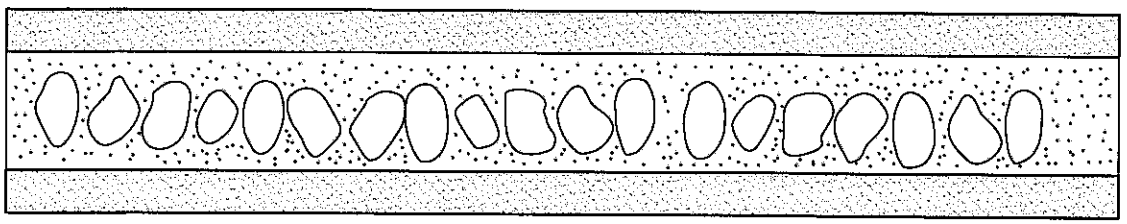
NOTE: OVERSIZED MATERIAL SHOULD BE REMOVED FROM THE 15' CLEAR ZONES WITH SPECIAL EQUIPMENT, SUCH AS A ROCK RAKE, PRIOR TO PLACING THE NEXT FILL LIFT.
*VARIANCES TO THE ABOVE ROCK HOLD DOWN MAY BE GRANTED SUBJECT TO APPROVAL BY THE OWNER, GEOTECHNICAL ENGINEER, AND GOVERNING AGENCY

TYPICAL WINDROW DETAIL (END VIEW)

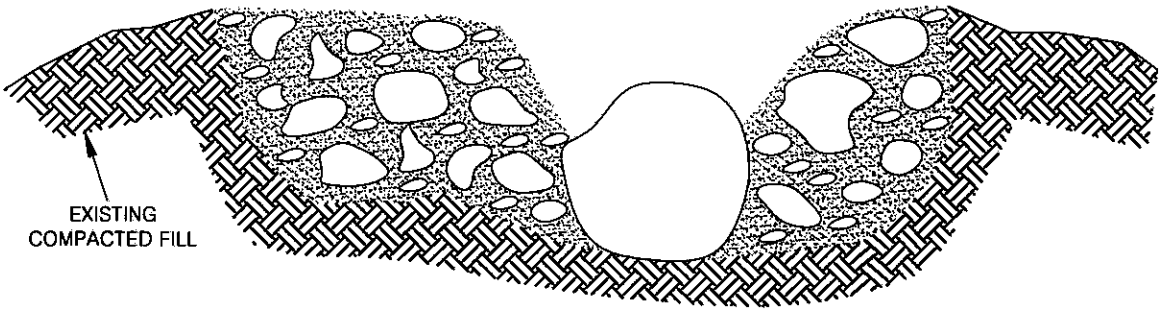


NOTE: COMPACTED FILL SHALL BE BROUGHT UP TO A HIGHER ELEVATION ALONG EACH WINDROW SO GRANULAR SOIL CAN BE FLOODED IN A "TRENCH CONDITION".

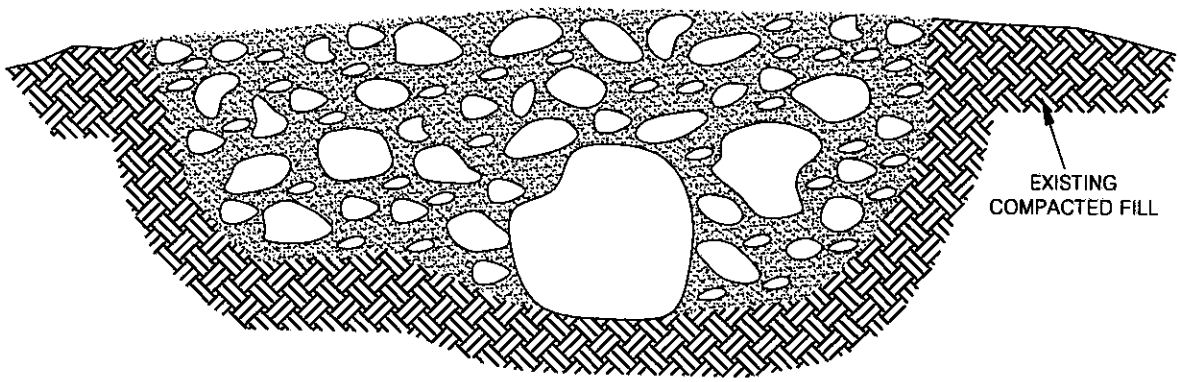
PROFILE VIEW



ISOLATED ROCK BURIAL DETAILS

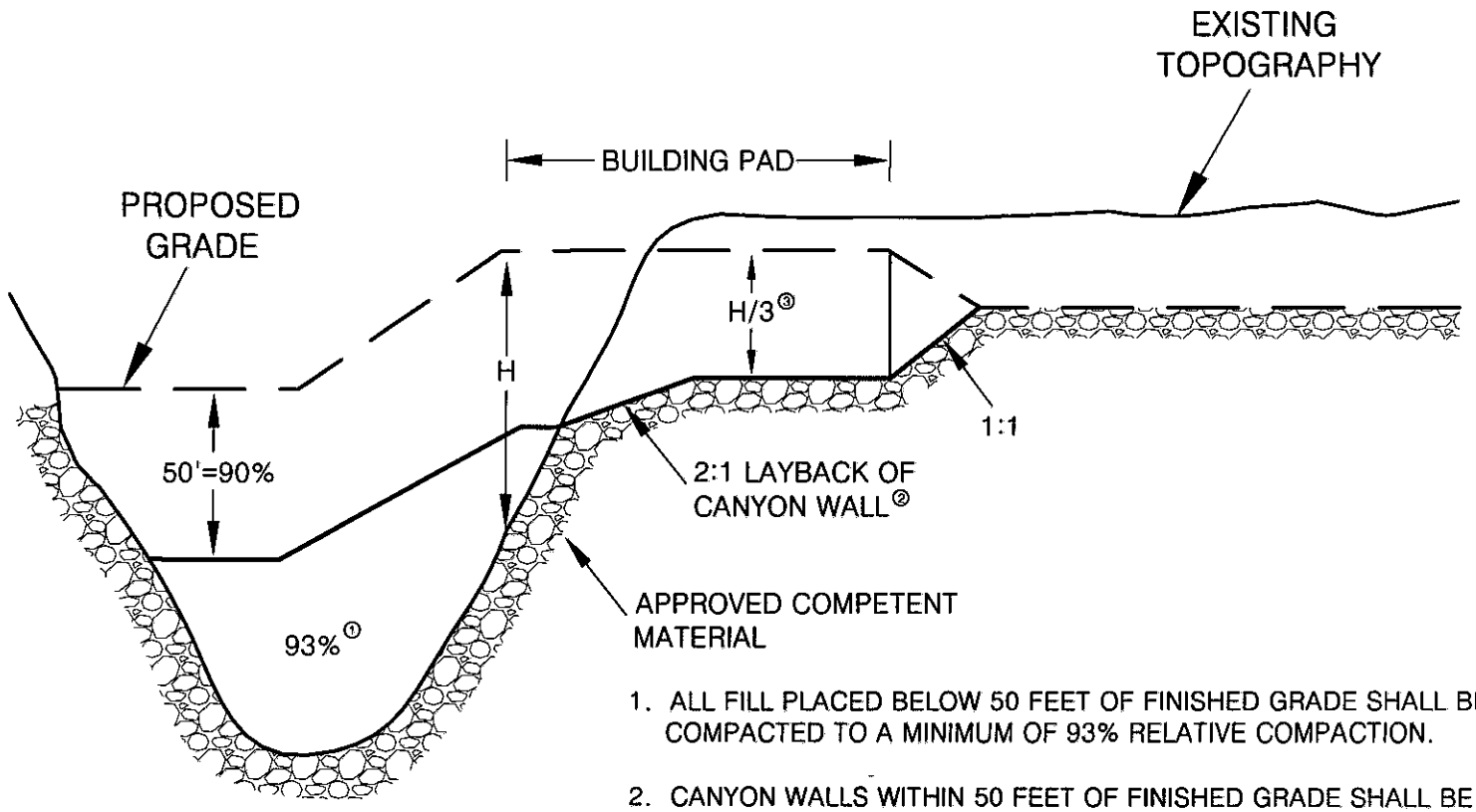


EXCAVATE HOLE INTO EXISTING FILL PRISM, PLACE BOULDER (< 8 feet in maximum dimension) INTO EXISTING COMPACTED FILL. SURROUND WITH SAND, GRAVEL, COBBLES AND WATER HEAVILY. TRACK WITH D8 OR LARGER EQUIPMENT UNTIL RESULTING FILL FULLY SUPPORTS EQUIPMENT. OBSERVE AND/OR TEST IN ACCORDANCE WITH ASTM D1556, D2922 OR D3017. ROCKS LARGER THAN 8 FEET SHALL BE FURTHER REDUCED IN SIZE BY SECONDARY BREAKING.



RELATIVE COMPACTION VS. DEPTH

CANYON WALL LAY BACK
DIFFERENTIAL FILL OVEREXCAVATION DETAILS



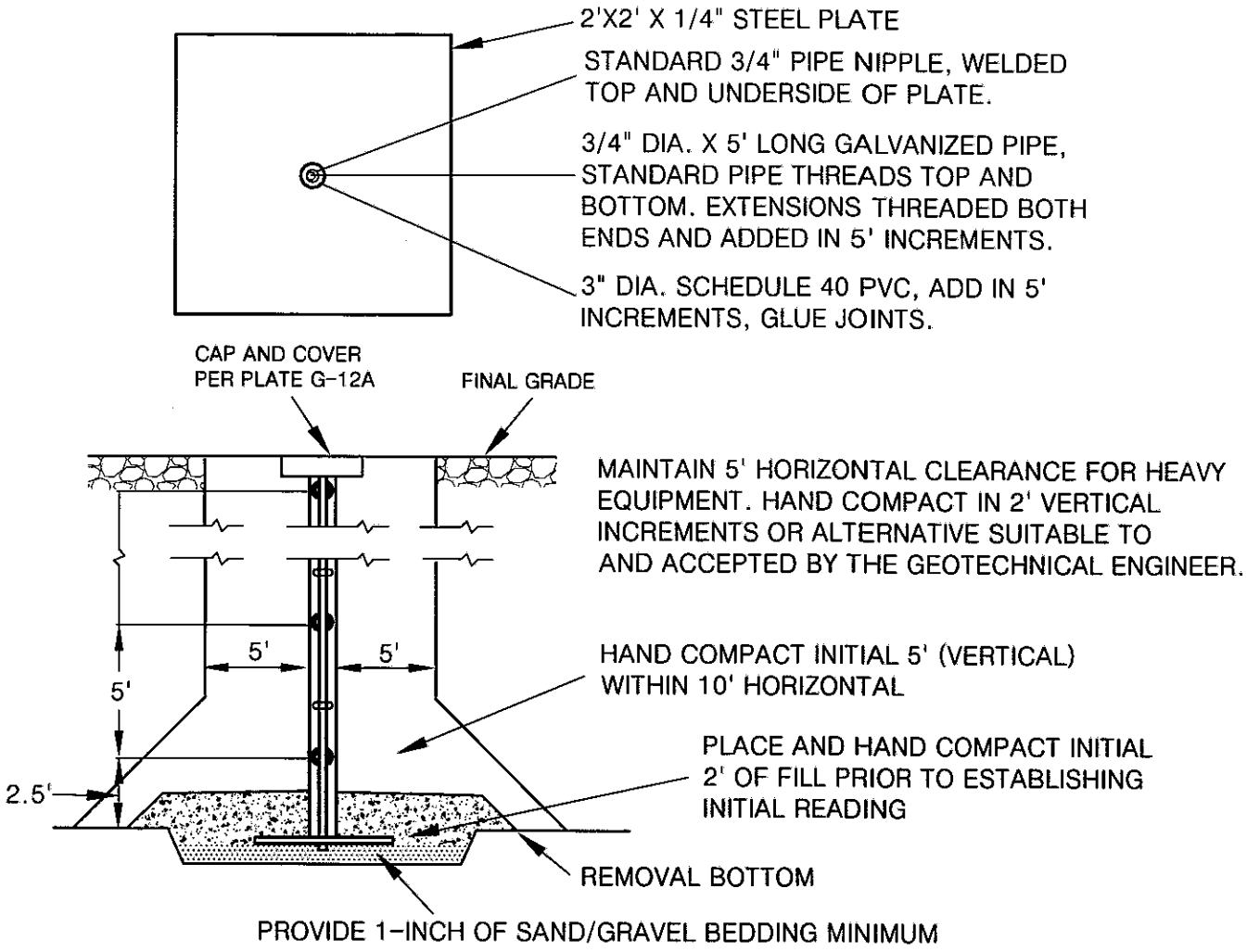
1. ALL FILL PLACED BELOW 50 FEET OF FINISHED GRADE SHALL BE COMPACTED TO A MINIMUM OF 93% RELATIVE COMPACTION.

2. CANYON WALLS WITHIN 50 FEET OF FINISHED GRADE SHALL BE LAID BACK TO A SLOPE RATIO OF 2:1 OR FLATTER.

3. ALL BUILDING PADS SHALL BE OVER EXCAVATED TO A MINIMUM OF 1/3 OF THE MAXIMUM DEPTH OF FILL BELOW THE BUILDING PAD TO A MAXIMUM OF 17 FEET.

4. IF THE 2:1 LAY BACK OF THE CANYON WALL IS IMPRACTICAL, THEN AS AN ALTERNATIVE THE INCREASED COMPACTION STANDARDS IN NOTE 1 SHOULD BE EXTENDED UP TO H/3 AND THE LAY BACK WILL NOT BE REQUIRED.

