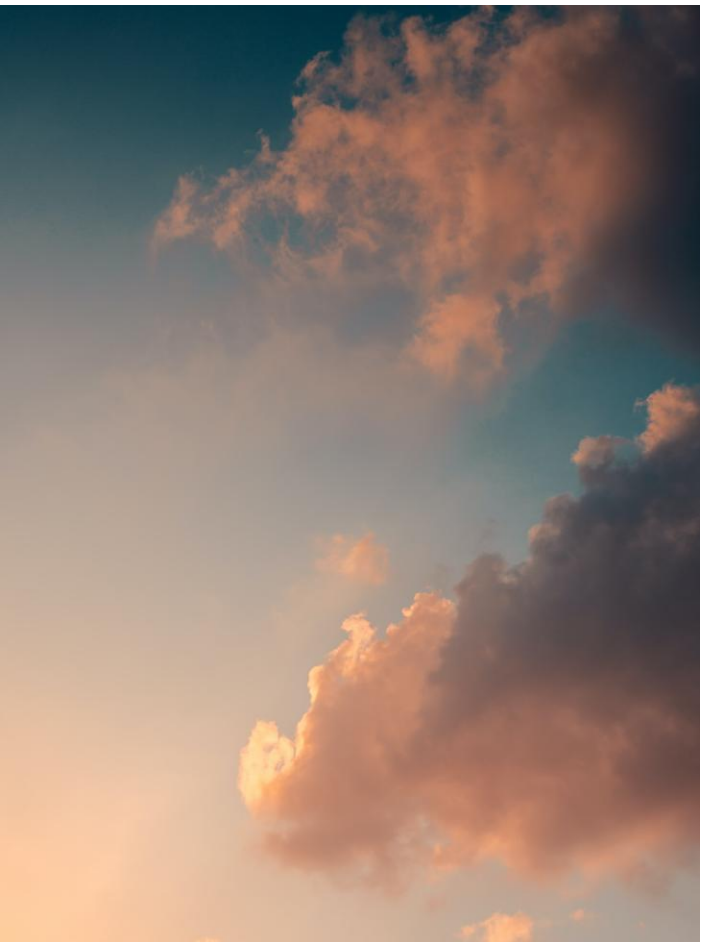
# Appendix F-4

Preliminary Water Quality Management Plan







# GATEWAY VILLAGE

*PRELIMINARY WATER QUALITY MANAGEMENT PLAN*

**Prepared For:**
Brookfield Properties
3200 Park Center, Suite 1000
Costa Mesa, CA 92626
(714) 200-1636

**Prepared By:**
**FUSCOE ENGINEERING, INC.**
15535 Sand Canyon, Suite 100
Irvine, California 92618
(949) 474-1960
**fuscoe.com**

**Project Manager:** Winnie Tham, PE.

**Date Prepared:** 12/5/2024
**Date Revised:**

**Project Number:** 308-092

# PRELIMINARY
# WATER QUALITY MANAGEMENT PLAN (WQMP)

## Gateway Village

Portola Parkway at Bee Canyon Access Road and Jeffrey Road, County of Orange

APN 104-118-09, 71, 73, 97, 98

Prepared for:

Brookfield Properties
3200 Park Center, Suite 1000
Costa Mesa, CA 92626
(714) 200-1636

Prepared by:

Fuscoe Engineering, Inc.
15535 Sand Canyon Ave Suite 100
Irvine, CA 92618
(949) 474-1960
Winnie Tham, PE

Date Prepared: 12/5/2024

| PROJECT OWNER'S CERTIFICATION | | | |
|---|---|---|---|
| Permit/Application No.: | Pending | Grading Permit No.: | Pending |
| Tract/Parcel Map and Lot(s)No.: | Tract 14916, Lot 372<br>Tract 1/88, Lot 372, 384, 398, 399 | Building Permit No.: | Pending |
| Address of Project Site and APN: | Portola Parkway at Bee Canyon Access Road and Jeffrey Road<br>APN 104-118-09, 71, 73, 97, 98 | | |

This Water Quality Management Plan (WQMP) has been prepared for BROOKFIELD PROPERTIES by FUSCOE ENGINEERING, INC. The WQMP is intended to comply with the requirements of the County of Orange 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 , including the ongoing operation and maintenance of all best management practices (BMPs), 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 Santa Ana Region. 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: BROOKFIELD PROPERTIES | | | |
|---|---|---|---|
| Name: | Derek Spalding | | |
| Title: | Development Director | | |
| Address: | 3200 Park Center, Suite 1000, Costa Mesa, CA 92626 | | |
| Email: | derek.spalding@brookfieldpropertiesdevelopment.com | | |
| Telephone #: | (714) 200-1636 | | |
| I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein. | | | |
| Owner Signature: | | Date: | |

| | | | |
|---|---|---|---|
| Preparer (Engineer): Winnie Tham | | | |
| Title: | Senior Project Manager | PE Registration # | |
| Company: | Fuscoe Engineering, Inc. | | |
| Address: | 15535 Sand Canyon Ave Suite 100, Irvine, CA 92618 | | |
| Email: | wtham@fuscoe.com | | |
| Telephone #: | (949) 474-1960 | | |
| I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board. | | | |
| Preparer Signature: | | Date: | |
| Place Stamp Here | | | |

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- Vicinity Map
- WQMP Exhibit
- Grading Plan
- BIO–7 Proprietary Biotreatment
- PRE-2 BioClean Connector Pipe Screen
- Underground Detention System (Hydromodification)

EDUCATIONAL MATERIALS (INCLUDED IN APPENDIX C)

- The Ocean Begins at Your Front Door
- Homeowners Guide for Sustainable Water Use
- Household Tips
- Recycle at Your Local Used Oil Collection Center (Central County)
- Responsible Pest Control
- Tips for Pet Care
- Tips for Pool Maintenance
- Tips for Residential Pool, Landscape and Hardscape Drains
- Tips for Protecting Your Watershed
- DF-1 Drainage System Operation & Maintenance
- R-5 Disposal of Pet Waste
- R-7 Household Hazardous Waste
- R-8 Water Conservation
- SD-11 Roof Runoff Controls
- SD-12 Efficient Irrigation
- SD-13 Storm Drain Signage

# SECTION I DISCRETIONARY PERMITS AND WATER QUALITY CONDITIONS

| PROJECT INFORMATION | | | |
|---|---|---|---|
| Permit/Application No.: | Pending | Grading or Building Permit No.: | Pending |
| Address of Project Site (or Tract Map and Lot Number if no address) and APN: | Portola Parkway at Bee Canyon Access Road and Jeffrey Road<br>APN 104-118-09, 71, 73, 97, 98 | | |
| WATER QUALITY CONDITIONS OF APPROVAL OR ISSUANCE | | | |
| Water Quality Conditions of Approval or Issuance applied to this project: (Please list verbatim.) | Pending – to be provided in Final WQMP | | |
| CONCEPTUAL WQMP | | | |
| Was a Conceptual Water Quality Management Plan previously approved for this project? | The serves as the Conceptual Water Quality Management Plan. | | |
| WATERSHED-BASED PLAN CONDITIONS | | | |

| | |
|---|---|
| Applicable conditions from watershed - based plans including WIHMPs and TMDLs: | TMDLs include the following:<br>Based on the 2020-2022 Integrated Report (CWA Section 303[d] List), the 303(d) listed impairments include:<br>• Peters Canyon: Pesticides, Pathogens, Pesticides, Metals Pesticides, Total Toxics<br>• San Diego Creek Reach 2: Pathogens, Nutrients, Sediment, Total Toxics<br>• San Diego Creek Reach 1: Metals, Selenium, Nutrients, Pesticides, Siltation<br>• Newport Bay, Upper: Metals, Nutrients, Pathogens, Pesticides/PCBs, Siltation<br>• Newport Bay, Lower: Metals, Nutrients, Pathogens, Pesticides/Priority Organics, Siltation |

# SECTION II PROJECT DESCRIPTION

## II.1 PROJECT DESCRIPTION

The proposed Gateway Village project site encompasses approximately 71.0 acres in the City of Irvine. The project site is bounded by Portola Parkway, Jeffrey Road, and Bee Canyon Access Road. A Vicinity Map is included in Section VI.

| DESCRIPTION OF PROPOSED PROJECT | |
|---|---|
| Development Category (Model WQMP, Table 7.11-2; or 7.11-3): | Category 8: All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety.<br><br>If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discussed in Section 7.II-2.0 only applies to the addition or replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development. |
| Project Area ($ft^2$): | 3,715,668 $ft^2$ (91.5 acres) |
| # of Dwelling Units: | 1,3690 |
| SIC Code: | NA |
| Planning Area / Community Name: | PA6 Portola Springs |
| Narrative Project Description: | The project includes the development of approximately 1,360 two- to three-story homes, including both attached and detached configurations, with an average site density between 10 and 35 units per acre. Access to the site would be provided via Jeffrey Road and a right-in/right-out driveway on Portola Parkway. The project would create essential public access points, trails, and other improvements in the Gateway Preserve Open Space to be located north of the site. The project also includes the extension of the Jeffrey Open Space Trail (JOST) and creation of new park space located at the terminus of the JOST. Park space is expected to include parking, restroom, and trail staging. |

| DESCRIPTION OF PROPOSED PROJECT | | | | |
|---|---|---|---|---|
| Project Area: | Pervious Area | Pervious Area Percentage | Impervious Area | Impervious Area Percentage |
| Pre-Project Conditions: | 85.3 ac | 100% | 0 ac | 0% |
| Post-Project Conditions: | 12.8 ac | 15% | 72.5 ac | 85% |