SETTLEMENT PLATE DETAIL



NOTES:

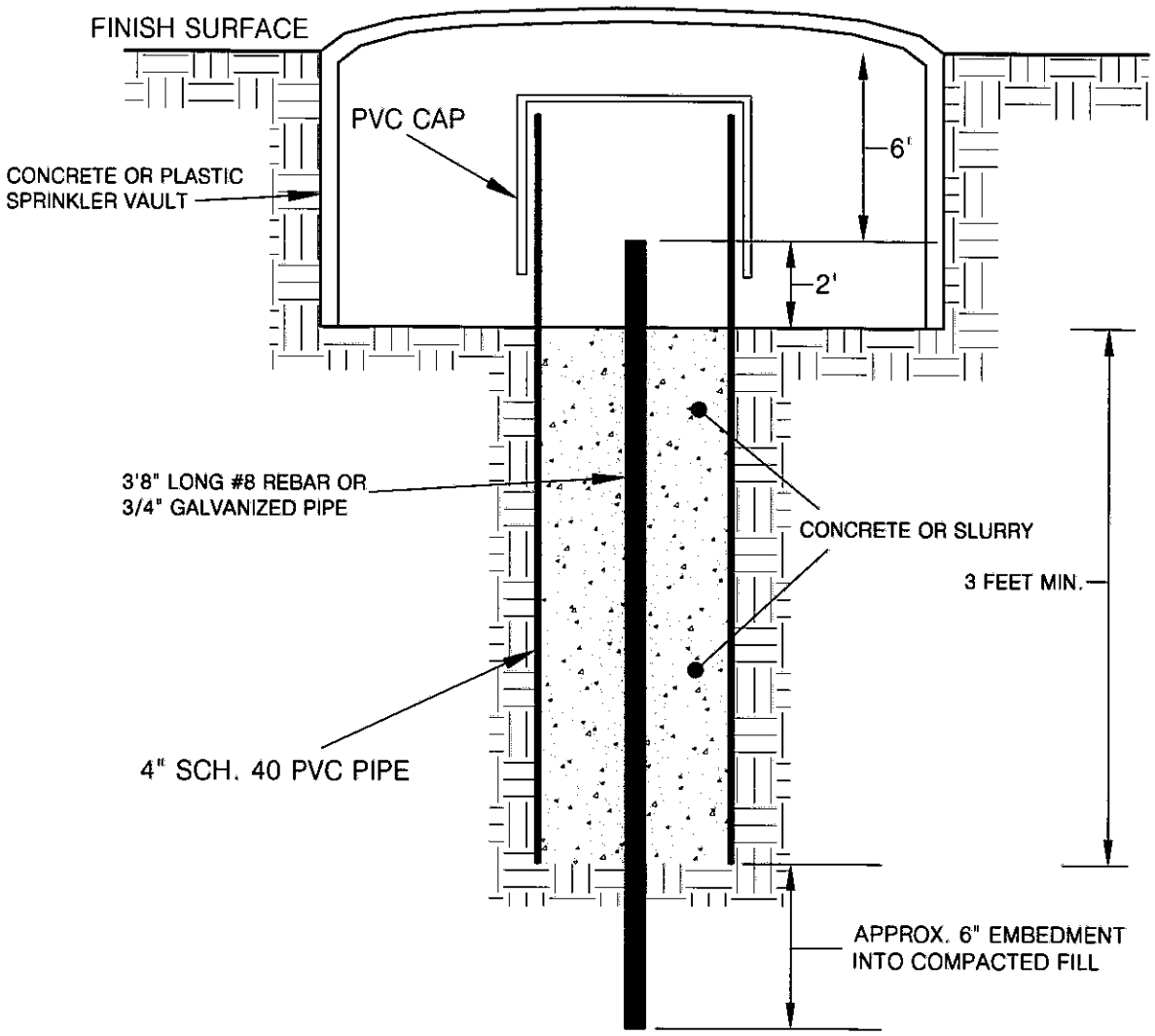
1) LOCATIONS OF SETTLEMENT PLATES SHALL BE CLEARLY MARKED AND READILY VISIBLE (RED FLAGGED) TO EQUIPMENT OPERATORS.

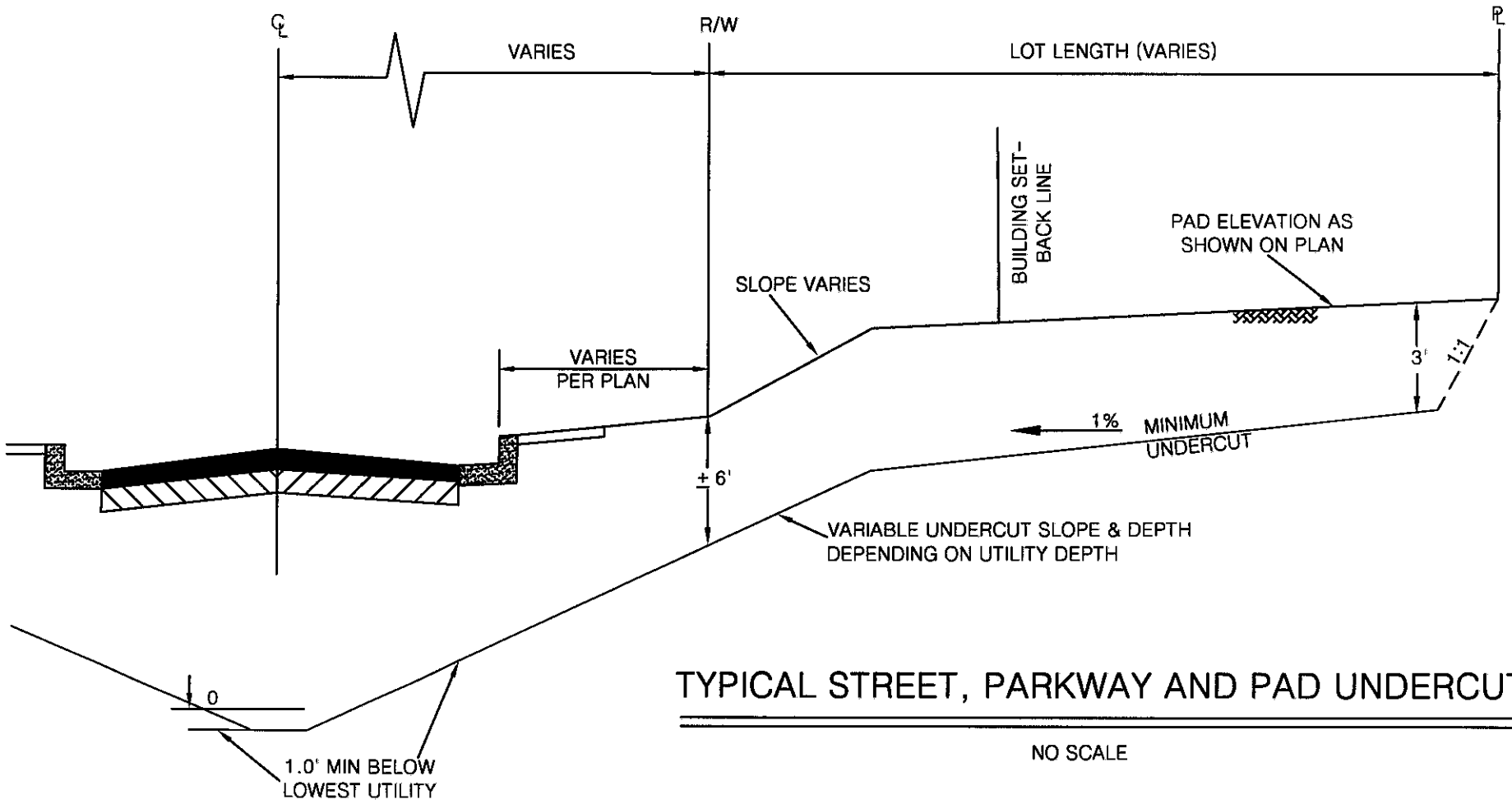
2) CONTRACTOR SHALL MAINTAIN 10' HORIZONTAL CLEARANCE FOR HEAVY EQUIPMENT WITHIN 5' (VERTICAL) OF PLATE BASE. FILL WITHIN CLEARANCE AREA SHALL BE HAND COMPACTED TO PROJECT SPECIFICATIONS OR COMPACTED BY ALTERNATIVE APPROVED BY THE GEOTECHNICAL ENGINEER.

3) AFTER 5' (VERTICAL) OF FILL IS IN PLACE, CONTRACTOR SHALL MAINTAIN 5' HORIZONTAL EQUIPMENT CLEARANCE. FILL IN CLEARANCE AREA SHALL BE HAND COMPACTED (OR APPROVED ALTERNATIVE) IN VERTICAL INCREMENTS NOT TO EXCEED 2 FEET.

4) IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE OR EXTENSION RESULTING FROM EQUIPMENT OPERATING WITHIN PRESCRIBED CLEARANCE AREA, CONTRACTOR SHALL IMMEDIATELY NOTIFY GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATE AND EXTENSION RODS TO WORKING ORDER.

SURFACE SETTLEMENT MONUMENT DETAIL





TYPICAL STREET, PARKWAY AND PAD UNDERCUT

NO SCALE

ALTA CALIFORNIA GEOTECHNICAL, INC .
VER. 3/13

PLATE G-19

PATH: C:\Users\Jinks\Desktop\Drafting\GRADING DETAILS\G-19.dwg

Zoning Summary

Existing Zoning:	BP-2
Proposed Zoning:	RM - Residential Medium Density District
Max. Density:	18 Homes per Acre
Perimeter Site Setbacks:	20'
Common Open Space:	25%
Max. Building Height:	35'
Max. Lot Coverage:	60%

LEGEND

Tm	MONTEREY FORMATION
B-4 ⊕	APPROXIMATE LOCATION OF HOLLOW STEM AUGER BORING
P-2 ○	APPROXIMATE LOCATION OF INFILTRATION TEST
— — —	LIMITS OF REPORT



Project Summary

Total Site Area: ±4.4 Acres
Net Site Area: ±2.47 Acres

Total Units: 58 Homes
- (02) Plan 1 | 1,323 SF | 3 bed | 2.5 Bath | Tandem Garage
- (19) Plan 2 | 1,530 SF | 3 bed | 2.5 Bath
- (22) Plan 3 | 1,575 SF | 3 bed | 2.5 Bath
- (15) Plan 4 | 1,825 SF | 4 bed | 2.5 Bath

Total SF: 89,470 SF

Total Density: 13.18 Homes per Acre
Net Density: 23.48 Homes per Acre

Parking:
Provided: 133 Spaces (2.3 spaces per home)
- Garage: 116 Spaces
- Head in: 17 Spaces (9'x18')

Open Space:
Provided: ±27,940 SF (0.64 AC)

Sloped Area: 83,053 SF (1.92 AC @ 44% of Total Area)

Notes:
- The sloped landscape currently occupies 44% of the total site area.
- There is no defined minimum width requirement for common open space.
- If we calculate 25% of the net area, we would be required to provide 0.61 acres of common open space.

PLATE 1

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0631 DATE: Sept. 2025

Notes:
1. Site plan is for conceptual purposes only.
2. Site plan must be reviewed by planning, building, and fire departments for code compliance.
3. Base information per civil engineer.
4. Civil engineer to verify all setbacks and grading information
5. Building Footprints might change due to the final design elevation style.
6. Open space area is subject to change due to the balcony design of the elevation.
7. Building setbacks are measured from property lines to building foundation lines.

BRANDYWINE HOMES

Concept Site Plan
15 Argonaut
Aliso Viejo, CA

0 20 40 80

SP-06

© 2025 WILLIAM HEZMALHALCH ARCHITECTS, INC. dba WHA. | 2025186 | 09-19-25

ARCHITECTS . PLANNERS . DESIGNERS
WHA.
ORANGE COUNTY . LOS ANGELES . BAY AREA

Attachment F: HYDROMODIFICATION CALCULATIONS

SOHM

PROJECT REPORT

General Model Information

Project Name:	160715-SOHM
Site Name:	Presidio
Site Address:	15 Argonaut
City:	Aliso Viejo
Report Date:	7/8/2026
Gage:	Laguna Beach
Data Start:	10/01/1949
Data End:	09/30/2006
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
A,Scrub,VSteep(>15%)	4.56
Pervious Total	4.56

Impervious Land Use	acre
Impervious Total	0
Basin Total	4.56

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A,Scrub,Flat(0-5%)	0.43
A,Scrub,VSteep(>15%)	2.04
Pervious Total	2.47

Impervious Land Use	acre
Impervious,Flat(0-5)	1.93
Impervious,Mod(5-10)	0.16
Impervious Total	2.09
Basin Total	4.56

Element Flows To:

Surface	Interflow	Groundwater
StormTech 1	StormTech 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

StormTech 1

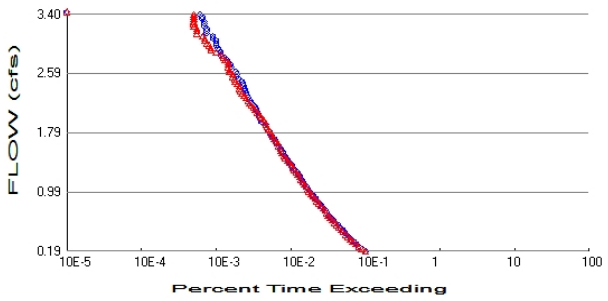
Chamber Model: 3500
Dimensions
Max Row Length: 200
Number of Chambers: 40
Number of Endcaps: 16
Top Stone Depth: 12
Bottom Stone Depth: 9
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 54 in.
Notch Type: Rectangular
Notch Width: 3.839 ft.
Notch Height: 1.093 ft.
Orifice 1 Diameter: 1.916 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

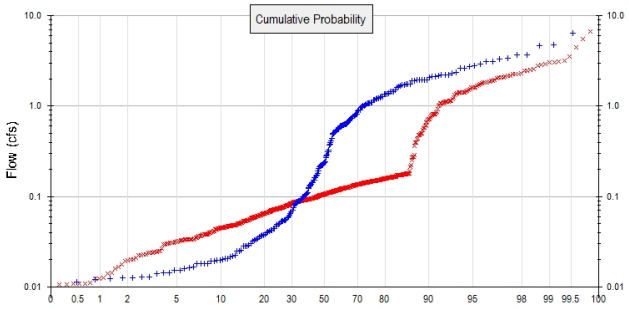
StormTech Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.047	0.000	0.000	0.000
0.0833	0.047	0.001	0.028	0.000
0.1667	0.047	0.003	0.040	0.000
0.2500	0.047	0.004	0.049	0.000
0.3333	0.047	0.006	0.057	0.000
0.4167	0.047	0.008	0.064	0.000
0.5000	0.047	0.009	0.070	0.000
0.5833	0.047	0.011	0.076	0.000
0.6667	0.047	0.012	0.081	0.000
0.7500	0.047	0.014	0.086	0.000
0.8333	0.047	0.017	0.090	0.000
0.9167	0.047	0.021	0.095	0.000
1.0000	0.047	0.025	0.099	0.000
1.0833	0.047	0.028	0.103	0.000
1.1667	0.047	0.032	0.107	0.000
1.2500	0.047	0.035	0.111	0.000
1.3333	0.047	0.038	0.115	0.000
1.4167	0.047	0.042	0.118	0.000
1.5000	0.047	0.045	0.122	0.000
1.5833	0.047	0.049	0.125	0.000
1.6667	0.047	0.052	0.128	0.000
1.7500	0.047	0.056	0.131	0.000
1.8333	0.047	0.059	0.134	0.000
1.9167	0.047	0.062	0.137	0.000
2.0000	0.047	0.066	0.140	0.000
2.0833	0.047	0.069	0.143	0.000
2.1667	0.047	0.072	0.146	0.000
2.2500	0.047	0.076	0.149	0.000
2.3333	0.047	0.079	0.152	0.000
2.4167	0.047	0.082	0.154	0.000
2.5000	0.047	0.085	0.157	0.000
2.5833	0.047	0.088	0.160	0.000
2.6667	0.047	0.091	0.162	0.000

2.7500	0.047	0.095	0.165	0.000
2.8333	0.047	0.098	0.167	0.000
2.9167	0.047	0.101	0.170	0.000
3.0000	0.047	0.104	0.172	0.000
3.0833	0.047	0.107	0.174	0.000
3.1667	0.047	0.110	0.177	0.000
3.2500	0.047	0.112	0.179	0.000
3.3333	0.047	0.115	0.181	0.000
3.4167	0.047	0.118	0.195	0.000
3.5000	0.047	0.121	0.547	0.000
3.5833	0.047	0.123	1.133	0.000
3.6667	0.047	0.126	1.880	0.000
3.7500	0.047	0.129	2.758	0.000
3.8333	0.047	0.131	3.750	0.000
3.9167	0.047	0.133	4.845	0.000
4.0000	0.047	0.136	6.033	0.000
4.0833	0.047	0.138	7.308	0.000
4.1667	0.047	0.140	8.663	0.000
4.2500	0.047	0.142	10.09	0.000
4.3333	0.047	0.143	11.60	0.000
4.4167	0.047	0.145	13.17	0.000
4.5000	0.047	0.147	14.81	0.000
4.5833	0.047	0.148	15.96	0.000
4.6667	0.047	0.150	18.06	0.000
4.7500	0.047	0.152	20.77	0.000
4.8333	0.047	0.153	23.98	0.000
4.9167	0.047	0.155	27.60	0.000
5.0000	0.047	0.156	31.57	0.000
5.0833	0.047	0.158	35.83	0.000
5.1667	0.047	0.160	40.34	0.000
5.2500	0.047	0.161	45.04	0.000
5.3333	0.047	0.163	49.88	0.000
5.4167	0.047	0.164	54.81	0.000
5.5000	0.047	0.166	59.77	0.000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 4.56
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.47
Total Impervious Area: 2.09

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.917294
5 year	2.749176
10 year	3.395606
25 year	4.722952

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.917647
5 year	2.581169
10 year	3.123826
25 year	4.713411

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1917	1989	2001	100	Pass
0.2241	1794	1772	98	Pass
0.2565	1639	1622	98	Pass
0.2888	1505	1488	98	Pass
0.3212	1395	1348	96	Pass
0.3535	1290	1262	97	Pass
0.3859	1200	1175	97	Pass
0.4183	1125	1088	96	Pass
0.4506	1048	1002	95	Pass
0.4830	991	944	95	Pass
0.5154	918	877	95	Pass
0.5477	863	820	95	Pass
0.5801	792	767	96	Pass
0.6124	735	714	97	Pass
0.6448	695	671	96	Pass
0.6772	648	635	97	Pass
0.7095	613	598	97	Pass
0.7419	574	577	100	Pass
0.7743	541	544	100	Pass
0.8066	515	501	97	Pass
0.8390	486	473	97	Pass
0.8713	457	447	97	Pass
0.9037	431	420	97	Pass
0.9361	403	393	97	Pass
0.9684	379	375	98	Pass
1.0008	354	351	99	Pass
1.0332	340	333	97	Pass
1.0655	326	319	97	Pass
1.0979	304	301	99	Pass
1.1302	291	288	98	Pass
1.1626	278	274	98	Pass
1.1950	266	262	98	Pass
1.2273	255	249	97	Pass
1.2597	243	235	96	Pass
1.2921	225	222	98	Pass
1.3244	210	215	102	Pass
1.3568	204	204	100	Pass
1.3891	190	190	100	Pass
1.4215	182	180	98	Pass
1.4539	175	171	97	Pass
1.4862	168	160	95	Pass
1.5186	158	152	96	Pass
1.5509	151	146	96	Pass
1.5833	147	144	97	Pass
1.6157	138	138	100	Pass
1.6480	129	133	103	Pass
1.6804	124	126	101	Pass
1.7128	121	121	100	Pass
1.7451	113	115	101	Pass
1.7775	106	110	103	Pass
1.8098	102	106	103	Pass
1.8422	96	100	104	Pass
1.8746	94	96	102	Pass

1.9069	92	94	102	Pass
1.9393	81	89	109	Pass
1.9717	79	85	107	Pass
2.0040	78	80	102	Pass
2.0364	74	76	102	Pass
2.0687	72	72	100	Pass
2.1011	69	66	95	Pass
2.1335	67	63	94	Pass
2.1658	63	59	93	Pass
2.1982	60	56	93	Pass
2.2306	57	53	92	Pass
2.2629	54	50	92	Pass
2.2953	52	47	90	Pass
2.3276	51	44	86	Pass
2.3600	49	42	85	Pass
2.3924	48	41	85	Pass
2.4247	47	41	87	Pass
2.4571	46	38	82	Pass
2.4895	44	36	81	Pass
2.5218	40	35	87	Pass
2.5542	38	33	86	Pass
2.5865	38	33	86	Pass
2.6189	37	30	81	Pass
2.6513	32	30	93	Pass
2.6836	32	29	90	Pass
2.7160	31	29	93	Pass
2.7484	29	29	100	Pass
2.7807	28	26	92	Pass
2.8131	26	25	96	Pass
2.8454	23	24	104	Pass
2.8778	23	20	86	Pass
2.9102	22	17	77	Pass
2.9425	21	17	80	Pass
2.9749	20	16	80	Pass
3.0073	20	15	75	Pass
3.0396	20	14	70	Pass
3.0720	18	14	77	Pass
3.1043	18	13	72	Pass
3.1367	15	11	73	Pass
3.1691	15	11	73	Pass
3.2014	15	11	73	Pass
3.2338	14	10	71	Pass
3.2662	14	10	71	Pass
3.2985	14	10	71	Pass
3.3309	13	10	76	Pass
3.3632	13	10	76	Pass
3.3956	12	10	83	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

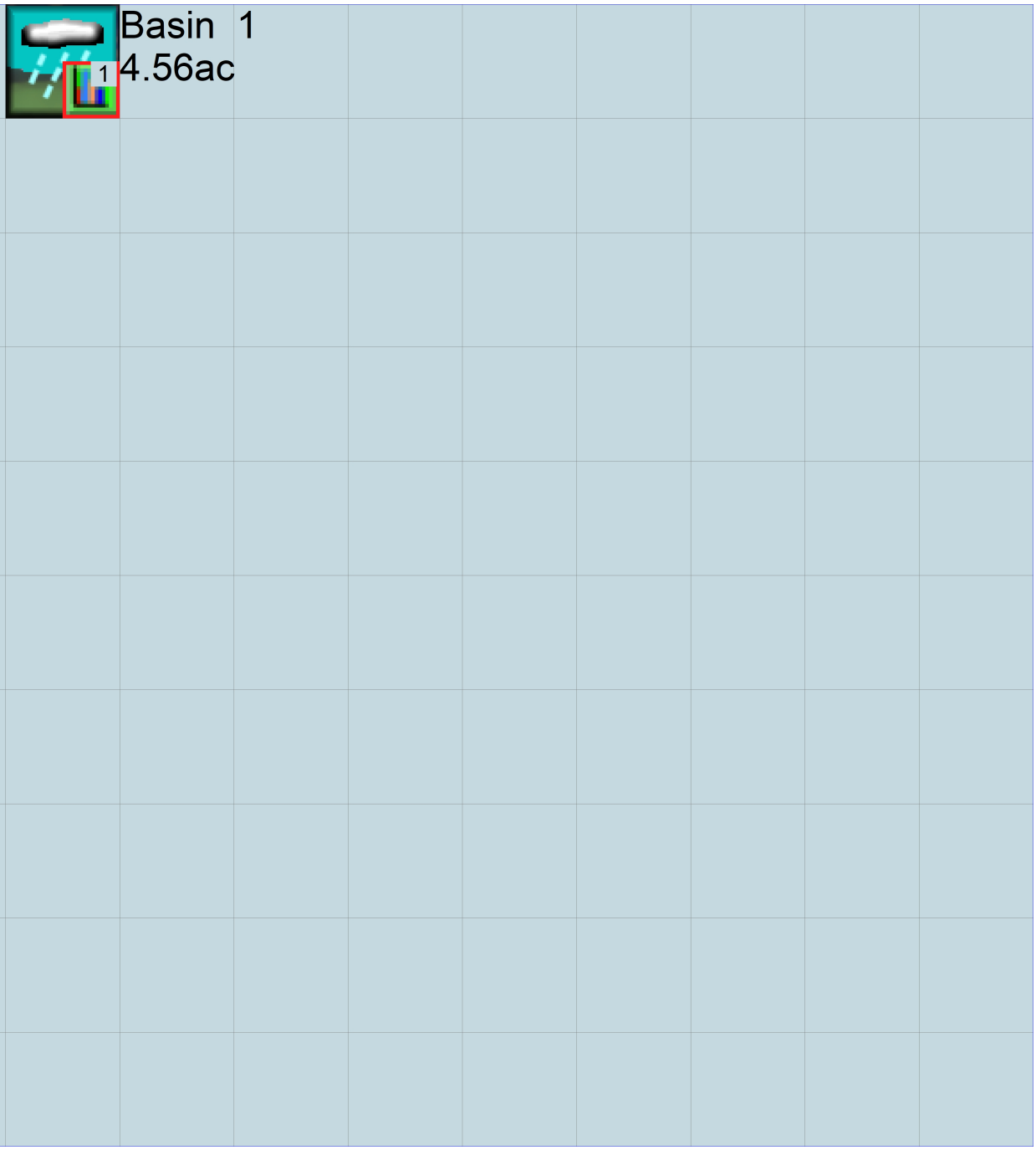
No PERLND changes have been made.

IMPLND Changes

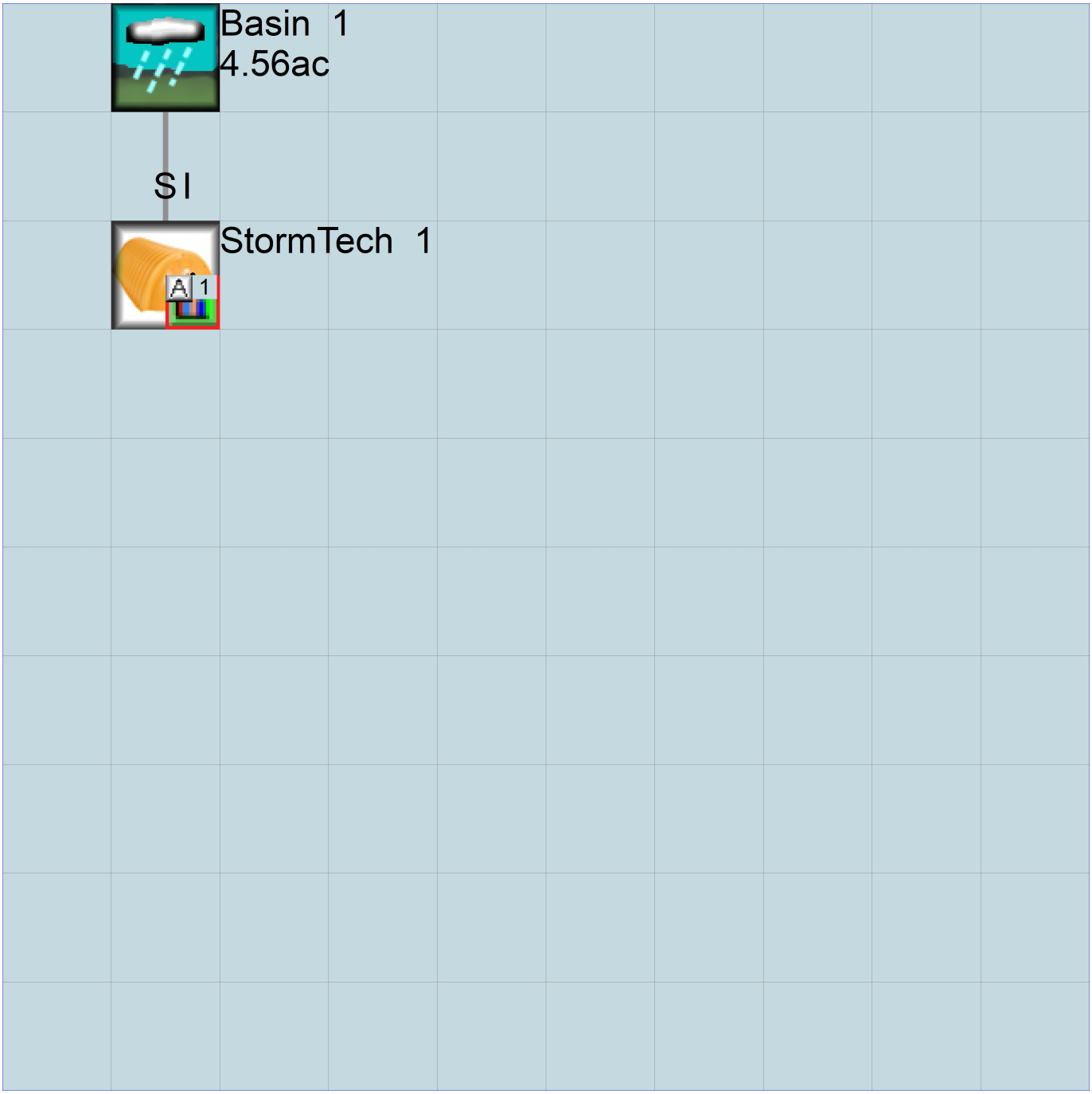
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1949 10 01        END    2006 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   160715-SOHM.wdm
MESSU       25   Pre160715-SOHM.MES
            27   Pre160715-SOHM.L61
            28   Pre160715-SOHM.L62
            30   POC160715-SOHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       4
      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           ***
    4     A,Scrub,VSteep(>15%)    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 ***
    4         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  *********
    4         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 ***
    4         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
    4             0       4.2      0.03       250       0.2       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    4            40        35         2         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    4             0       0.3       0.3       1.3       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    4       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  ***
    4      0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13
  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
    4             0         0      0.03         0      0.84       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   4                        4.56     COPY   501     12
PERLND   4                        4.56     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       1949 10 01        END    2006 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   160715-SOHM.wdm
MESSU       25   Mit160715-SOHM.MES
            27   Mit160715-SOHM.L61
            28   Mit160715-SOHM.L62
            30   POC160715-SOHM1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      PERLND       4
      IMPLND       1
      IMPLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        StormTech  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           ***
    1     A,Scrub,Flat(0-5%)      1    1    1    1   27    0
    4     A,Scrub,VSteep(>15%)    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 ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
    4         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  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
    4         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 ***
    1         0    0    0    1    0    0    0    0    1    0    0
    4         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
    1              0       5.2      0.09       400      0.05       0.8     0.955
    4              0       4.2      0.03       250       0.2       0.8     0.955
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1             40        35         2         2         0      0.03         0
    4             40        35         2         2         0      0.03         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                          ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1              0       0.9       0.3         4       0.7         0
    4              0       0.3       0.3       1.3       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    1       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
    4       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  ***
    1      0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13
    4      0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13
  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
    1              0         0      0.09         0      1.04       0.3      0.01
    4              0         0      0.03         0      0.84       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
    2     Impervious,Mod(5-10)    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
    2         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
    2         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
    2         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
    2            100       0.1       0.1      0.09
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   1                      0.43     RCHRES   1      2
PERLND   1                      0.43     RCHRES   1      3
PERLND   4                      2.04     RCHRES   1      2
PERLND   4                      2.04     RCHRES   1      3
IMPLND   1                      1.93     RCHRES   1      5
IMPLND   2                      0.16     RCHRES   1      5