| | |
|---|---|
| Drainage Patterns/ Connections: | Existing Condition:<br>Eight existing drainage facilities exist around the perimeter of the project site and include,<br>a) Hicks Canyon Facility F27 (Drain A) in Jeffrey Road, a 102" mainline drain and associated laterals L10 (Drain D) and L12 (Drain C),<br>b) AD 07-22 36"and 48" drains in Portola Parkway (Drain F),<br>c) AD 07-22 36" drain at Portola Parkway/Bee Canyon Road intersection (Drain E),<br>d) 36" drain crossover in Bee Canyon Road (Drain D1),<br>e) 30" drain in Bee Canyon Road (Drain Y) (N.A.P.),<br>f) 51" drain crossover in Bee Canyon Road (Drain Z) (N.A.P.)<br><br>Under existing conditions, drains C, D, D1, E, and F, receive runoff from project site areas and will continue to do so under proposed conditions. Drain Y collects runoff from areas due east of Bee Canyon Road but does not collect or convey site flows. Drain D1 crosses Bee Canyon Road approximately 3,400 feet north of the intersection of Portola Parkway and Bee Canyon Road and conveys runoff from natural areas east of Bee Canyon Road into the project site. For purposes of discussion in this report, Drain C will connect to the F27 lateral L12 at POC1, Drain D will connect to the F27 lateral L10 at POC2, Drain E will connect to the AD 07-22 36" drain at POC 3 near the intersection of Portola Parkway and Bee Canyon Road, and Drain F will connect to the AD 07-22 36" drain at POC4 on Portola Parkway midblock between Jeffrey Road and Bee Canyon Road.<br><br>The topography on the lower two thirds of the site generally drains in a southerly direction toward Portola Parkway, with a moderate gradient of 2.5 to 3 percent. At Portola Parkway, the lower two thirds flow is collected by two existing storm drain pipes, one on Portola Parkway midway between Jeffrey Road and Bee Canyon Road one at the intersection of Portola Parkway and Bee Canyon Road.<br><br>Proposed Condition:<br>DMAs A1, A2, & A3: Offsite runon originates east of Bee Canyon Road, crosses Bee Canyon Road in a 36" RCP pipe, outlets to the surface approximately 100 feet west of Bee Canyon Road and travels on the surface to POC 2. In the proposed condition, a drain will be connected to the existing 36" pipe outlet, undergrounded, and conveyed to POC 2. Onsite DMAs A1, A2, and A3 tributary areas will be collected, treated by a MWS, and conveyed to a detention basin |

| DESCRIPTION OF PROPOSED PROJECT | |
|---|---|
| | (underground tank) just upstream of POC2 where Q2 peak flow mitigation will be performed. The reduced flow will be connected back to the pass-through drain.<br><br>DMAs A4, A5, A6, & A7: A storm drain (pass through drain) will be provided in 'C' Street to intercept off-site flows and convey them to POC 1. The pipe will be sized to convey 25-year rain event flows and does not require peak flow mitigation. The flows from DMAs A4, A5, A6, and A7 (onsite flows) will be collected, treated by MWS, and conveyed to the park site where 2-year peak flow mitigation will be required. A detention basin (underground tank) will be provided for said mitigation. The reduced flow will be connected back to the pass-through drain.<br><br>DMA B1: A proposed storm drain will originate at the intersection of 'B' and 'D' Streets and traverse south in 'D' Street to the southeast corner of the project site. The low flows will be split off and sent to a Contech Bioscape for treatment. The 2 year and high flows will be sent to a proposed detention basin (underground tank) will be provided at the southeast corner location for peak flow mitigation. The reduced flow will be connected to an existing 36" RCP pipe at the corner of Portola Parkway and Bee Canyon Road (POC 4).<br><br>DMA C1: Drainage in C1 consists of a short piece of storm drain in 'E' Street which collects runoff from the street and from the single lot and be treated by MWS. The storm drain connects to a 36" RCP in Portola Parkway mid-block between Jeffrey Road and Bee Canyon Road. The connection point is labeled POC 3. Because the proposed flow rate is less than the existing flow rate, Q2 peak flow mitigation is not required. |

## II.2 POTENTIAL STORM WATER POLLUTANTS

The table below, derived from Table 2 of the Countywide Model WQMP Technical Guidance Document (December 2013), summarizes the categories of land use or project features of concern and the general pollutant categories associated with them.

| ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Priority Project Categories and/or Project Features | General Pollutant Categories | | | | | | | |
| | Suspended Solid/ Sediments | Nutrients | Heavy Metals | Pathogens (Bacteria/ Virus) | Pesticides | Oil & Grease | Toxic Organic Compound | Trash & Debris |
| **Detached Residential Development** | E | E | N | E | E | E | N | E |
| **Attached Residential Development** | E | E | N | E | E | E(2) | N | E |
| Commercial/Industrial Development | E(1) | E(1) | E(5) | E(3) | E(1) | E | E | E |
| Automotive Repair Shops | N | N | E | N | N | E | E | E |
| Restaurants | E(1)(2) | E(1) | E(2) | E | E(1) | E | N | E |
| Hillside Development >5,000 ft2 | E | E | N | E | E | E | N | E |
| **Parking Lots** | E | E(1) | E | E(4) | E(1) | E | E | E |
| Streets, Highways, & Freeways | E | E(1) | E | E(4) | E(1) | E | E | E |
| Retail Gasoline Outlets | N | N | E | N | N | E | E | E |

*Notes:*
E = expected to be of concern N = not expected to be of concern
(1) Expected pollutant if landscaping exists on-site, otherwise not expected.
(2) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.
(3) Expected pollutant if land use involves food or animal waste products, otherwise not expected.
(4) Bacterial indicators are routinely detected in pavement runoff.
(5) Expected if outdoor storage or metal roofs, otherwise not expected.
Source: County of Orange. (2013, December 20). Technical Guidance Document for the Preparation of Conceptual/ Preliminary and/or Project Water Quality Management Plans (WQMPs). Table 2.1.

| POLLUTANTS OF CONCERN | | |
|---|---|---|
| Pollutant | E = Expected to be of concern<br>N =Not Expected to be of concern | Additional Information and Comments |
| Suspended Solid/ Sediment | E | 303(d) listed impairments, TMDL in effect (see table in Section III.3 for TMDL details)<br>Potential Source of Pollutants: Landscape area, parking lots |

| POLLUTANTS OF CONCERN | | |
|---|---|---|
| Pollutant | E = Expected to be of concern<br>N =Not Expected to be of concern | Additional Information and Comments |
| Nutrients | E | 303(d) listed impairments, TMDL in effect (see table in Section III.3 for TMDL details)<br>Potential Source of Pollutants: Landscape area |
| Heavy Metals | E | 303(d) listed impairments, TMDL in effect (see table in Section III.3 for TMDL details)<br>Potential Source of Pollutants: parking lots |
| Pathogens (Bacteria/Virus) | E | 303(d) listed impairments, TMDL in effect (see table in Section III.3 for TMDL details)<br>Potential Source of Pollutants: Landscape area, walkways |
| Pesticides | E | 303(d) listed impairments, TMDL in effect (see table in Section III.3 for TMDL details)<br>Potential Source of Pollutants: Landscape area |
| Oil & Grease | E | Potential Source of Pollutants: Drive aisles, parking lots |
| Toxic Organic Compounds | E | Potential Source of Pollutants: parking lots |
| Trash & Debris | E | Potential Source of Pollutants: Landscape area, Walkways, parking lots |

## II.3 HYDROLOGIC CONDITIONS OF CONCERN

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent

*or*

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event exceeds the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☒ Yes ☐ No (show map)

According to Figure XVI-3a the project site falls within an area susceptible to hydromodification impacts. The project is expected to increase overall imperiousness and time of concentration, however, the TGD recognizes that increases in Tc are acceptable, as a longer Tc is generally associated with natural conditions and nearly universally results in lower concerns for hydromodification impacts (TGD, Section 2.2.3.1, footnote 4).

The proposed Gateway Village project site ultimately drains 5 miles downstream to the Upper Newport Bay via the San Diego Creek Channel and those receiving waters are susceptible to hydrologic conditions of concern (HCOC's). As such, the project is required to mitigate either the excess runoff volume (by retention) or the excess runoff flow rate (by detention) from a 2-year rain event if excess' are present. Soil testing on the site indicates the soils have very low percolation capabilities, thus flow rate detention of the post-development 2-year peak flow rate to within 110% of the pre-development flow rate is the appropriate method of mitigation if excess' are present. Accordingly, each of the four project site watersheds (POCs 1, 2, 3, & 4) have been evaluated for 2-year peak flow mitigation with results shown in the table below.

| POC | Ex. $Q_2$ Rate (cfs) | 110% Ex. $Q_2$ (cfs) | Prop. $Q_2$ Pre-Mitigation Rate (cfs) | Detention Basin Storage (cf) | Prop. $Q_2$ Post-Mitigation (cfs) | Post-Mitigation Exceedance (%) | Meets Compliance |
|---|---|---|---|---|---|---|---|
| 1 | 3.1 | 3.4 | 2.5 | None | None | 81% | Yes |
| 2 | 6.3 | 6.9 | 12.1 | 17,500 | 6.7 | 106% | Yes |
| 3 | 25.1 | 27.6 | 71.5 | 190,575 | 27.4 | 109% | Yes |
| 4 | 15.6 | 17.2 | 8.3 | None | None | 53% | Yes |

The table shows that proposed condition 2-year flow rates exceed 110% of existing condition 2-year flow rates in sub-watersheds 1, 2, and 4. Mitigation has been added to those sub-watersheds in the form of underground concrete detention vaults with outlet control to reduce outbound 2-year flow rates to acceptable levels. The underground detention vaults will simultaneously serve to reduce proposed condition 25-year design peak flow rates to existing/threshold levels. Basin routing calculations for 2-year can be found in Appendix G. The POC map can also be found in Appendix G.