******Routing******
PERLND   1                      0.43     COPY     1     12
PERLND   4                      2.04     COPY     1     12
IMPLND   1                      1.93     COPY     1     15
IMPLND   2                      0.16     COPY     1     15
PERLND   1                      0.43     COPY     1     13
PERLND   4                      2.04     COPY     1     13
RCHRES   1                         1     COPY   501     16
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                              ***
    1     StormTech  1            1    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
  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
  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  0  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      0.04       0.0       3.0       0.5       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  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   66    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.048710  0.000000  0.000000
  0.083333  0.048710  0.001623  0.028758
  0.166667  0.048710  0.003247  0.040670
  0.250000  0.048710  0.004871  0.049810
  0.333333  0.048710  0.006495  0.057516
  0.416667  0.048710  0.008118  0.064305
  0.500000  0.048710  0.009742  0.070442
  0.583333  0.048710  0.011365  0.076087
  0.666667  0.048710  0.012989  0.081340
  0.750000  0.048710  0.014613  0.086274
  0.833333  0.048710  0.018201  0.090941
  0.916667  0.048710  0.021771  0.095380
  1.000000  0.048710  0.025330  0.099621
  1.083333  0.048710  0.028877  0.103689
  1.166667  0.048710  0.032412  0.107603
  1.250000  0.048710  0.035932  0.111379
  1.333333  0.048710  0.039443  0.115032
```

```
  1.416667  0.048710  0.042937  0.118572
  1.500000  0.048710  0.046417  0.122010
  1.583333  0.048710  0.049881  0.125353
  1.666667  0.048710  0.053328  0.128610
  1.750000  0.048710  0.056758  0.131786
  1.833333  0.048710  0.060171  0.134887
  1.916667  0.048710  0.063564  0.137919
  2.000000  0.048710  0.066937  0.140885
  2.083333  0.048710  0.070290  0.143790
  2.166667  0.048710  0.073620  0.146638
  2.250000  0.048710  0.076926  0.149431
  2.333333  0.048710  0.080209  0.152173
  2.416667  0.048710  0.083465  0.154867
  2.500000  0.048710  0.086694  0.157514
  2.583333  0.048710  0.089895  0.160118
  2.666667  0.048710  0.093065  0.162680
  2.750000  0.048710  0.096204  0.165202
  2.833333  0.048710  0.099309  0.167687
  2.916667  0.048710  0.102380  0.170135
  3.000000  0.048710  0.105413  0.172548
  3.083333  0.048710  0.108406  0.174928
  3.166667  0.048710  0.111360  0.177276
  3.250000  0.048710  0.114271  0.179594
  3.333333  0.048710  0.117135  0.181882
  3.416667  0.048710  0.119944  0.195878
  3.500000  0.048710  0.122706  0.547637
  3.583333  0.048710  0.125409  1.133361
  3.666667  0.048710  0.128051  1.880092
  3.750000  0.048710  0.130621  2.758381
  3.833333  0.048710  0.133121  3.750793
  3.916667  0.048710  0.135536  4.845423
  4.000000  0.048710  0.137855  6.033469
  4.083333  0.048710  0.140047  7.308077
  4.166667  0.048710  0.142054  8.663713
  4.250000  0.048710  0.143904  10.09579
  4.333333  0.048710  0.145691  11.60041
  4.416667  0.048710  0.147423  13.17423
  4.500000  0.048710  0.149080  14.81433
  4.583333  0.048710  0.150755  15.96499
  4.666667  0.048710  0.152378  18.06484
  4.750000  0.048710  0.154002  20.77946
  4.833333  0.048710  0.155626  23.98499
  4.916667  0.048710  0.157249  27.60297
  5.000000  0.048710  0.158873  31.57197
  5.083333  0.048710  0.160496  35.83737
  5.166667  0.048710  0.162121  40.34689
  5.250000  0.048710  0.163744  45.04840
  5.333333  0.048710  0.165368  49.88896
  5.416667  0.048710  0.166991  54.81463
  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

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   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     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        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        16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK    16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Attachment G: DRAINAGE REPORT

PRELIMINARY DRAINAGE REPORT: Tract No. 19489

Proposed 58-Unit Townhome Development

Aliso Viejo, California

ACG Project No. 106715

May 28, 2026

Site Location:

15 Argonaut
Aliso Viejo, CA 92656

Prepared For:

Brandywine Homes
2355 Main Street, Suite 220
Irvine, CA 92614

Prepared By:

Advanced Civil Group, Inc.
30251 Golden Lantern, Suite E PMB 251
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Hydrology Exhibits
Time of Concentration Nomograph
Mean Precipitation Intensities
Rational Method Hydrology Calculation

INTRODUCTION

Project Description

The proposed development at 15 Argonaut ("Property") consists of a proposed 58-unit townhome development ("Project"). The Project is in Aliso Viejo ("City"), County of Orange ("County"). The area of the Property is 4.40 acres known as Assessor Parcel Number's 623-093-10 and 623-093-11. Existing commercial developments border the Property to the south and east. An existing hillside and v-ditches are located on the north and west portions of the Property (See Figure 1 - Area Map and Figure 2 - Vicinity Map).

The central to southeast portion of the existing property is relatively flat and contains a commercial building, drive aisles, and parking. The north and west side of the property consists of a 2:1 hillside slope which drains to v-ditches. The runoff from the v-ditches discharge to the surface and flow to the front of the property along with all other surface flows where it discharges to Argonaut via under sidewalk drains.

Project Objectives

The objectives of this study are listed below.

1. Use the Rational Method to determine the 10-Year Storm peak flow rates for the existing and proposed conditions.

2. Demonstrate that all habitable structures and protected for the 100-Year Storm Event.

3. Prepare Final Drainage Study based on objectives above.

Figure 1 - Area Map

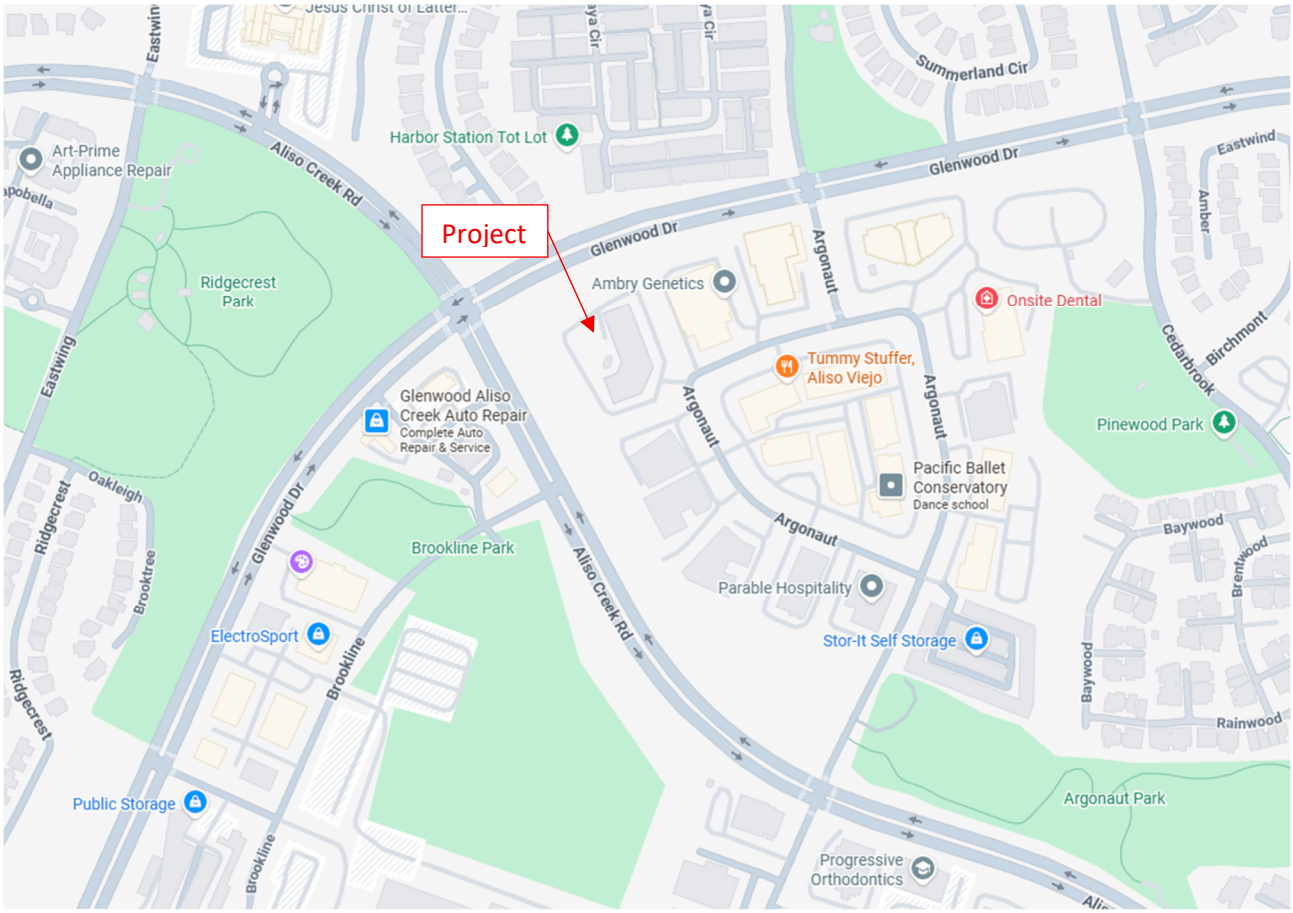
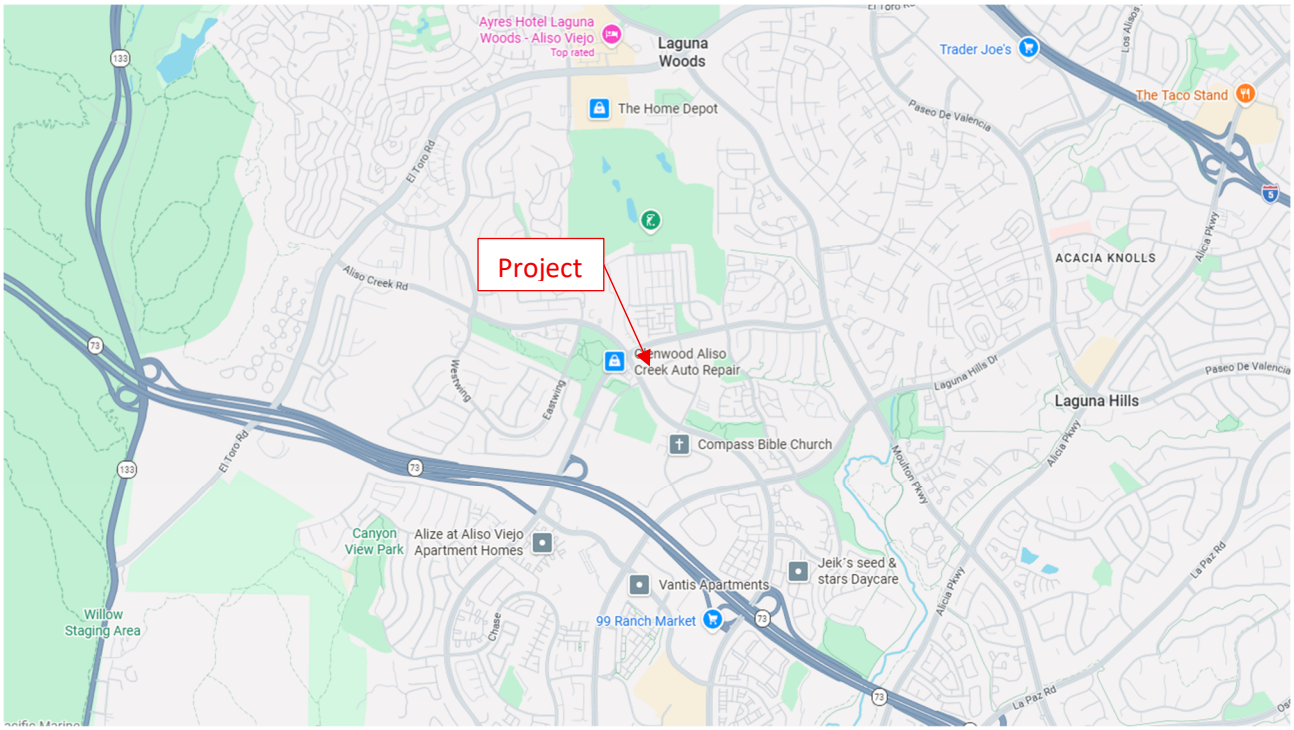


Figure 2 - Vicinity Map



Existing Facilities

The central to southeast portion of the property is relatively flat and contains a commercial building, drive aisles, and parking. The north and west side of the property consists of a 2:1 hillside slope which drains to v-ditches. The runoff from the v-ditches discharge to the surface and flow to the front of the property along with all other surface flows where it discharges to Argonaut via under sidewalk drains.

Proposed Facilities

The proposed redevelopment replaces an existing commercial property that slopes from northwest to southeast. The northern and western boundaries feature a 2:1 hillside slope with v-ditches that intercept runoff; under the new design, this drainage will be conveyed through underground pipes to the front of the property, maintaining existing hydraulic patterns. Onsite stormwater will be collected via area drains and directed to a biofiltration system for treatment before being pumped for final discharge into Argonaut.

HYDROLOGY

Methodology

The tributary drainage area boundaries were delineated utilizing topography from aerial photogrammetry over the Project site and surrounding areas. The proposed Project drainage design found on the attached Site BMP Locations exhibit illustrates the locations of onsite drainage systems.

Rational Method

The Rational Method, an empirical computational procedure for developing peak runoff and discharge for storms of a specified recurrence interval in small watersheds, was used to compute peak flow rates for the watersheds tributary to the Project. The Orange County Hydrology Manual provides a Rational Method formula to calculate the peak runoff. The Rational Method formula is:

$$Q = CIA$$

Where:

Q = Peak discharge, in cubic feet per second (cfs)
C = Runoff coefficient representing the ratio of runoff depth to rainfall depth
= 0.90 (ai + ((1-Fp) ap)/I) for I greater than Fp; 0.90 ai for I less than or equal to Fp
ai = ratio of impervious area to total area (decimal fraction)
ap = ration of pervious area to total are (decimal fraction), (ap = 1 – ai)
Fp = infiltration rate for pervious area (inches per hour)
I = The time-averaged rainfall intensity for a storm duration equal to the time of concentration, in inches/hour (in/hr)
A = Drainage area, in acres (ac)

Hydrology Summary

The peak flow rate for the 10-year storm event was calculated using the Rational Method. The results of these calculations are presented in Table 1 below. Supporting documentation for these results is included in the attachments.

Table 1 - Rational Method Results

	10-Year Existing Storm Event	10-Year Proposed Storm Event
Drainage Area 1	8.10 cfs	7.57 cfs
Drainage Area 2	0.68 cfs	0.68 cfs
Drainage Area 3	0.67 cfs	0.67 cfs
Drainage Area 4	0.58 cfs	0.58 cfs

The 10-year Rational Method analysis shows that the proposed condition maintains or slightly reduces peak flows compared to existing conditions, with Drainage Area 1 decreasing from 8.10 cfs to 7.57 cfs and the other areas remaining unchanged.

100-Year Storm Protection

The project site is not located within a mapped FEMA Special Flood Hazard Area (SFHA), as confirmed by FEMA FIRMette Panel 06059C0426J, effective date 12/3/2009. Based on this determination, the site is outside of the 100-year floodplain and is not subject to mapped flood zone inundation.

All proposed habitable structures have been designed and graded such that finished floor elevations are above the adjacent public and private street elevations, providing positive drainage away from the buildings. Surface runoff generated by the 100-year storm event will be collected and conveyed through proposed on-site drainage improvements and/or adjacent street conveyance systems in accordance with Orange County Local Drainage Manual requirements.

CONCLUSION

Based on the Rational Method analysis, the proposed Project drainage design will not increase peak runoff for the 10-year storm event. Peak flows are either maintained or slightly reduced compared to existing conditions, demonstrating that the Project's on-site drainage systems effectively manage runoff. Therefore, the proposed development meets the hydrology performance objectives and is consistent with the requirements of the Orange County Hydrology Manual.

Attachments



	TOTAL AREA	4.56 AC
	TOTAL PERVIOUS AREA	2.45 AC
	% PERVIOUS	53 %
	% IMPERVIOUS	47 %
	DRAINAGE AREA 1	3.16 AC
	TOTAL PERVIOUS AREA	1.21 AC
	% PERVIOUS	38 %
	% IMPERVIOUS	62 %
	DRAINAGE AREA 2	0.35 AC
	TOTAL PERVIOUS AREA	0.31 AC
	% PERVIOUS	89 %
	% IMPERVIOUS	11 %
	DRAINAGE AREA 3	0.26 AC
	TOTAL PERVIOUS AREA	0.24 AC
	% PERVIOUS	92 %
	% IMPERVIOUS	8 %
	DRAINAGE AREA 4	0.79 AC
	TOTAL PERVIOUS AREA	0.69 AC
	% PERVIOUS	87 %
	% IMPERVIOUS	13 %

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

ADVANCED CIVIL GROUP

ADVANCED CIVIL GROUP INC.
30251 GOLDEN LANTERN,
SUITE E, PMB 251
LAGUNA NIGUEL, CA 92647
(866) 338-5778 PHONE
WWW.ADVANCEDCIVILGROUP.COM

PREPARED BY:

R.C.E. NO. 68795

DATE 3/31/2026

PERVIOUS AREA EXISTING CONDITION 15 ARGONAUT

ALISO VIEJO



	TOTAL AREA	4.56 AC
	TOTAL PERVIOUS AREA	2.36 AC
	% PERVIOUS	52 %
	% IMPERVIOUS	48 %
	DRAINAGE AREA 1	3.16 AC
	TOTAL PERVIOUS AREA	1.12 AC
	% PERVIOUS	35 %
	% IMPERVIOUS	65 %
	DRAINAGE AREA 2	0.35 AC
	TOTAL PERVIOUS AREA	0.31 AC
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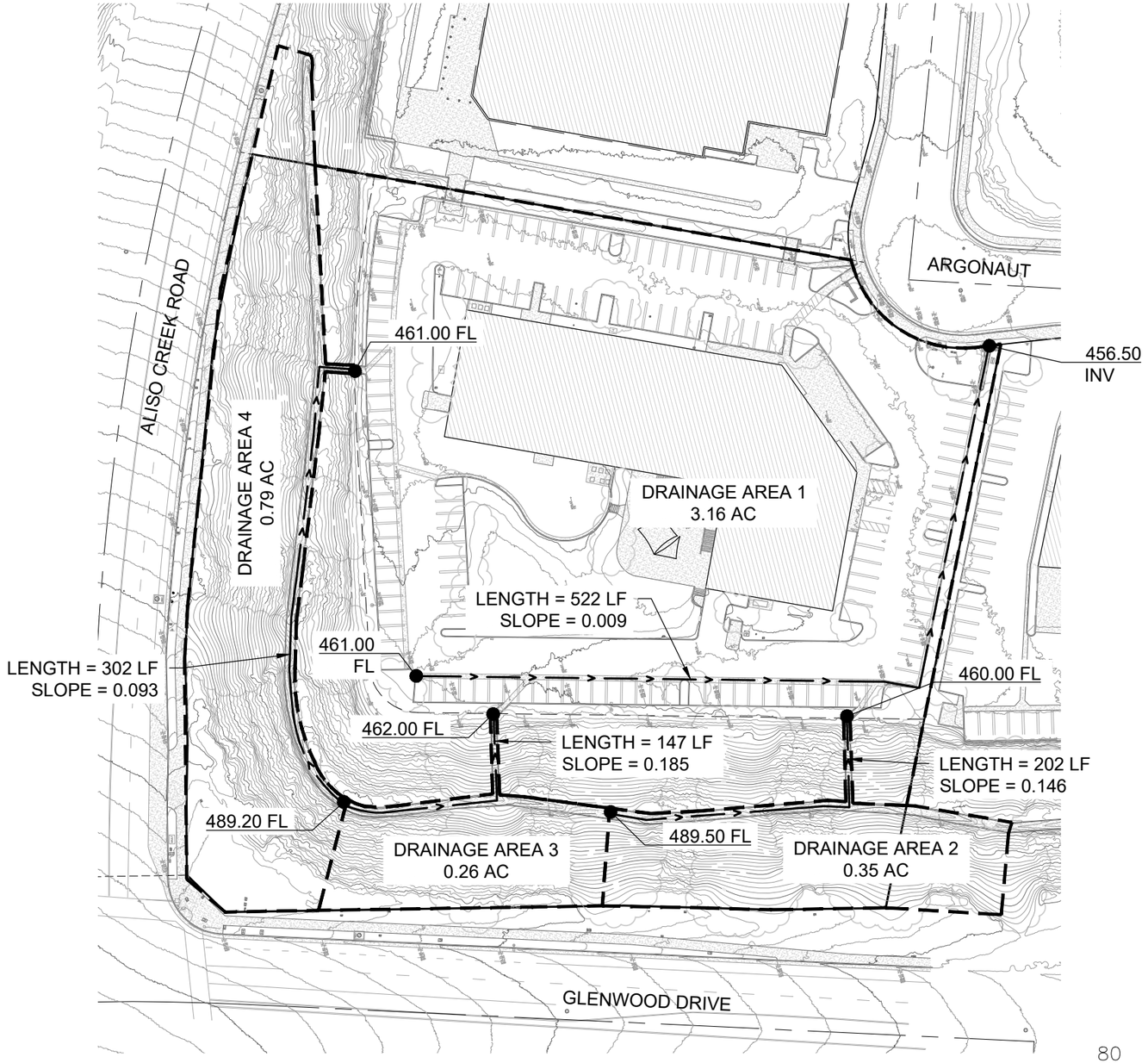
DATE 4/8/2026

PERVIOUS AREA PROPOSED CONDITION 15 ARGONAUT

ALISO VIEJO

EXISTING HYDROLOGY EXHIBIT

IN THE CITY OF ALISO VIEJO,
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

DRAINAGE AREA:

DMA	(AC)
1	3.16
2	0.48
3	0.30
4	0.79

LEGEND:

FLOW PATH

DRAINAGE BOUNDARY

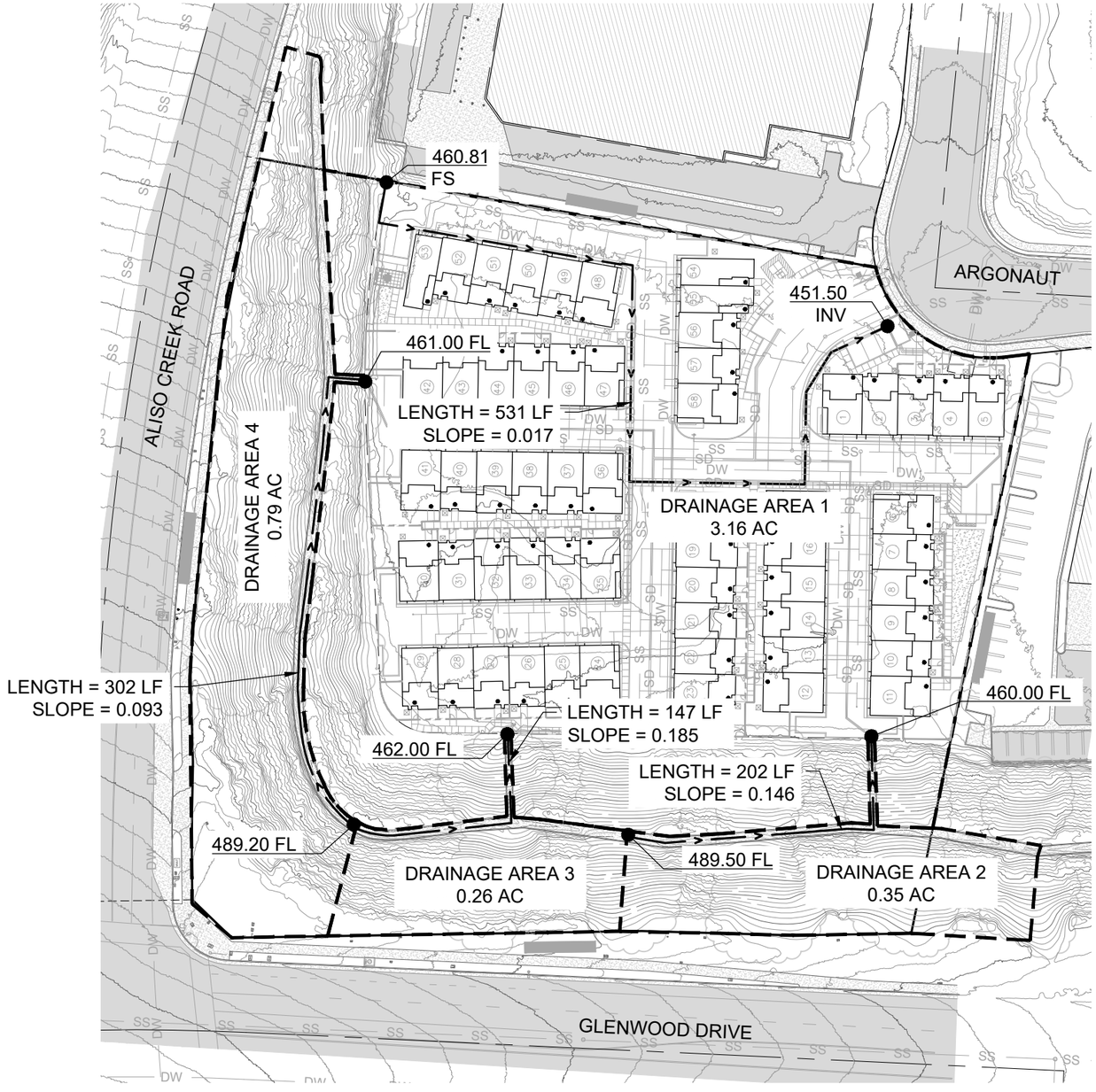
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SCALE: 1"=80'

PROPOSED HYDROLOGY EXHIBIT

IN THE CITY OF ALISO VIEJO,
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

DRAINAGE AREA:

DMA	(AC)
1	3.16
2	0.48
3	0.30
4	0.79

LEGEND:

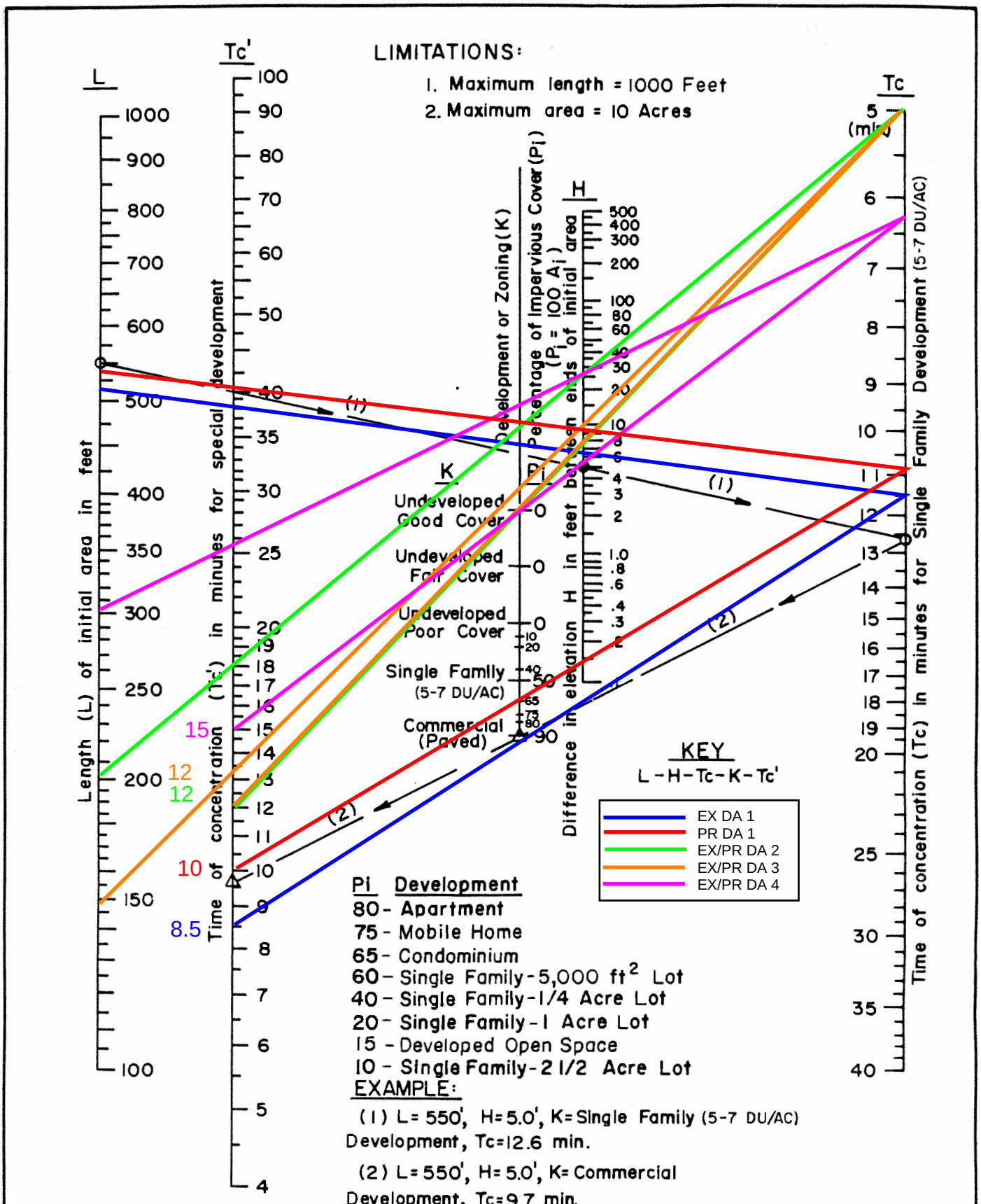
FLOW PATH

DRAINAGE BOUNDARY

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'