## II.4 POST DEVELOPMENT DRAINAGE CHARACTERISTICS

The project drains in two major directions, northwest and southeast, and ultimately connect at Peters Canyon Channel, to San Diego Creek Channel, then Newport Bay. The two tributary paths are outlined below:

Northwest
- Hicks Canyon Channel
- Peters Canyon Channel

Southeast
- Northwest Collector Channel
- Trabuco Retarding Basin
- Central Irvine Channel
- Peters Canyon Channel

## II.5 PROPERTY OWNERSHIP/MANAGEMENT

| PROPERTY OWNERSHIP/MANAGEMENT | |
|---|---|
| Public Streets: | City of Irvine |
| Private Streets: | Owner |
| Landscaped Areas: | Owner |
| Open Space: | Owner |
| Easements: | Owner |
| Parks: | City of Irvine |
| Buildings: | Owner |
| Structural BMPs: | Owner |

A Home Owners Association (HOA) will be formed upon project completion. The HOA will be responsible for inspecting and maintaining all BMPs prescribed for Gateway Village Until a HOA is formally established, BROOKFIELD PROPERTIES shall assume all BMP maintenance and inspection

responsibilities for the proposed project. Inspection and maintenance responsibilities are outlined in Section V of this report.

# SECTION III SITE DESCRIPTION

## III.1 PHYSICAL SETTING

| | |
|---|---|
| Planning Area/ Community Name: | Gateway Village<br>PA6 Portola Springs |
| Address: | Portola Parkway at Bee Canyon Access Road and Jeffrey Road |
| Land Use: | REC (Recreation) |
| Zoning: | 1.5 - Recreation |
| Acreage: | 85.3 drainage area including run-on (81.2 property acreage) |
| Predominant Soil Type: | Mostly soil C, but includes A, B, and D. |

## III.2 SITE CHARACTERISTICS

| | |
|---|---|
| Precipitation Zone: | 0.80 |
| Topography: | The topography on the upper third of the site generally drains by surface ditch (2 ditches) in a southwest direction (toward Jeffrey Road) at a gradient of 3.5 percent and is collected by two exiting storm drain pipes along Jeffrey Road. The conveyance includes offsite runoff. Topography on the lower two thirds of the site generally drains in a southerly direction toward Portola Parkway with a moderate gradient of 2.5 to 3 percent and is collected by two existing storm drain pipes along Portola Parkway. |
| Drainage Patterns/ Connections: | See Section II.1 and Section II.4 for a complete description of existing and proposed drainage patterns and connections. |

| | |
|---|---|
| Soil Type, Geology, and Infiltration Properties: | The subject site is located along the southeastern margin of the Los Angeles Basin, a large structural depression within the Peninsular Ranges geomorphic province of California. The site is specifically located in the eastern-most portion of the Tustin Plain, and it is within the mouth of a tributary drainage of the San Diego Creek Watershed (CDMG, 2000), that reaches the ocean at Newport Bay. The site is located within the relatively narrow Hicks Canyon at the base of the foothills that support the Santa Ana Mountain Range to the northeast of the site. Bedrock hills to the north and south of the site generally consist of the bedrock units that form the foothills, the Tertiary Vaqueros and Sespe Formations. The site is underlain by interfingered alluvial fan and alluvial deposits that thicken to the west where the relatively low relief neighborhoods located west of Portola Parkway were constructed. To the east of the site, there are branches of smaller tributary drainages from the foothills, and a localized stream channel crosses the site. |
| Hydrogeologic (Groundwater) Conditions: | Groundwater was not encountered by LGC Geotechnical to the maximum explored depth of 30 feet below existing grade. During a previous evaluation (NMG, 2023) groundwater was encountered at depths ranging from approximately 64 to 99 feet below existing grade. Regional mapping indicates the historic high groundwater table at a depth ranging from 20 to 40 feet below existing grade (CDMG, 2000). Based on the recent findings from NMG and eventual removal of the crops and irrigation from the area, we believe groundwater will be encountered at a deeper depth than currently described. Groundwater is not expected to be a major constraint to the project. However, please note that seepage may be encountered in the bedrock areas on the southern edge of the subject site.<br><br>In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Groundwater conditions below the site may be variable, depending on numerous factors including seasonal rain fall, local irrigation, and groundwater pumping, among others. |

| | |
|---|---|
| Geotechnical Conditions (relevant to infiltration): | The following is an excerpt from the the Geotechnical Report by LGC, dated November 22, 2024, regarding their advisement against infiltration: "Based on our experience in the area and results of field infiltration testing indicating highly variable infiltration rates and soils with fines contents (silts and clays), COT data indicating highly layered native soils, we recommend against the intentional infiltration of stormwater into the subsurface soils."<br><br>There are two closed GeoTracker sites near or within the project.<br>  |
| Off-Site Drainage: | The following is the acreage of offsite runon to each DMA:<br><br>DMAs A1, A2, and A3 = 36.7 acres<br>DMAs A4, A5, A6, & A7 = 130.5 acres<br>DMA B1 = 6.7 acres<br><br>Run-on flows do not comingle with onsite flows and are not tributary to onsite BMPs. More details on offsite flows can be found in the Hydrology Report. |
| Utility and Infrastructure Information: | Dry and wet utilities will be incorporated into the proposed project and will tie into existing facilities. |

## III.3 WATERSHED DESCRIPTION

| | |
|---|---|
| Receiving Waters: | San Diego Creek Reach 1; Newport Bay, Upper; Newport Bay, Lower; Pacific Ocean |
| 303(d) Listed Impairments: | Based on the 2020-2022 Integrated Report (CWA Section 303[d] List), the 303(d) listed impairments include:<br><br>• San Diego Creek Reach 1: Benthic Community Effects, DDT, Indicator Bacteria, Malathion, Nutrients, Sedimentation/Siltation, Selenium, Toxaphene, Toxicity<br>• Newport Bay, Upper: Chlordane, Copper, DDT, Indicator Bacteria, Malathion, Nutrients, PCBs, Sedimentation/Siltation, Toxicity<br><br>Newport Bay, Lower: Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs, Toxicity |
| Applicable TMDLs: | • San Diego Creek Reach 1: Metals, Selenium, Nutrients, Pesticides, Siltation<br>• Newport Bay, Upper: Metals, Nutrients, Pathogens, Pesticides/PCBs, Siltation<br><br>Newport Bay, Lower: Metals, Nutrients, Pathogens, Pesticides/Priority Organics, Siltation |
| Pollutants of Concern for the Project: | Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Oil & Grease, Trash & Debris |
| Hydrologic Conditions of Concern (HCOCs): | Refer to Section II.3. HCOCs are addressed. |
| Environmentally Sensitive and Special Biological Significant Areas: | The project is not located within 200 feet or adjacent to an Environmentally Sensitive Area (ESA). Also, there is no Area of Special Biological Significance (ASBS) in the City of Irvine. |

# SECTION IV BEST MANAGEMENT PRACTICES (BMPs)

## TRIV.1 PROJECT PERFORMANCE CRITERIA

Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?

☐ Yes ☒ No

| PROJECT PERFORMANCE CRITERIA | |
|---|---|
| Hydromodification Control Performance Criteria:<br>(Model WQMP Section 7.II-2.4.2.2) | If a hydrologic condition of concern (HCOC) exists, priority projects shall implement onsite or regional hydromodification controls such that:<br>▪ Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and<br>▪ Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent.<br>Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to:<br>▪ Retain the excess volume from the two-year runoff event to the MEP, and<br>▪ Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate. |
| LID Performance Criteria:<br>(Model WQMP Section 7.II-2.4.3) | Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85$^{th}$ percentile, 24-hour storm event (Design Capture Volume).<br>LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency. |

| PROJECT PERFORMANCE CRITERIA | |
|---|---|
| Treatment Control BMP Performance Criteria:<br>(Model WQMP Section 7.II-3.2.2) | If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMP(s) shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate. |
| LID Design Storm Capture Volume: | *DCV = (0.75 x* 0.85 *+0.15) x* 0.80 *inches x* 85.3 *ac x 43560 sf/ac x 1/12 in/ft*<br>= 209,384<br><br>*Refer to Section IV.2.2 for specific Drainage Manage Area (DMA) breakdown and Appendix A for detailed calculations (Worksheet B).* |

## IV.2 SITE DESIGN AND DRAINAGE PLAN

The following section describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

### IV.2.1 Site Design BMPs

*Minimize Impervious Area*

The project will increase impervious surfaces as compared to existing conditions. However, landscaping will be provided throughout the site within the common areas as well as around the perimeter of the building.

*Maximize Natural Infiltration Capacity*

Infiltration is not recommended for the project site due to poor infiltration rates. See the attached Geotechnical Report for more details.

*Preserve Existing Drainage Patterns and Time of Concentration*

Runoff from the site will continue to flow similar to existing conditions.

*Disconnect Impervious Areas*

Landscaping will be provided adjacent to sidewalks and between the proposed buildings.

*Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas*

There are no existing vegetated or sensitive areas to preserve on the project site. All disturbed areas will either be paved or landscaped.

*Xeriscape Landscaping*

Xeriscape landscaping is not proposed for the project. Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

### IV.2.2 Drainage Management Areas

In accordance with the MS4 permit and the 2011 Model WQMP, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas and sizing LID and other treatment control BMPs. DMAs have been delineated based on the proposed site grading patterns, drainage patterns, storm drain and catch basin locations.