ORANGE COUNTY

HYDROLOGY MANUAL

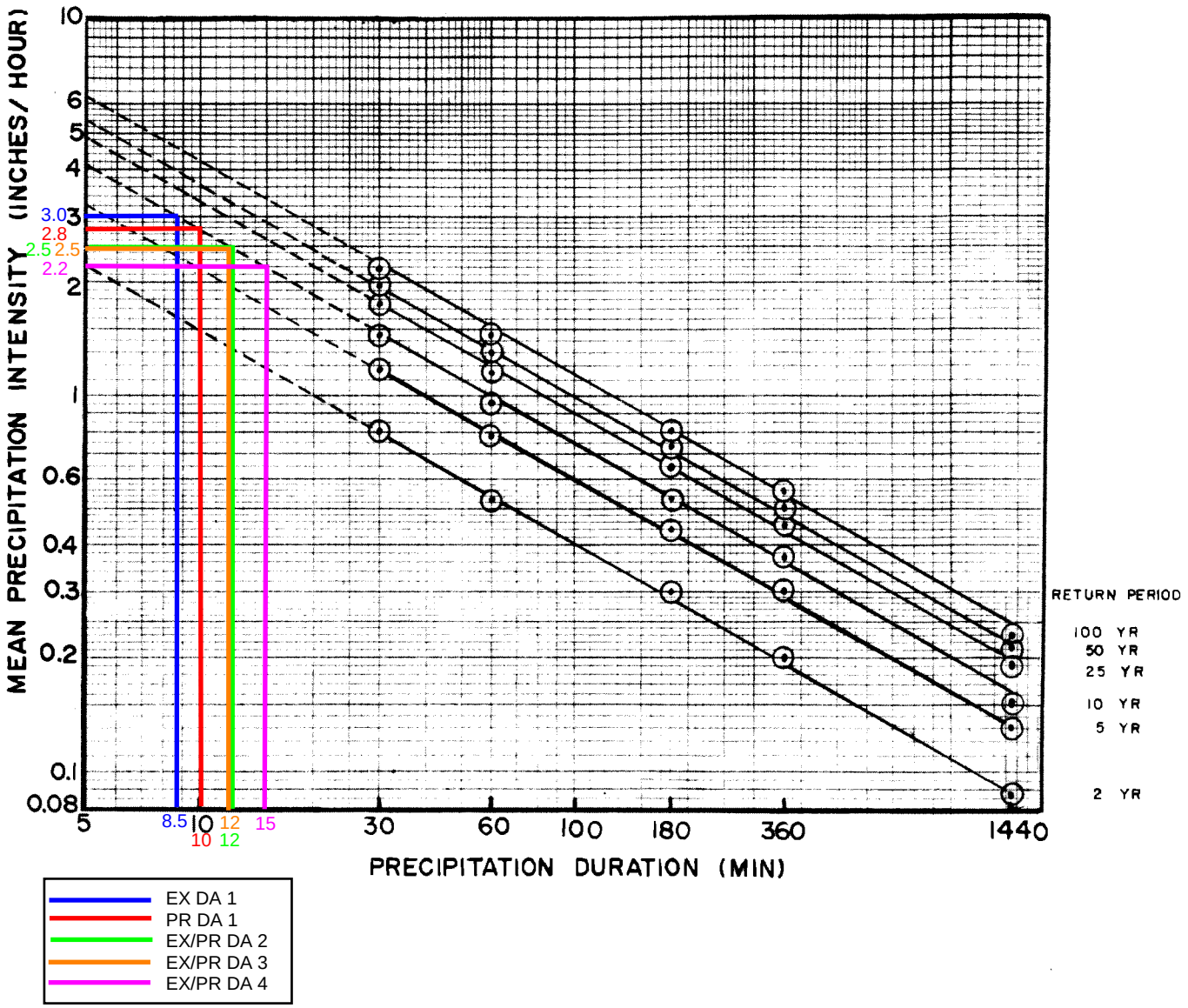
TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

Regression Equations: $I(t) = at^b$

(I= Intensity in inches/hour, t= duration in minutes)

Return Frequency (years)	a	b
2	5.702	-0.574
5	7.870	-0.562
10	10.209	-0.573
25	11.995	-0.566
50	13.521	-0.566
100	15.560	-0.573



ORANGE COUNTY

HYDROLOGY MANUAL

MEAN PRECIPITATION INTENSITIES FOR NONMOUNTAINOUS AREAS

Figure B-3

Rational Method Hydrology Calculation

15 Argonaut

5/19/2026

OC Hydrology Manual
Section D - Rational Method
Fp is from Section C.6.4 of OC Hydrology Manual (soil type A)
I is from OC Hydrology Manual Figure B-3

Drainage Area 1
10-Year Existing

ai	0.62	
ap	0.38	
Fp	0.4	in/hr
C	0.85	
I	3.0	in/hr
A	3.16	acres
Q	8.10	cfs

Drainage Area 1
10-Year Proposed

ai	0.65	
ap	0.35	
Fp	0.4	in/hr
C	0.86	
I	2.8	in/hr
A	3.16	acres
Q	7.57	cfs

Drainage Area 2
10-Year Existing

ai	0.11	
ap	0.89	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.68	cfs

Drainage Area 2
10-Year Proposed

ai	0.11	
ap	0.89	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.68	cfs

Drainage Area 3
10-Year Existing

ai	0.08	
ap	0.92	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.67	cfs

Drainage Area 3
10-Year Proposed

ai	0.08	
ap	0.92	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.67	cfs

Drainage Area 4
10-Year Existing

ai	0.13	
ap	0.87	
Fp	0.4	in/hr

C	0.76	
I	2.2	in/hr
A	0.35	acres

Q	0.58	cfs

Drainage Area 4
10-Year Proposed

ai	0.13	
ap	0.87	
Fp	0.4	in/hr

C	0.76	
I	2.2	in/hr
A	0.35	acres

Q	0.58	cfs

Attachment H: MAINTENANCE COVENANT AND AGREEMENT

RECORDING REQUESTED BY
AND MAIL TO:

CITY OF ALISO VIEJO
PUBLIC WORKS DEPARTMENT
12 JOURNEY
ALISO VIEJO, CA 92656

Space above this line is for Recorder's use

MAINTENANCE COVENANT AND AGREEMENT FOR
WATER QUALITY MANAGEMENT PLAN (WQMP) REQUIREMENTS

The undersigned hereby certifies I am (we are) the owner(s) ("Owner(s)") of the hereinafter described real property located in the City of Aliso Viejo, County of Orange, State of California ("Property"):
Site Address: _____ APN: _____

Please attach the legal description for the Property as Attachment 1.

Owner and its heirs, successors, and assigns, including each successive owner of an interest in all or any part of the Property shall, throughout the period of their respective ownership, implement, and fund implementation of, the Operations & Maintenance ("O&M") Plan for the Property, which was approved by the City as part of the Water Quality Management Plan ("WQMP") required for development of the Property, and shall operate, inspect, maintain, repair, and replace the Best Management Practices ("BMPs") described in the O&M Plan for the Property, which includes:

- Description of all post-construction BMPs (non-structural and structural)
- WQMP BMP Site Plan
- Description of the Owner's responsibilities and required training of persons performing BMP implementation, operation, maintenance, and inspection
- Implementation/inspection/maintenance frequency and operating schedule
- Specific BMP implementation, maintenance, and inspection activities
- Description of all permits required for the implementation, operation, and maintenance of BMPs
- Forms to be used in documenting implementation, operation, maintenance, and inspection of BMPs
- Recordkeeping requirements

Please attach copies of the approved O&M Plan and WQMP BMP Site Plan as Attachment 2 to this Agreement for recordation.

A copy of the approved O&M Plan is described in the current WQMP for the project, as it may be amended from time to time according to its terms, which is on file with the City of Aliso Viejo and is incorporated herein by this reference.

Owner(s) shall maintain the drainage devices described in the O&M Plan for the Property indicated and as shown on plans permitted by the City of Aliso Viejo in good and functional condition to safeguard the property owners and adjoining properties from damage and pollution.

Owner(s) hereby consent to inspection of the Property by an inspector authorized by the City Manager, or his or her designee, for the purpose of verifying compliance with the provisions of this Agreement.

Owner(s) shall provide printed educational materials with any sale of the property which provide information on what stormwater management facilities are present, the type(s) and location(s) of maintenance signs that are required, and how the necessary maintenance can be performed.

Owner(s) shall provide actual notice of this Agreement and its terms to any respective successor(s) in interest to the Property prior to transfer of said interest to such successor(s) in interest. This covenant and agreement shall run with the land and shall be binding upon any future owners, encumbrances, their successors, heirs or assigns and shall continue in effect until the City of Aliso Viejo approves its termination.

Print Name of Owner(s): 1._____, 2._____

Signature of Owner(s):

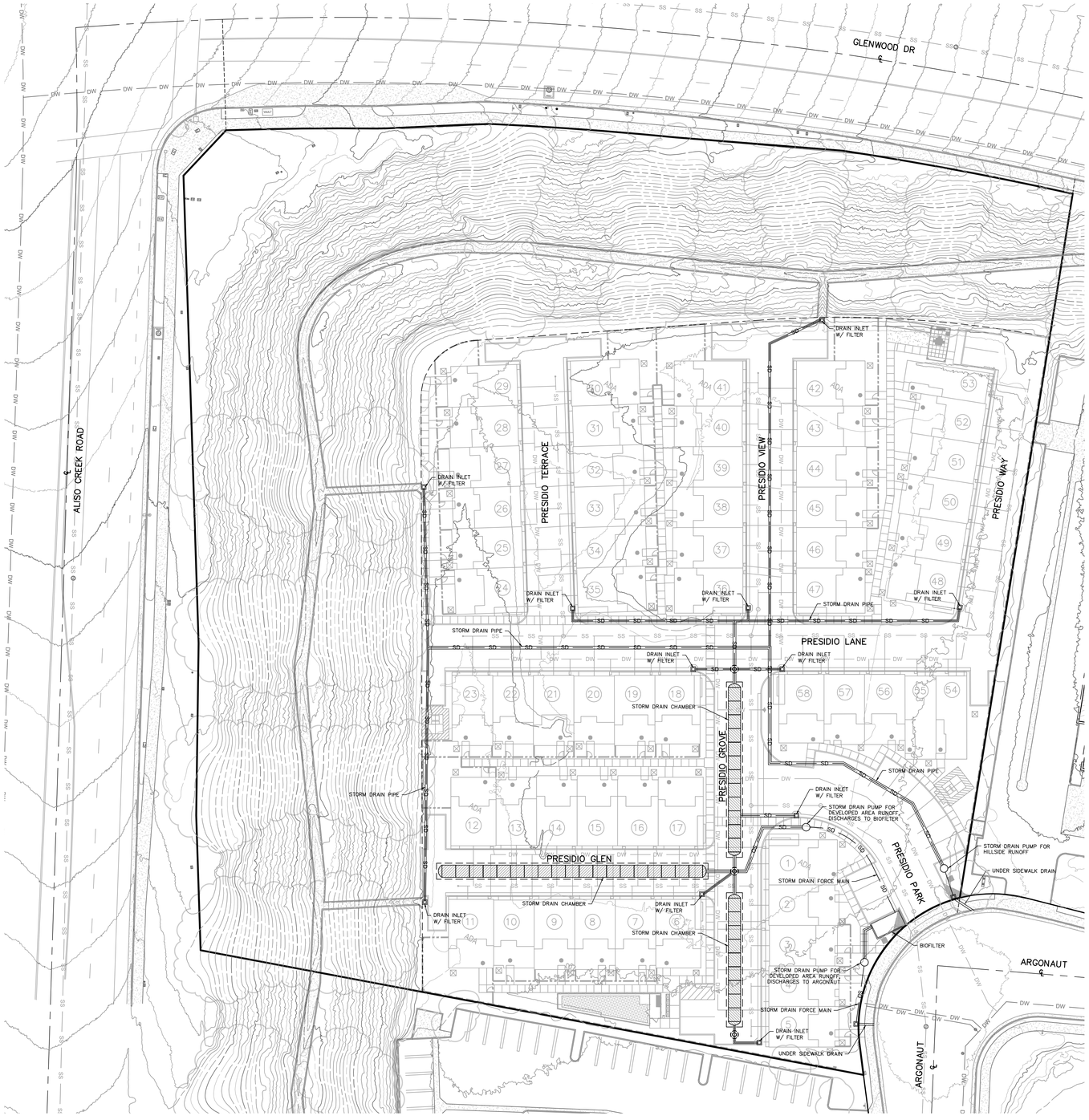
1:_____ Date:_____

2:_____ Date:_____

(ATTACH NOTARY)

WQMP SITE PLAN

IN THE CITY OF ALISO VIEJO
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

SCALE 1"=30'

30 15 0 30 60 90

SCALE: 1"=30'

FCS
An ADEC Innovation

F.2 - Drainage Report

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PRELIMINARY DRAINAGE REPORT: Tract No. 19489

Proposed 58-Unit Townhome Development

Aliso Viejo, California

ACG Project No. 106715

July 14, 2026

Site Location:

15 Argonaut
Aliso Viejo, CA 92656

Prepared For:

Brandywine Homes
2355 Main Street, Suite 220
Irvine, CA 92614

Prepared By:

Advanced Civil Group, Inc.
30251 Golden Lantern, Suite E PMB 251
Laguna Niguel, CA 92677
(866) 338-5778
advancedcivilgroup.com

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CONCLUSION 7

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Figure 2 - Vicinity Map 4

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Attachments

Pervious Area Exhibits
Hydrology Exhibits
Time of Concentration Nomograph
Mean Precipitation Intensities
Rational Method Hydrology Calculation

INTRODUCTION

Project Description

The proposed development at 15 Argonaut ("Property") consists of a proposed 58-unit townhome development ("Project"). The Project is in Aliso Viejo ("City"), County of Orange ("County"). The area of the Property is 4.40 acres known as Assessor Parcel Number's 623-093-10 and 623-093-11. Existing commercial developments border the Property to the south and east. An existing hillside and v-ditches are located on the north and west portions of the Property (See Figure 1 - Area Map and Figure 2 - Vicinity Map).

The central to southeast portion of the existing property is relatively flat and contains a commercial building, drive aisles, and parking. The north and west side of the property consists of a 2:1 hillside slope which drains to v-ditches. The runoff from the v-ditches discharge to the surface and flow to the front of the property along with all other surface flows where it discharges to Argonaut via under sidewalk drains.