The design capture volumes (DCV) and treatment flow rates ($Q_{Design}$) for each DMA are summarized in the table below. These have been derived utilizing the "Simple Method" in accordance with the TGD Section III.1.1. Additional calculations and TGD Worksheets are provided in Appendix A.

| DMA ID | Drainage Area (acres) | Assumed % Imp. | Design Storm Depth (in) | Tc (min) | Rainfall Intensity (in/hr) | Simple Method DCV ($ft^3$) | $Q_{Design}$ (cfs) | BMP Size/Model | BMP Treatment Capacity |
|---|---|---|---|---|---|---|---|---|---|
| DMA A1 | 3.9 | 85% | 0.80 | 5 | 0.26 | **8,925** | **0.799** | TWO (2) MWS-L-8-16 | 0.462 cfs x 2 = 0.924 cfs |
| DMA A2 | 4.4 | 85% | 0.80 | 5 | 0.26 | **10,069** | **0.901** | TWO (2) MWS-L-8-16 | 0.462 cfs x 2 = 0.924 cfs |
| DMA A3 | 2.4 | 85% | 0.80 | 5 | 0.26 | **5,492** | **0.492** | ONE (1) MWS-L-8-20 | 0.577 cfs |
| DMA A4 | 1.8 | 85% | 0.80 | 5 | 0.26 | **4,119** | **0.369** | ONE (1) MWS-L-8-16 | 0.462 cfs |
| DMA A5 | 0.8 | 85% | 0.80 | 5 | 0.26 | **1,831** | **0.164** | ONE (1) MWS-L-4-15 | 0.175 cfs |
| DMA A6 | 0.4 | 85% | 0.80 | 5 | 0.26 | **915** | **0.082** | ONE (1) MWS-L-4-8 | 0.115 cfs |
| DMA A7 | 0.3 | 85% | 0.80 | 5 | 0.26 | **687** | **0.061** | ONE (1) MWS-L-4-6 | 0.073 cfs |
| DMA B1 | 64.6 | 85% | 0.80 | 5 | 0.26 | **147,828** | **13.235** | Bioscape - 49,380 sf | 13.200 cfs |
| DMA C1 | 6.7 | 85% | 0.80 | 5 | 0.26 | **15,332** | **1.373** | TWO (2) MWS-L-8-24 | 0.693 cfs x 2 = 1.386 cfs |

## IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Low Impact Development (LID) BMPs are required in addition to site design measures and source controls to reduce pollutants in storm water discharges. LID BMPs are engineered facilities that are designed to retain or biotreat runoff on the project site. The 4th Term MS4 Storm Water Permit (Order R8-2009-0030) requires the evaluation and use of LID features using the following hierarchy of treatment: infiltration, evapotranspiration, harvest/reuse, and biotreatment. The following sections summarize the LID BMPs proposed for the project in accordance with the permit hierarchy and performance criteria outlined in Section IV.1.

### IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be a hybrid between site design practices and LID BMPs. HSCs are distinguished from site design BMPs in that they do not reduce the tributary area or reduce the imperviousness of a drainage area; rather they reduce the runoff volume that would result from a drainage area with a given imperviousness compared to what would result if HSCs were not used.

| HYDROLOGIC SOURCE CONTROLS | | |
|---|---|---|
| ID | Name | Included? |
| HSC-1 | Localized on-lot infiltration | ☐ |
| HSC-2 | Impervious area dispersion (e.g. roof top disconnection) | ☐ |
| HSC-3 | Street trees (canopy interception) | ☐ |
| HSC-4 | Residential rain barrels (not actively managed) | ☐ |
| HSC-5 | Green roofs/Brown roofs | ☐ |
| HSC-6 | Blue roofs | ☐ |
| HSC-7 | Impervious area reduction (e.g. permeable pavers, site design) | ☐ |

HSCs were not incorporated into the project's design.

### IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

| INFILTRATION | | |
|---|---|---|
| ID | Name | Included? |
| INF-3<br>INF-4 | Bioretention Without Underdrains | ☐ |
| | Rain Gardens | ☐ |
| | Porous Landscaping | ☐ |
| | Infiltration Planters | ☐ |
| | Retention Swales | ☐ |
| INF-2 | Infiltration Trenches | ☐ |
| INF-1 | Infiltration Basins | ☐ |
| INF-5 | Drywells | ☐ |
| INF-7 | Subsurface Infiltration Galleries | ☐ |
| -- | French Drains | ☐ |
| INF-6 | Permeable Asphalt | ☐ |
| | Permeable Concrete | ☐ |
| | Permeable Concrete Pavers | ☐ |
| | Other: | ☐ |

No infiltration BMPs are proposed within the new development project. As discussed in Section III.2, the project site has field infiltration tests indicating highly variable infiltration rates, soils with fines contents (silts and clays), and COT data indicating highly layered native soils. Due to these characteristics, the geotechnical engineer is recommending against infiltration.

### IV.3.3 Rainwater Harvesting BMPs

Harvest and use (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

| HARVEST & REUSE / RAINWATER HARVESTING | | |
|---|---|---|
| ID | Name | Included? |
| HU-1 | Above-ground cisterns and basins | ☐ |
| HU-2 | Underground detention | ☐ |
| -- | Other: | ☐ |

For a system to be considered "feasible", the system must be designed with a storage volume equal to the DCV from the tributary area and achieve more than 40% capture. The system must also be able to drawdown in 30 days to meet the 40% capture value. This is determined by calculating the Estimated Applied Water Use (EAWU) equation from Appendix X of the TGD. The EAWU can then be divided by the water quality volume for the project site or DMA to determine drawdown time. If the drawdown time is less than 30 days, harvest and reuse is considered partially feasible and the Effective Irrigated Area to Tributary Area (EIATA) ratio may be utilized to determine the capture efficiency of the system. If drawdown is greater than 30 days, harvest and reuse may be concluded to be infeasible.

As shown by Worksheet J included in Appendix A, harvest and reuse is considered infeasible due insufficient water demand during the wet season to drawdown the water quality volume.

### IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a broad class of LID BMPs that reduce storm water volume to the maximum extent practicable, treat storm water using a suite of treatment mechanisms characteristic of biologically active systems, and discharge water to the downstream storm drain system or directly to receiving waters.

| BIOTREATMENT | | |
|---|---|---|
| ID | Name | Included? |
| BIO-1 | Bioretention with underdrains | ☐ |
| | Storm Water planter boxes with underdrains | ☐ |
| | Rain gardens with underdrains | ☐ |
| BIO-5 | Constructed wetlands | ☐ |
| BIO-2 | Vegetated swales | ☐ |
| BIO-3 | Vegetated filter strips | ☐ |
| BIO-7 | Proprietary vegetated biotreatment systems | ☒ |

| BIOTREATMENT | | |
|---|---|---|
| ID | Name | Included? |
| BIO-4 | Wet extended detention basin | ☐ |
| BIO-6 | Dry extended detention basins | ☐ |
| -- | Other: | ☐ |

In accordance with the Model WQMP and TGD, the biotreatment BMPs will be sized to treat runoff from the Design Capture Storm (85$^{th}$ percentile, 24-hour). Since Modular Wetlands and Bioscape are sized based on flow rate, they were sized utilizing the methodology for flow based BMPs (TGD Section III.1.2 and Worksheet D).

Modular Wetlands Linear by Contech are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration. The pre-treatment chamber contains the first three stages of treatment and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system.

Bioscape by Contech is a proprietary biotreatment system. Stormwater enters the Bioscape through a pipe, curb inlet, or sheet flow and ponds over the pretreatment mulch layer, capturing heavy sediment and debris. Organics and microorganisms within the mulch trap and degrade metals and hydrocarbons. The mulch also provides water retention for the system's vegetation. Stormwater flows through engineered Filterra media which filters fine pollutants and nutrients. Organic material in the media removes dissolved metals and acts as a food source for root-zone microorganisms. Treated water exits through an underdrain pipe or infiltrates (if designed accordingly). Rootzone microorganisms digest and transform pollutants into forms easily absorbed by plants. Plant roots absorb stormwater and pollutants that were transformed by microorganisms, regenerating the media's pollutant removal capacity. The roots grow, provide a hospitable environment for the rootzone microorganisms and penetrate the media, maintaining hydraulic conductivity. The plant trunk and foliage utilize nutrients such as Nitrogen and Phosphorus for plant health, sequester heavy metals into the biomass, and provide evapotranspiration of residual water within the system.

Eleven precast Contech MWS units and one Contech Bioscape planter are proposed to meet the water quality treatment requirements. Due to the site being HCOC susceptible, there are two detention systems proposed onsite to mitigate the peak 2-yr storm event required flowrate. The MWS units and Bioscape are sized based on the flowrate of the 85*th* percentile storm event. See Appendix A for additional calculations.

| DMA ID | BMP ID | GPS Coordinates | Drainage Area (acres) | Assumed % Imp. | $Q_{Design}$ (cfs) | BMP Size/Model | BMP Treatment Capacity |
|---|---|---|---|---|---|---|---|
| DMA A1 | A1.1 & A1.2 | 33.718841, -117.729601 & 33.718773, -117.729594 | 3.9 | 85% | **0.799** | TWO (2) MWS-L-8-16 | 0.462 cfs x 2 = 0.924 cfs |
| DMA A2 | A2.1& A2.2 | 33.718662, -117.731071 & 33.718662, -117.730977 | 4.4 | 85% | **0.901** | TWO (2) MWS-L-8-16 | 0.462 cfs x 2 = 0.924 cfs |
| DMA A3 | A3 | 33.719099,-117.731546 | 2.4 | 85% | **0.492** | ONE (1) MWS-L-8-20 | 0.577 cfs |
| DMA A4 | A4 | 33.720113, -117.730985 | 1.8 | 85% | **0.369** | ONE (1) MWS-L-8-16 | 0.462 cfs |
| DMA A5 | A5 | 33.720011, -117.731027 | 0.8 | 85% | **0.164** | ONE (1) MWS-L-4-15 | 0.175 cfs |
| DMA A6 | A6 | 33.719418, -117.730241 | 0.4 | 85% | **0.082** | ONE (1) MWS-L-4-8 | 0.115 cfs |
| DMA A7 | A7 | 33.719927, -117.731155 | 0.3 | 85% | **0.061** | ONE (1) MWS-L-4-6 | 0.073 cfs |
| DMA B1 | B1 | 33.712464, -117.737405 | 64.6 | 85% | **13.235** | Bioscape - 49,380 sf | 13.200 cfs |
| DMA C1 | C1.1 & C1.2 | 33.714161, -117.738843 & 33.714089, -117.738711 | 6.7 | 85% | **1.373** | TWO (2) MWS-L-8-24 | 0.693 cfs x 2 = 1.386 cfs |

## IV.3.5 Hydromodification Control BMPs

See Section II.3 for details on project hydromodification mitigation.

| HYDROMODIFICATION CONTROLS | |
|---|---|
| BMP Name | BMP Description |
| DET-1 | 17,500 cf of storage |
| DET-2 | 190,575 cf of storage |

## IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. LID BMPs (biotreatment) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

Not applicable.

## IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs.

| TREATMENT CONTROL BMPs | | |
|---|---|---|
| ID | Name | Included? |
| TRT-1 | Sand Filters | ☐ |
| TRT-2 | Cartridge Media Filter | ☐ |
| PRE-1 | Hydrodynamic Separation Device | ☐ |
| PRE-2 | Catch Basin Insert | ☐ |
| | Other: | ☐ |

Not applicable. LID BMPs (biotreatment) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

To provide compliance with the CA Trash Provisions, BioClean Connector Pipe Screens (CPS) will be utilized at each Modular Wetland System unit for DMAs A1, A2, A3, A4, A5, A6, A7, and C1. For DMA B1, CPS will pe provided at each catch basin.

The 1-yr, 1-hr full capture compliance calculations are in the following table. The BioClean CPS model CPS-L-2.7 will be utilized which has a capacity of 3.84 cfs, meeting the requirements. The precipitation data is included in Appendix A.

| DMA ID | BMP ID | Drainage Area (acres) | Assumed % Imp. | Rainfall Intensity (in/hr) | $Q_{Design}$ (cfs) | BMP Size/Model | BMP Treatment Capacity |
|---|---|---|---|---|---|---|---|
| DMA A1 | A1.1 & A1.2 | 3.9 | 85% | 0.39 | **1.199** | TWO (2) BIOCLEAN CPS-L-2.7 | 3.84 x 2 = 7.68 cfs |
| DMA A2 | A2.1& A2.2 | 4.4 | 85% | 0.39 | **1.352** | TWO (2) BIOCLEAN CPS-L-2.7 | 3.84 x 2 = 7.68 cfs |
| DMA A3 | A3 | 2.4 | 85% | 0.39 | **0.738** | ONE (1) BIOCLEAN CPS-L-2.7 | 3.84 cfs |
| DMA A4 | A4 | 1.8 | 85% | 0.39 | **0.553** | ONE (1) BIOCLEAN CPS-L-2.7 | 3.84 cfs |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DMA A5 | A5 | 0.8 | 85% | 0.39 | **0.246** | ONE (1) BIOCLEAN CPS-L-2.7 | 3.84 cfs |
| DMA A6 | A6 | 0.4 | 85% | 0.39 | **0.123** | ONE (1) BIOCLEAN CPS-L-2.7 | 3.84 cfs |
| DMA A7 | A7 | 0.3 | 85% | 0.39 | **0.092** | ONE (1) BIOCLEAN CPS-L-2.7 | 3.84 cfs |
| DMA B1 | B1 | 64.6 | 85% | 0.39 | **19.853** | ONE (1) BIOCLEAN CPS-L-2.7 AT EACH CATCH BASIN | |
| DMA C1 | C1.1 & C1.2 | 6.7 | 85% | 0.39 | **2.059** | TWO (2) BIOCLEAN CPS-L-2.7 | 3.84 x 2 = 7.68 cfs |

## IV.3.8 Non-Structural Source Control BMPs

| NON-STRUCTURAL SOURCE CONTROL BMPs | | | | |
|---|---|---|---|---|
| ID | Name | Included? | Not Applicable? | If Not Applicable, Provide Brief Reason |
| N1 | Education for Property Owners, Tenants and Occupants | ☒ | ☐ | |
| N2 | Activity Restrictions | ☒ | ☐ | |
| N3 | Common Area Landscape Management | ☒ | ☐ | |
| N4 | BMP Maintenance | ☒ | ☐ | |
| N5 | Title 22 CCR Compliance (How development will comply) | ☐ | ☒ | No hazardous materials proposed. |
| N6 | Local Water Quality Permit Compliance | ☐ | ☒ | The City of Irvine does not issue water quality permits. |
| N7 | Spill Contingency Plan | ☐ | ☒ | No hazardous materials proposed. |
| N8 | Underground Storage Tank Compliance | ☐ | ☒ | No underground storage tanks proposed. |
| N9 | Hazardous Materials Disclosure Compliance | ☐ | ☒ | No hazardous materials stored onsite. |
| N10 | Uniform Fire Code Implementation | ☐ | ☒ | No hazardous materials proposed. |
| N11 | Common Area Litter Control | ☒ | ☐ | |
| N12 | Employee Training | ☒ | ☐ | |

| NON-STRUCTURAL SOURCE CONTROL BMPs | | | | |
|---|---|---|---|---|
| ID | Name | Included? | Not Applicable? | If Not Applicable, Provide Brief Reason |
| N13 | Housekeeping of Loading Docks | ☐ | ☒ | No below-grade loading docks are proposed. |
| N14 | Common Area Catch Basin Inspection | ☒ | ☐ | |
| N15 | Street Sweeping Private Streets and Parking Lots | ☒ | ☐ | |
| N16 | Retail Gasoline Outlets | ☐ | ☒ | No gasoline facilities proposed. |

*N1, Education for Property Owners, Tenants and Occupants*

Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter. Refer to Section VII for a list of materials available and attached to this WQMP. Additional materials are available through the County of Orange Stormwater Program website (https://h2oc.org/resources/) and the California Stormwater Quality Association's (CASQA) BMP Handbooks (http://www.cabmphandbooks.com/). Frequency of occurrence will be annually.

*N2, Activity Restrictions*

The Owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include but are not limited to handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.

*N3, Common Area Landscape Management*

Management programs will be designed and implemented by the Owner to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors.

*N4, BMP Maintenance*

The Owner will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors. Details on BMP maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Appendix D.

*N11, Common Area Litter Control*

The Owner will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for investigation.

*N12, Employee Training*

All employees of the Owner and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.

*N14, Common Area Catch Basin Inspection*

All on-site catch basin inlets and drainage facilities shall be inspected and maintained by the Owner at least once a year, prior to the rainy season, no later than October 1st of each year.

*N15, Street Sweeping Private Streets and Parking Lots*

The Owner shall be responsible for sweeping all on-site streets, drive isles, and or parking lots within the project on a monthly basis.

## IV.3.9 Structural Source Control BMPs

| STRUCTURAL SOURCE CONTROL BMPs | | | | |
|---|---|---|---|---|
| ID | Name | Included? | Not Applicable? | If Not Applicable, Provide Brief Reason |
| S1<br>SD-13 | Provide storm drain system stenciling and signage | ☒ | ☐ | |
| S2<br>SD-34 | Design and construct outdoor material storage areas to reduce pollution introduction | ☐ | ☒ | No outdoor material storage areas are proposed. |
| S3<br>SD-32 | Design and construct trash and waste storage areas to reduce pollution introduction | ☐ | ☒ | No outdoor waste storage areas are proposed. |
| S4<br>SD-12 | Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control | ☒ | ☐ | |

| STRUCTURAL SOURCE CONTROL BMPs | | | | |
|---|---|---|---|---|
| ID | Name | Included? | Not Applicable? | If Not Applicable, Provide Brief Reason |
| S5 | Protect slopes and channels and provide energy dissipation | ☐ | ☒ | There are no slopes or channels on the project site. |
| S6 SD-31 | Properly Design: Dock areas | ☐ | ☒ | No loading docks are proposed. |
| S7 SD-31 | Properly Design: Maintenance bays | ☐ | ☒ | No maintenance bays are proposed. |
| S8 SD-33 | Properly Design: Vehicle wash areas | ☐ | ☒ | No wash areas are proposed. |
| S9 SD-36 | Properly Design: Outdoor processing areas | ☐ | ☒ | No processing areas are proposed. |
| S10 | Properly Design: Equipment wash areas | ☐ | ☒ | No wash areas are proposed. |
| S11 SD-30 | Properly Design: Fueling areas | ☐ | ☒ | No fueling areas are proposed. |
| S12 SD-10 | Properly Design: Hillside landscaping | ☐ | ☒ | No hillside development proposed. |
| S13 | Properly Design: Wash water control for food preparation areas | ☐ | ☒ | No food prep areas proposed. |
| S14 | Properly Design: Community car wash racks | ☐ | ☒ | No community car wash racks are proposed. |

*S1/SD-13, Provide storm drain system stenciling and signage*

The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy. Stencils shall be inspected for legibility on an annual basis and re-stenciled as necessary. Frequency of occurrence will be annually.

*S4/SD-12, Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control*

The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The Owner will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems

shall be in conformance with water efficiency guidelines. Systems shall be tested twice per year, and water used during testing/flushing shall not be discharged to the storm drain system.