Project Objectives

The objectives of this study are listed below.

1. Use the Rational Method to determine the 10-Year Storm peak flow rates for the existing and proposed conditions.

2. Demonstrate that all habitable structures and protected for the 100-Year Storm Event.

3. Prepare Final Drainage Study based on objectives above.

Figure 1 - Area Map

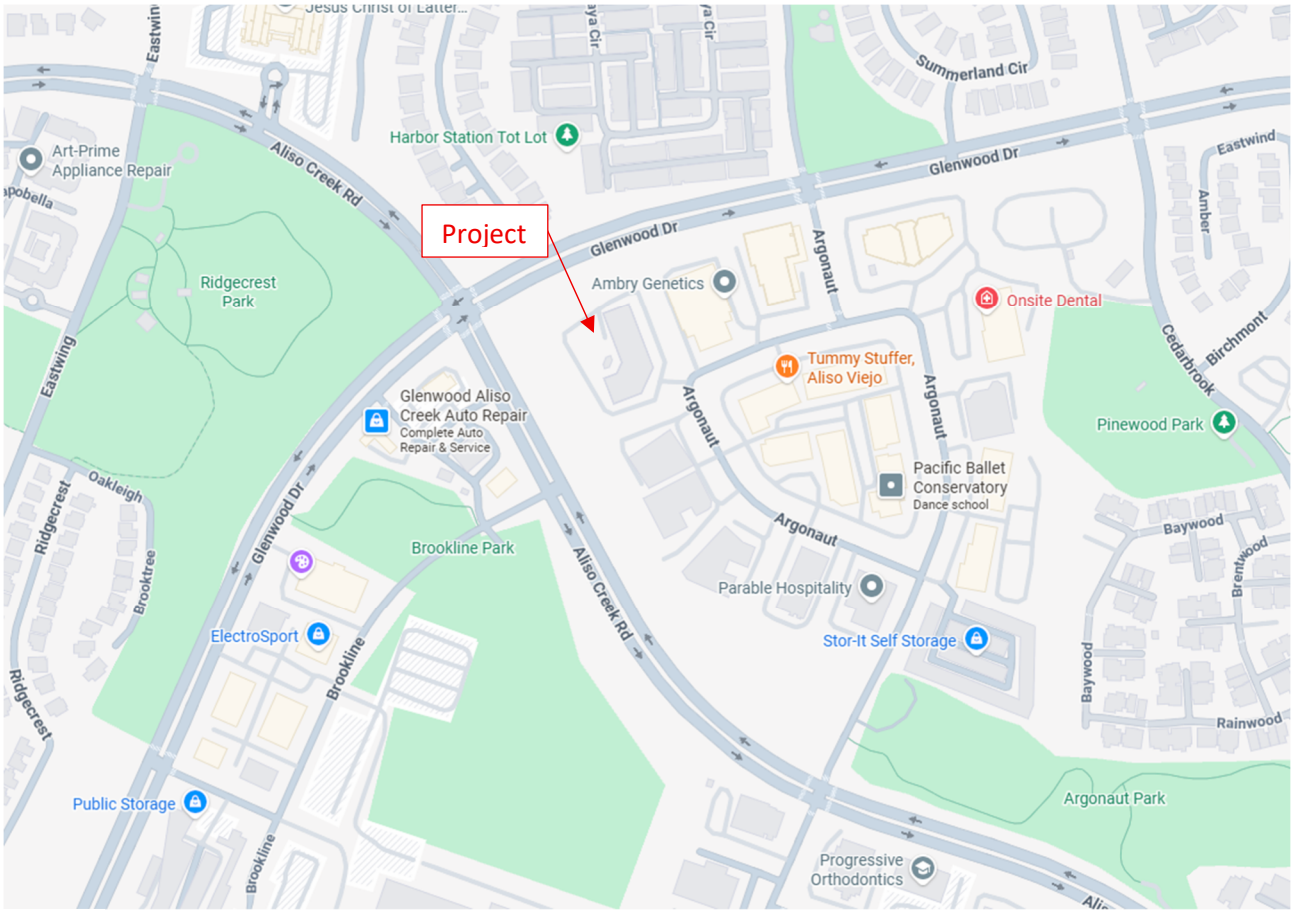
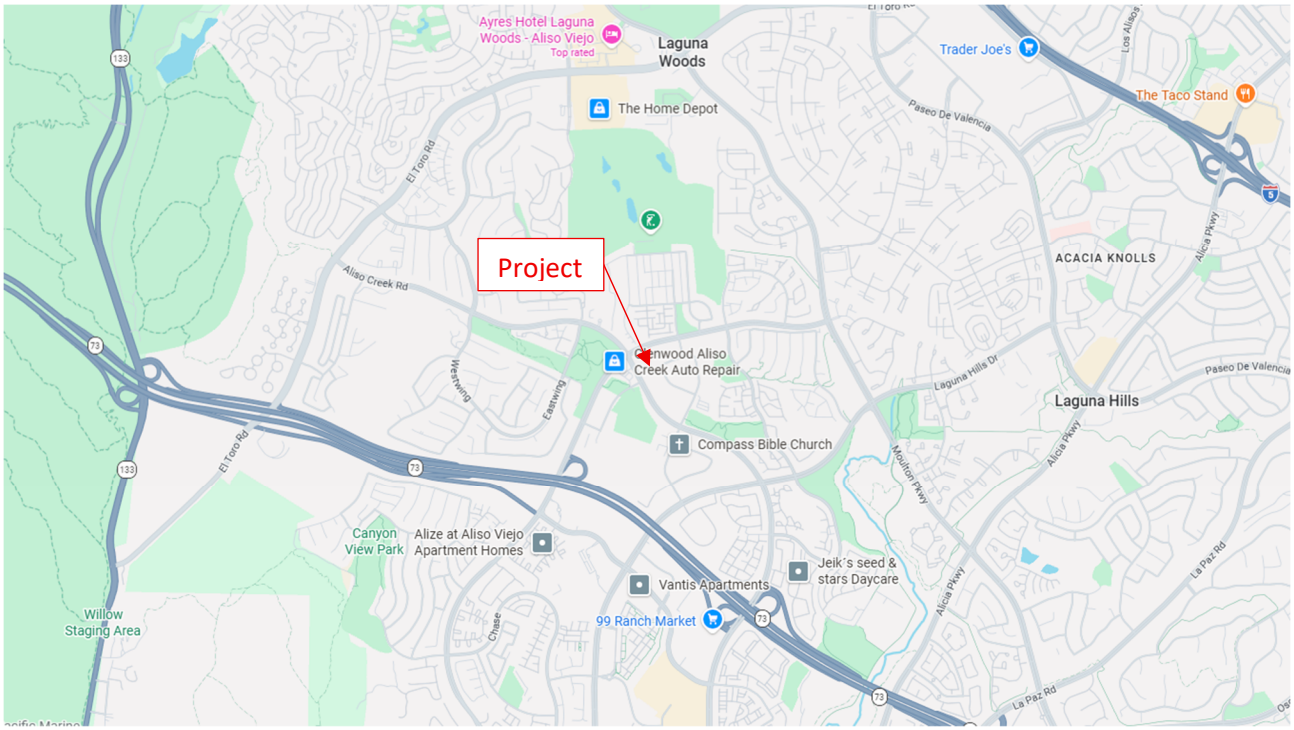


Figure 2 - Vicinity Map



Existing Facilities

The central to southeast portion of the property is relatively flat and contains a commercial building, drive aisles, and parking. The north and west side of the property consists of a 2:1 hillside slope which drains to v-ditches. The runoff from the v-ditches discharge to the surface and flow to the front of the property along with all other surface flows where it discharges to Argonaut via under sidewalk drains.

Proposed Facilities

The proposed redevelopment replaces an existing commercial property that slopes from northwest to southeast. The northern and western boundaries feature a 2:1 hillside slope with v-ditches that intercept runoff; under the new design, this drainage will be conveyed through underground pipes to the front of the property, maintaining existing hydraulic patterns. Onsite stormwater will be collected via area drains and directed to underground storage chambers which are proposed to mitigate the peak flow per hydromodification requirements. Runoff will exit the storage chambers at a designed flow rate and then pumped to a biofiltration system for treatment before being pumped for final discharge into Argonaut.

HYDROLOGY

Methodology

The tributary drainage area boundaries were delineated utilizing topography from aerial photogrammetry over the Project site and surrounding areas. The proposed Project drainage design found on the attached Site BMP Locations exhibit illustrates the locations of onsite drainage systems.

Rational Method

The Rational Method, an empirical computational procedure for developing peak runoff and discharge for storms of a specified recurrence interval in small watersheds, was used to compute peak flow rates for the watersheds tributary to the Project. The Orange County Hydrology Manual provides a Rational Method formula to calculate the peak runoff. The Rational Method formula is:

$$Q = CIA$$

Where:

Q = Peak discharge, in cubic feet per second (cfs)
C = Runoff coefficient representing the ratio of runoff depth to rainfall depth
= 0.90 (ai + ((1-Fp) ap)/I) for I greater than Fp; 0.90 ai for I less than or equal to Fp
ai = ratio of impervious area to total area (decimal fraction)
ap = ration of pervious area to total are (decimal fraction), (ap = 1 – ai)
Fp = infiltration rate for pervious area (inches per hour)
I = The time-averaged rainfall intensity for a storm duration equal to the time of concentration, in inches/hour (in/hr)
A = Drainage area, in acres (ac)

Hydrology Summary

The peak flow rate for the 10-year storm event was calculated using the Rational Method. The results of these calculations are presented in Table 1 below. Supporting documentation for these results is included in the attachments.

Table 1 - Rational Method Results

	10-Year Existing Storm Event	10-Year Proposed Storm Event
Drainage Area 1	8.10 cfs	7.57 cfs
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The 10-year Rational Method analysis shows that the proposed condition maintains or slightly reduces peak flows compared to existing conditions, with Drainage Area 1 decreasing from 8.10 cfs to 7.57 cfs and the other areas remaining unchanged.

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The project site is not located within a mapped FEMA Special Flood Hazard Area (SFHA), as confirmed by FEMA FIRMette Panel 06059C0426J, effective date 12/3/2009. Based on this determination, the site is outside of the 100-year floodplain and is not subject to mapped flood zone inundation.

All proposed habitable structures have been designed and graded such that finished floor elevations are above the adjacent public and private street elevations, providing positive drainage away from the buildings. Surface runoff generated by the 100-year storm event will be collected and conveyed through proposed on-site drainage improvements and/or adjacent street conveyance systems in accordance with Orange County Local Drainage Manual requirements.

CONCLUSION

Based on the Rational Method analysis, the proposed Project drainage design will not increase peak runoff for the 10-year storm event. Peak flows are either maintained or slightly reduced compared to existing conditions, demonstrating that the Project's on-site drainage systems effectively manage runoff. Therefore, the proposed development meets the hydrology performance objectives and is consistent with the requirements of the Orange County Hydrology Manual.

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	TOTAL PERVIOUS AREA	2.45 AC
	% PERVIOUS	53 %
	% IMPERVIOUS	47 %
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	DRAINAGE AREA 4	0.79 AC
	TOTAL PERVIOUS AREA	0.69 AC
	% PERVIOUS	87 %
	% IMPERVIOUS	13 %

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

ADVANCED CIVIL GROUP

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30251 GOLDEN LANTERN,
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LAGUNA NIGUEL, CA 92647
(866) 338-5778 PHONE
WWW.ADVANCEDCIVILGROUP.COM

PREPARED BY:

R.C.E. NO. 68795

DATE 3/31/2026

PERVIOUS AREA EXISTING CONDITION 15 ARGONAUT

ALISO VIEJO



	TOTAL AREA	4.56 AC
	TOTAL PERVIOUS AREA	2.36 AC
	% PERVIOUS	52 %
	% IMPERVIOUS	48 %
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80 40 0 80 160 240

SCALE: 1"=80'

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PREPARED BY:

R.C.E. NO. 68795

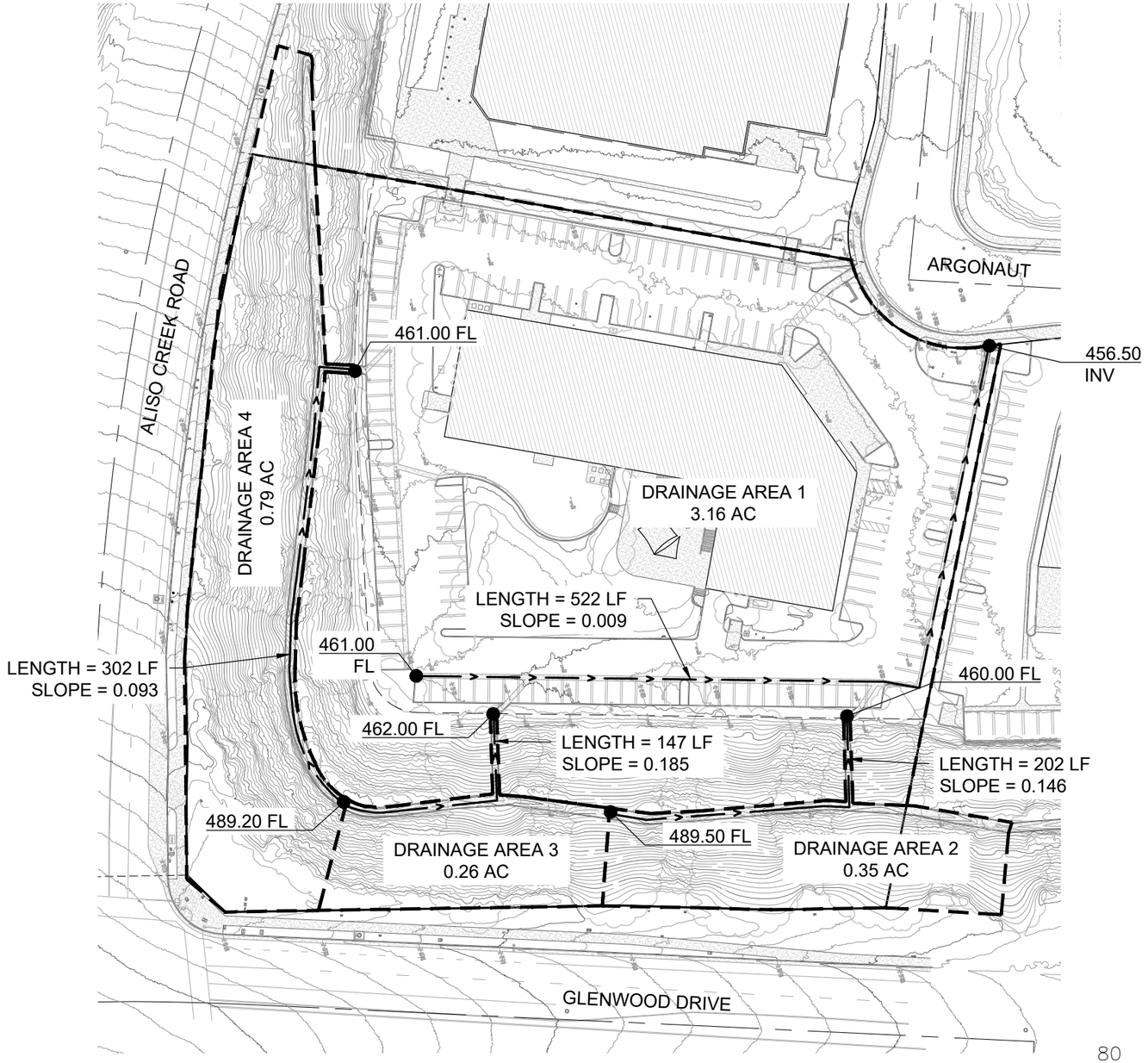
DATE 7/8/2026

PERVIOUS AREA PROPOSED CONDITION 15 ARGONAUT

ALISO VIEJO

EXISTING HYDROLOGY EXHIBIT

IN THE CITY OF ALISO VIEJO,
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

DRAINAGE AREA:

DMA	(AC)
1	3.16
2	0.48
3	0.30
4	0.79

LEGEND:

FLOW PATH

DRAINAGE BOUNDARY

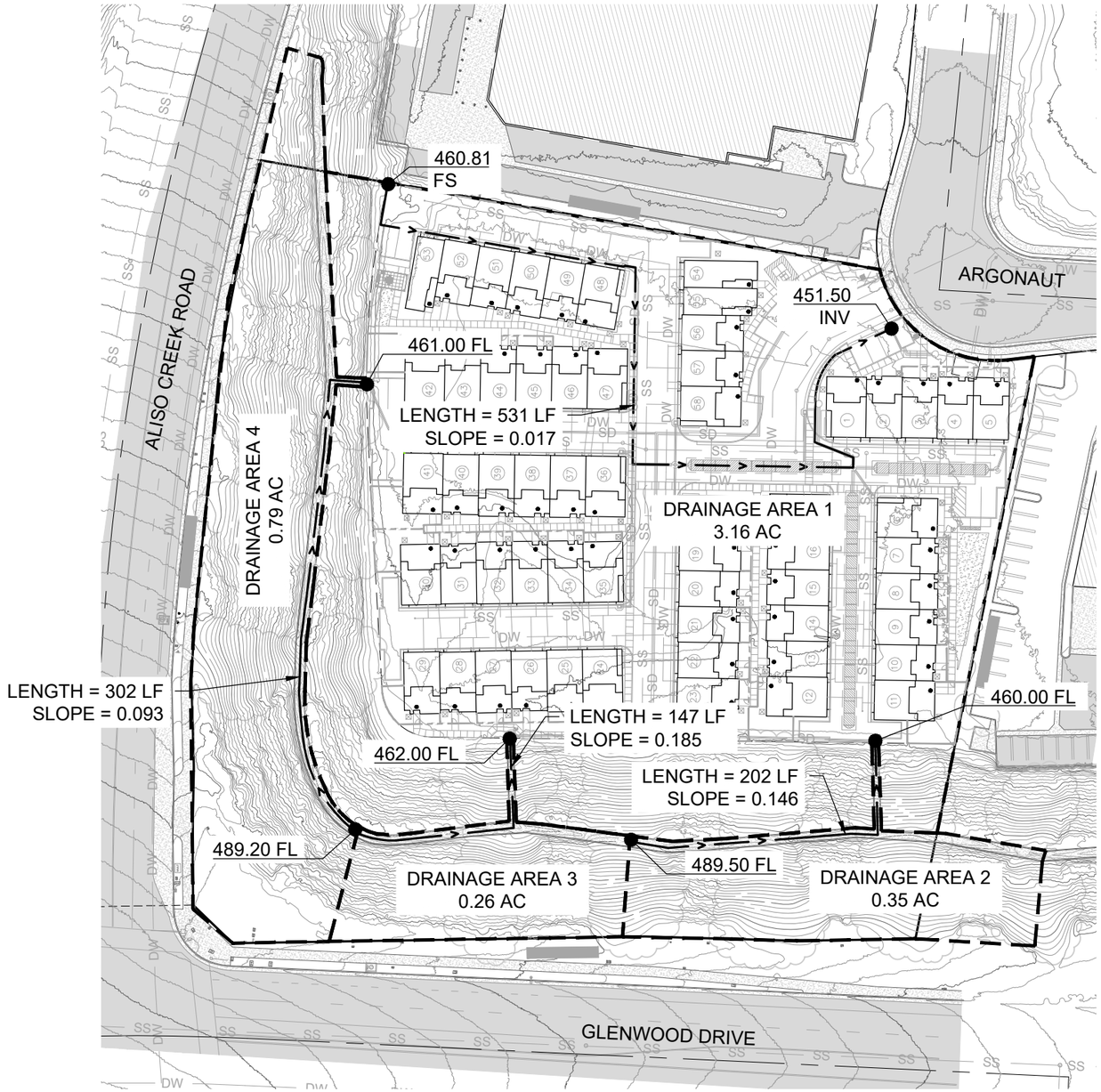
SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

PROPOSED HYDROLOGY EXHIBIT

IN THE CITY OF ALISO VIEJO,
COUNTY OF ORANGE, STATE OF CALIFORNIA



PROPERTY ADDRESS:

15 ARGONAUT
ALISO VIEJO, CA 92656

DRAINAGE AREA:

DMA	(AC)
1	3.16
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3	0.30
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LEGEND:

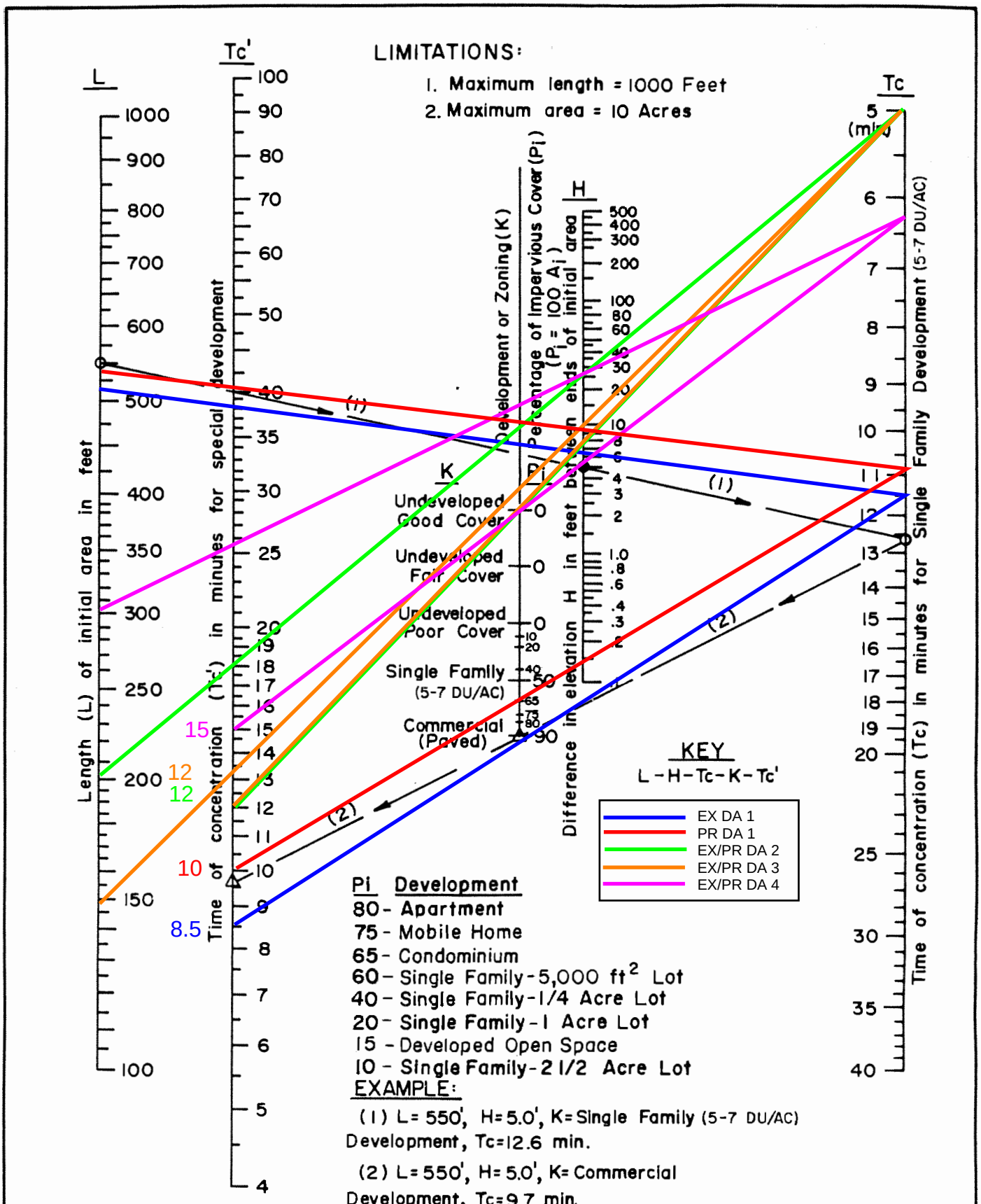
FLOW PATH

DRAINAGE BOUNDARY

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'



ORANGE COUNTY

HYDROLOGY MANUAL

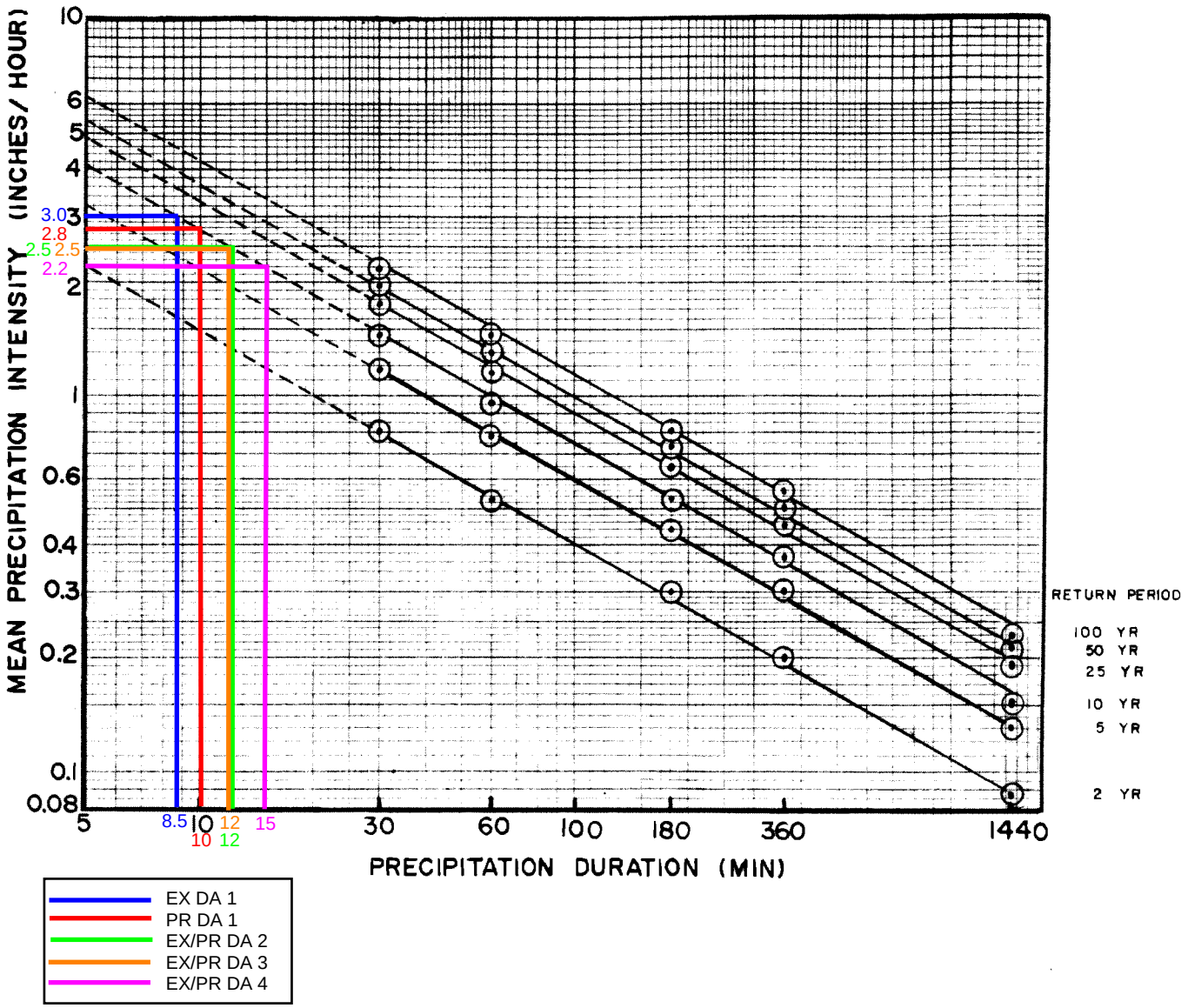
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(I= Intensity in inches/hour, t= duration in minutes)

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ORANGE COUNTY

HYDROLOGY MANUAL

MEAN PRECIPITATION INTENSITIES FOR NONMOUNTAINOUS AREAS

Figure B-3

Rational Method Hydrology Calculation

15 Argonaut

5/19/2026

OC Hydrology Manual
Section D - Rational Method
Fp is from Section C.6.4 of OC Hydrology Manual (soil type A)
I is from OC Hydrology Manual Figure B-3

Drainage Area 1
10-Year Existing

ai	0.62	
ap	0.38	
Fp	0.4	in/hr
C	0.85	
I	3.0	in/hr
A	3.16	acres
Q	8.10	cfs

Drainage Area 1
10-Year Proposed

ai	0.65	
ap	0.35	
Fp	0.4	in/hr
C	0.86	
I	2.8	in/hr
A	3.16	acres
Q	7.57	cfs

Drainage Area 2
10-Year Existing

ai	0.11	
ap	0.89	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.68	cfs

Drainage Area 2
10-Year Proposed

ai	0.11	
ap	0.89	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.68	cfs

Drainage Area 3
10-Year Existing

ai	0.08	
ap	0.92	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.67	cfs

Drainage Area 3
10-Year Proposed

ai	0.08	
ap	0.92	
Fp	0.4	in/hr
C	0.77	
I	2.5	in/hr
A	0.35	acres
Q	0.67	cfs

Drainage Area 4
10-Year Existing

ai	0.13	
ap	0.87	
Fp	0.4	in/hr

C	0.76	
I	2.2	in/hr
A	0.35	acres

Q	0.58	cfs

Drainage Area 4
10-Year Proposed

ai	0.13	
ap	0.87	
Fp	0.4	in/hr

C	0.76	
I	2.2	in/hr
A	0.35	acres

Q	0.58	cfs

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