## IV.4 ALTERNATIVE COMPLIANCE PLAN

### IV.4.1 Water Quality Credits

Local jurisdictions may develop a water quality credit program that applies to certain types of development projects after they first evaluate the feasibility of meeting LID requirements on-site. If it is not feasible to meet the requirements for on-site LID, project proponents for specific project types can apply credits that would reduce project obligations for selecting and sizing other treatment BMPs or participating in other alternative programs.

| WATER QUALITY CREDITS | |
|---|---|
| Credit | Applicable ? |
| Redevelopment projects that reduce the overall impervious footprint of the project site. | ☐ |
| Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface water quality if not redeveloped. | ☐ |
| Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance) | ☐ |
| Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution). | ☐ |
| Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned | ☐ |
| Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping). | ☐ |
| Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses. | ☐ |
| Developments in a city center area. | ☐ |
| Developments in historic districts or historic preservation areas. | ☐ |

| WATER QUALITY CREDITS | |
|---|---|
| Credit | Applicable ? |
| Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories. | ☐ |
| In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas. | ☐ |

Not applicable. Water quality credits will not be applied for the project. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

### IV.4.2 Alternative Compliance Plan Information

Not applicable. LID BMPs (biotreatment) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

# SECTION V INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPs

It has been determined that Brookfield Homes shall assume all BMP inspection and maintenance responsibilities for the Gateway Village project.

| | |
|---|---|
| Contact Name: | Derek Spalding |
| Company: | Development Director |
| Address: | 3200 Park Center, Suite 1000, Costa Mesa, CA 92626 |
| Phone: | (714) 200-1636 |
| Email: | derek.spalding@brookfieldpropertiesdevelopment.com |

Should the maintenance responsibility be transferred at any time during the operational life of Gateway Village, such as when an HOA or POA is formed for a project, a formal notice of transfer shall be submitted to the City of Irvine at the time responsibility of the property subject to this WQMP is transferred. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

The Owner shall verify BMP implementation and ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. The certification shall verify that, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer / early fall, prior to the start of the rainy season. A form that may be used to record implementation, maintenance, and inspection of BMPs is included in Appendix D.

The City of Irvine may conduct verifications to assure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP is taking place at the project site. The Owner shall retain operations, inspections and maintenance records of these BMPs and they will be made available to the City or County upon request. All records must be maintained for at least five (5) years after the recorded inspection date for the lifetime of the project.

Long-term funding for BMP maintenance shall be funded through fees paid into the HOA. Brookfield Homes, which will set up the HOA shall oversee that adequate funding for BMP maintenance is included within the HOA fee structure including annual maintenance fees and long-term maintenance reserve funds.

The Operations and Maintenance (O&M) Plan can be found in Appendix D.

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | | |
|---|---|---|---|---|
| | BMP | Inspection/Maintenance Activities | Minimum Frequency | Responsible Party |
| BIOTREATMENT BMPs | | | | |
| BIO-7 | Proprietary Biotreatment – Modular Wetland System | Remove trash from screening device.<br>Remove sediment from separation chamber.<br>Replace cartridge filter media.<br>Replace drain down filter media.<br>Trim vegetation. | Annually and before October 1st of each year. | Owner |
| DETENTION BMPs (HYDROMODIFICATION) | | | | |
| Underground Detention | Underground Detention | Inspect access entry covers, check for leaks, minor sediment in cistern bottom, vector control issues. Clean out screenings and first flush divertor. Inspect from clean out port and remove sediment, trash, debris, and oil. Identify any needed corrective maintenance that will require site specific design. | Four times per year during wet season (preferably after rain events), and once during the dry season (ideally September). | Owner |
| FULL CAPTURE SYSTEM BMP (TRASH COMPLIANCE) | | | | |
| PRE-2 | BioClean Connector Pipe Screen | Remove trash in inlet and support structure.<br>Inspect inlet for breakage.<br>Inspect support structure and anchor bolts, tighten if necessary.<br>Ensure no gaps between mounting hardware and vault wall. | Twice a year and before October 1st of each year. | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | | |
|---|---|---|---|---|
| | BMP | Inspection/Maintenance Activities | Minimum Frequency | Responsible Party |
| NON-STRUCTURAL SOURCE CONTROL BMPs | | | | |
| N1 | Education for Property Owners, Tenants and Occupants | Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter. | Annually | Owner |
| N2 | Activity Restrictions | The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing. | Ongoing | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | | |
|---|---|---|---|---|
| | BMP | Inspection/Maintenance Activities | Minimum Frequency | Responsible Party |
| N3 | Common Area Landscape Management | Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets. | Weekly | Owner |
| N4 | BMP Maintenance | Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. | Annually | Owner |
| N11 | Common Area Litter Control | Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities. | Weekly | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | | |
|---|---|---|---|---|
| | BMP | Inspection/Maintenance Activities | Minimum Frequency | Responsible Party |
| N12 | Employee Training | The Owner shall educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix D. | Annually | Owner |
| N14 | Common Area Catch Basin Inspection | Remove trash and debris from catch basins and grates. Check for damage, clogging, and standing water. Repair or mitigate clogging/standing water, as needed. | 2x per year and after large storm event | Owner |
| N15 | Street Sweeping Private Streets and Parking Lots | On-site parking lots, drive aisles, and the parking structure basement level will be swept on a monthly basis, at minimum. | Monthly | Owner |
| STRUCTURAL SOURCE CONTROL BMPs | | | | |
| S1<br>SD-13 | Provide storm drain system stenciling and signage | On-site storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible. | Annually | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | | |
|---|---|---|---|---|
| | BMP | Inspection/Maintenance Activities | Minimum Frequency | Responsible Party |
| S4<br>SD-12 | Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control | In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system. | 2x per year | Owner |

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

# SECTION VI SITE PLAN AND DRAINAGE PLAN

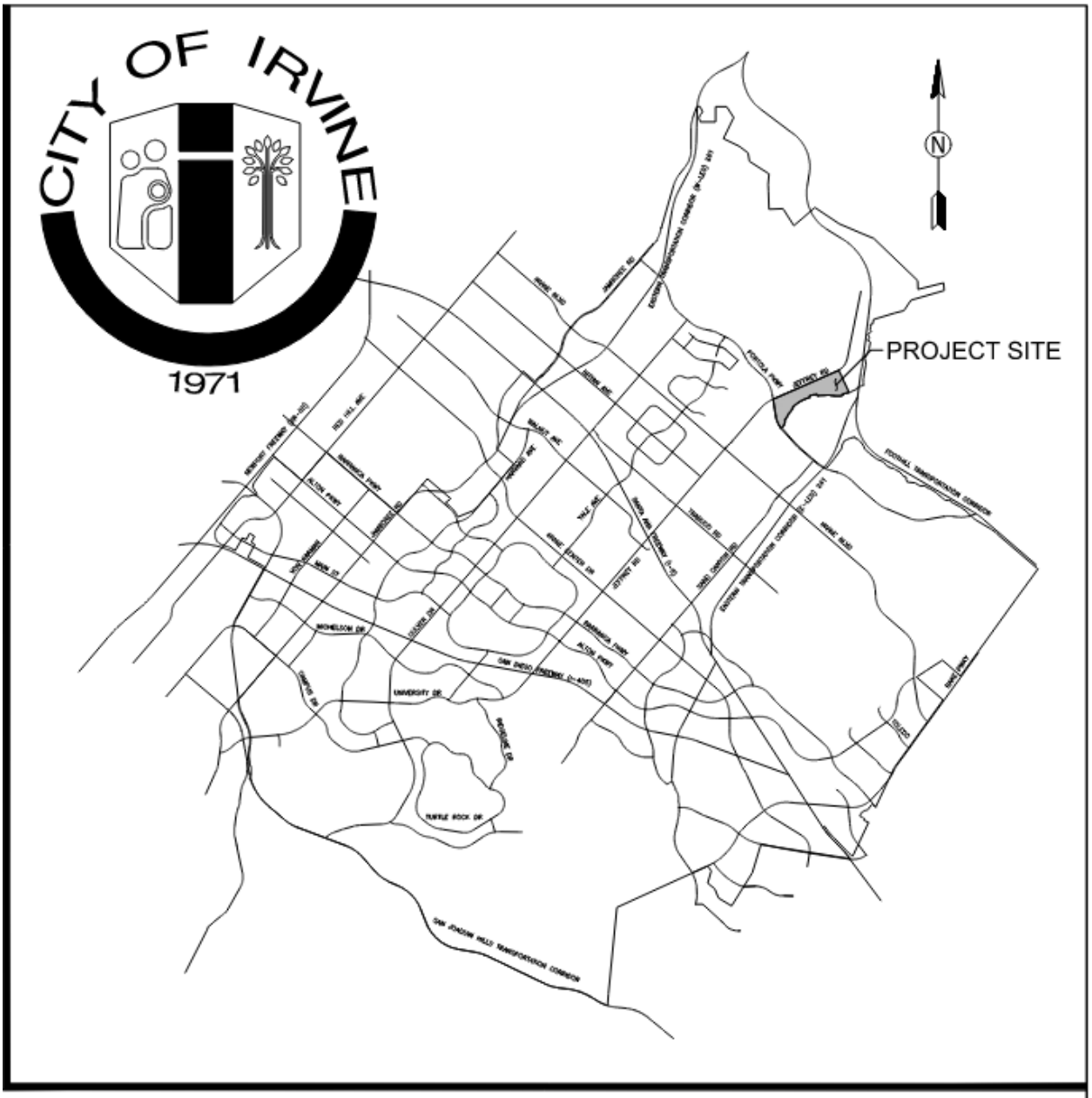
The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

## EXHIBITS

- Vicinity Map
- WQMP Exhibit
- Grading Plan

## BMP DETAILS

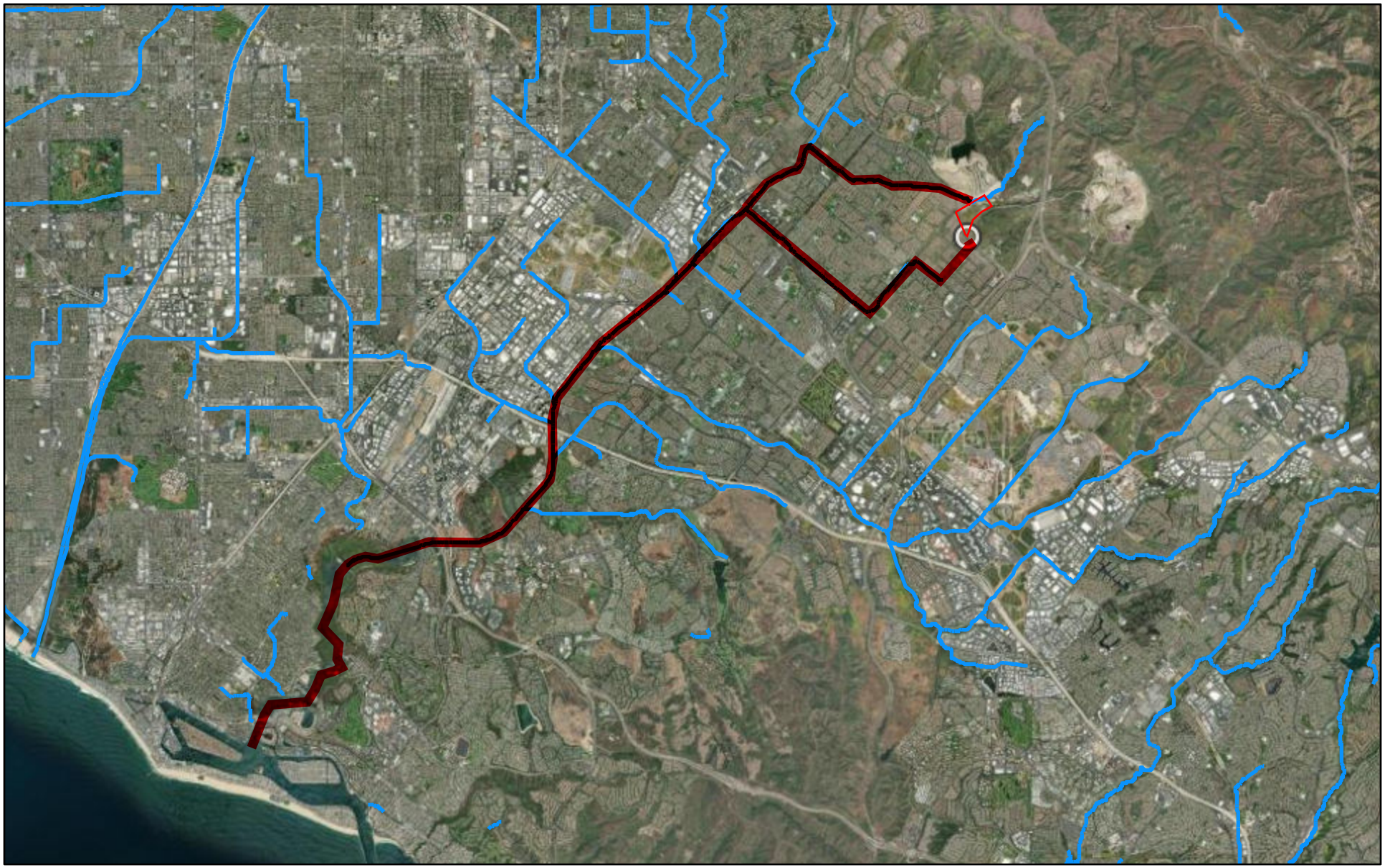
- BIO–7 Proprietary Biotreatment
- PRE-2 BioClean Connector Pipe Screen
- Underground Detention System (Hydromodification)




VICINITY MAP

Not to Scale

# Stormwater Network Map



11/19/2024

1:142,191

0 1 2 4 mi

0 1.5 3 6 km

Earthstar Geographics

Regional Channels

World Imagery

Low Resolution 15m Imagery

High Resolution 60cm Imagery

High Resolution 30cm Imagery

Citations

38m Resolution Metadata

## LEGEND

- PROPERTY LINE/RIGHT OF WAY
- CENTERLINE
- SD EX STORM DRAIN
- SD PROPOSED STORM DRAIN
- CATCH BASIN (N14, S1)
- DIRECTION OF PIPED FLOW
- DIRECTION OF SURFACE FLOW
- BMP DRAINAGE AREA BOUNDARY
- X / X DRAINAGE MANAGEMENT AREA
- BIOSCAPE (N4)
- MODULAR WETLAND SYSTEM (N4)

## LID BMPs

| | |
|---|---|
| BIO-7 | PROPRIETARY BIOTREATMENT |

## ABBREVIATIONS

| | |
|---|---|
| COI | CITY OF IRVINE |
| FCS | FULL CAPTURE SYSTEM |
| MWS | MODULAR WETLAND SYSTEM |
| RCP | REINFORCED CONCRETE PIPE |
| SD | STORM DRAIN |

## NON-STRUCTURAL SOURCE CONTROL BMPs

| | |
|---|---|
| N1 | EDUCATION FOR PROPERTY OWNERS, TENANTS AND OCCUPANTS |
| N2 | ACTIVITY RESTRICTIONS |
| N3 | COMMON AREA LANDSCAPE MANAGEMENT |
| N4 | BMP MAINTENANCE |
| N11 | COMMON AREA LITTER CONTROL |
| N12 | EMPLOYEE TRAINING |
| N14 | COMMON AREA CATCH BASIN INSPECTION |
| N15 | STREET SWEEPING PRIVATE STREETS AND PARKING LOTS |

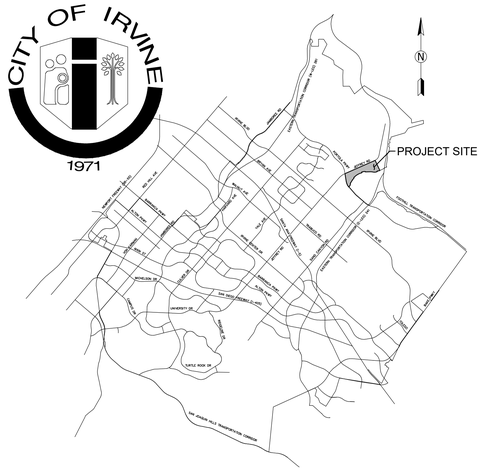
## STRUCTURAL SOURCE CONTROL BMPs

| | |
|---|---|
| S1 | PROVIDE STORM DRAIN SYSTEM STENCILING AND SIGNAGE |
| S4 | USE EFFICIENT IRRIGATION SYSTEMS & LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL |

| DMA ID | BMP ID | GPS Coordinates | Drainage Area (acres) | Assumed % Imp. | Runoff Coefficient | Design Storm Depth (in) | Tc (min) | Rainfall Intensity (in/hr) | Simple Method DCV ($ft^3$) | $Q_{design}$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|
| DMA A1 | A1.1 & A1.2 | 33.718841, -117.729601 & 33.718773, -117.729594 | 3.9 | 85% | 0.788 | 0.80 | 5 | 0.26 | **8,925** | **0.799** |
| DMA A2 | A2.1& A2.2 | 33.718662, -117.731071 & 33.718662, -117.730977 | 4.4 | 85% | 0.788 | 0.80 | 5 | 0.26 | **10,069** | **0.901** |
| DMA A3 | A3 | 33.719099,-117.731546 | 2.4 | 85% | 0.788 | 0.80 | 5 | 0.26 | **5,492** | **0.492** |
| DMA A4 | A4 | 33.720113, -117.730985 | 1.8 | 85% | 0.788 | 0.80 | 5 | 0.26 | **4,119** | **0.369** |
| DMA A5 | A5 | 33.720011, -117.731027 | 0.8 | 85% | 0.788 | 0.80 | 5 | 0.26 | **1,831** | **0.164** |
| DMA A6 | A6 | 33.719418, -117.730241 | 0.4 | 85% | 0.788 | 0.80 | 5 | 0.26 | **915** | **0.082** |
| DMA A7 | A7 | 33.719927, -117.731155 | 0.3 | 85% | 0.788 | 0.80 | 5 | 0.26 | **687** | **0.061** |
| DMA B1 | B1 | 33.712464, -117.737405 | 64.6 | 85% | 0.788 | 0.80 | 5 | 0.26 | **147,828** | **13.235** |
| DMA C1 | C1.1 & C1.2 | 33.714161, -117.738843 & 33.714089, -117.738711 | 6.7 | 85% | 0.788 | 0.80 | 5 | 0.26 | **15,332** | **1.373** |

| BMP Size/Model | BMP Treatment Capacity |
|---|---|
| TWO (2) MWS-L-8-16 | 0.462 cfs x 2 = 0.924 cfs |
| TWO (2) MWS-L-8-16 | 0.462 cfs x 2 = 0.924 cfs |
| ONE (1) MWS-L-8-20 | 0.577 cfs |
| ONE (1) MWS-L-8-16 | 0.462 cfs |
| ONE (1) MWS-L-4-15 | 0.175 cfs |
| ONE (1) MWS-L-4-8 | 0.115 cfs |
| ONE (1) MWS-L-4-6 | 0.073 cfs |
| Bioscape - 49,380 sf | 13.200 cfs |
| TWO (2) MWS-L-8-24 | 0.693 cfs x 2 = 1.386 cfs |

CITY OF IRVINE 1971




# VICINITY MAP




| PREPARED FOR: | PREPARED BY: | CITY OF IRVINE |
|---|---|---|
| BROOKFIELD PROPERTIES<br>3200 PARK CENTER, SUITE 1000<br>COSTA MESA, CA 92626<br>PHONE: (714) 200-1636 | FUSCOE ENGINEERING<br>15535 Sand Canyon Ave<br>Suite 100<br>Irvine, California 92618<br>949.474.1960<br>fuscoe.com | PERMIT # |
| | | WQMP EXHIBIT |
| | | GATEWAY VILLAGE<br>PORTOLA PARKWAY AT BEE CANYON ACCESS ROAD AND JEFFREY ROAD |

I:\Projects\3081900_Support Files\Reports\WQMP\Preliminary\Section II Exhibits\3081900_Gateway PWQMP.dwg [10/29/2024 4:55 PM] Printed by: Sierra Austin

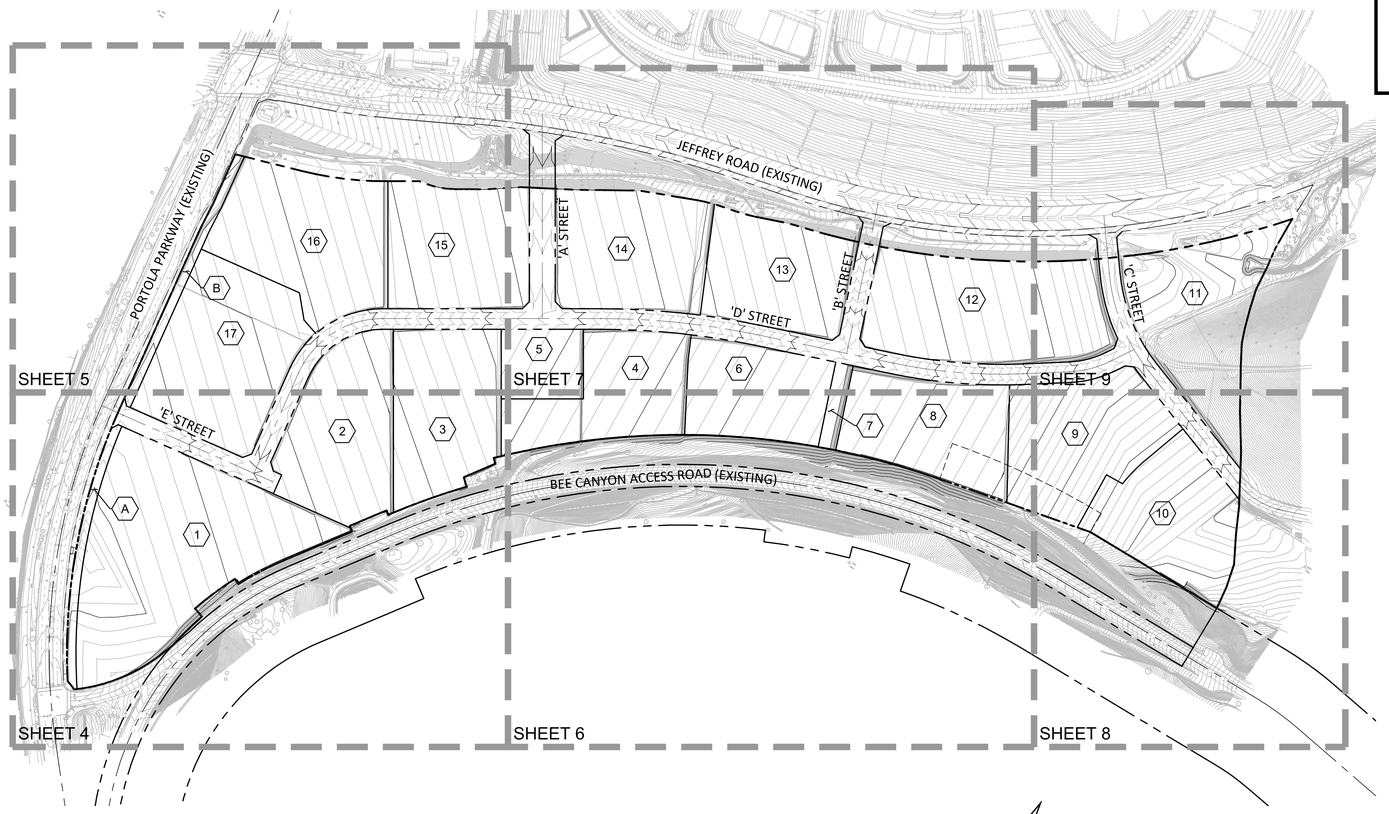
# VESTING TENTATIVE TRACT MAP 19352
# PLANNING AREA 2
## FOR CONDOMINIUM PURPOSES

LEGAL DESCRIPTION

PORTION OF LAND LOCATED IN THE CITY OF IRVINE, COUNTY OF ORANGE, STATE OF CALIFORNIA, LYING WITHIN PORTIONS OF BLOCKS 106, 107 AND 119 OF IRVINE'S SUBDIVISION, AS SHOWN ON MAP FILE IN BOOK 1, PAGE 88 OF MISCELLANEOUS RECORD MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY

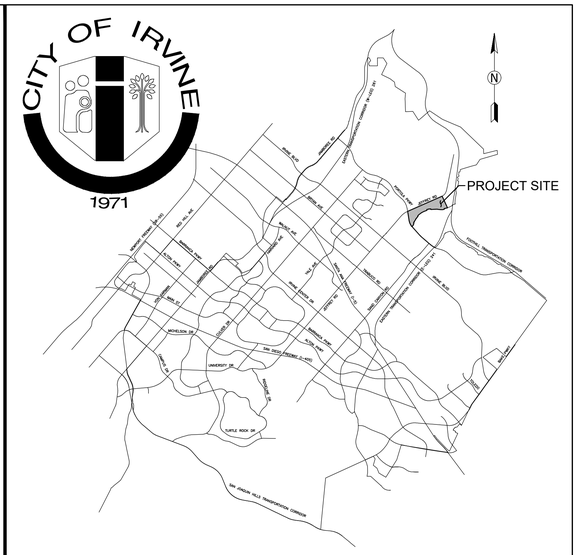
## NOTES

1. LAND USE: EXISTING – VACANT, EXISTING AGRICULTURE
   PROPOSED – MEDIUM–HIGH DENSITY RESIDENTIAL AND AFFORDABLE HOUSING
2. ADJACENT LAND USE:
   NORTH: EXISTING – JEFFREY ROAD, PLANNING AREA 1, AND EXISTING RESIDENTIAL
   EAST: EXISTING – VACANT, PRESERVATION
   SOUTH: EXISTING – VACANT, RECREATION
   WEST: EXISTING – PORTOLA PARKWAY, PLANNING AREA WOODBURY, AND EXISTING RESIDENTIAL
3. A. EXISTING GENERAL PLAN LAND USE DESIGNATION: RECREATION
   B. EXISTING ZONING DESIGNATION: 1.5 RECREATION
4. ELECTRICAL SERVICE WILL BE PROVIDED BY SOUTHERN CALIFORNIA EDISON COMPANY. ALL NEW ELECTRICAL SERVICE LINE WILL BE PLACED UNDERGROUND.
5. GAS SERVICE WILL BE PROVIDED BY SOUTHERN CALIFORNIA GAS COMPANY.
6. TELEPHONE SERVICE WILL BE PROVIDED BY AT&T.
7. CABLE T.V. SERVICES WILL BE PROVIDED BY COX COMMUNICATION.
8. DOMESTIC WATER, RECYCLED WATER AND SEWER SERVICE WILL BE PROVIDED BY IRVINE RANCH WATER DISTRICT.
9. THE DEVELOPER WILL COMPLY WITH ENERGY CONSERVATION MEASURES SET FORTH IN TITLE 24 OF THE CALIFORNIA ADMINISTRATIVE CODE.
10. PROPOSED SEWER FACILITIES: STANDARD LATERAL CONNECTIONS TO EXISTING SEWER SYSTEM SHALL BE IN ACCORDANCE WITH THE IRVINE RANCH WATER DISTRICT'S STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF WATER, SEWER AND RECYCLED WATER FACILITIES.
11. PROPOSED WATER FACILITIES: STANDARD DOMESTIC WATER CONNECTIONS TO EXISTING WATER SYSTEM SHALL BE IN ACCORDANCE WITH THE IRVINE RANCH WATER DISTRICT'S STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF WATER, SEWER AND RECYCLED WATER FACILITIES.
12. THE DEVELOPER RESERVES THE RIGHT TO FILE MULTIPLE FINAL MAPS FOR THIS TENTATIVE TRACT MAP.
13. MAINTENANCE OF ALL LETTERED LOTS SHALL BE THE RESPONSIBILITY OF A HOMEOWNERS ASSOCIATION OR PRIVATE ENTITY. SEE SHEET 2 FOR LOT AREA SUMMARY.
14. DRAINAGE OF THIS PROJECT WILL BE CONVEYED BY MEANS OF A STORM DRAIN SYSTEM CONSISTING OF VARYING SIZES OF STORM DRAINPIPE, AREA DRAINS, AND DITCHES.
15. TOTAL PROJECT ACREAGE IS 81.2 GROSS ACRES.
16. ALL LETTERED LOTS SHOWN ON THIS MAP MAY BE DIVIDED ON THE FINAL MAPS INTO MULTIPLE LOTS FOR PHASING, FINANCING, CONSTRUCTION OR DEDICATION PURPOSES.
17. ALL PUBLIC SIDEWALKS SHOWN OUTSIDE PUBLIC STREET RIGHT OF WAY WILL BE IN EASEMENTS DEDICATED FOR NON–EXCLUSIVE PEDESTRIAN PURPOSES.
18. A. THE PROPOSED PROJECT SITE IS SHOWN ON THE FIRM MAP (FLOOD INSURANCE RATE MAP) UNDER MAP NO. 06059C0305J DATED 12–03–09 AS ZONE X WHICH IS DESIGNATED OUTSIDE ANY 100–YEAR FLOOD ZONE.
    B. ALL PROPOSED UTILITIES WILL BE UNDERGROUND.
19. WHERE STREETS, INFRASTRUCTURE, TRAFFIC SIGNALS, AND LANDSCAPING HAVE NOT BEEN ACCEPTED BY THE CITY, THE DEVELOPER SHALL BE RESPONSIBLE FOR THE MAINTENANCE AND OPERATING COSTS OF THE STREETS, INFRASTRUCTURE, TRAFFIC SIGNALS, AND LANDSCAPING UNTIL SUCH TIME AS THE CITY OF IRVINE ACCEPTS THE IMPROVEMENTS.
20. ALL STORM DRAIN SYSTEMS WITHIN PRIVATE STREETS AND IN PRIVATE PROPERTY WILL BE PRIVATELY OWNED & MAINTAINED EXCEPT WHEN A PUBLIC EASEMENT IS PROVIDED.
21. SCHOOL DISTRICT IS IRVINE UNIFIED.
22. ALL LETTERED LOTS ARE NON BUILDABLE LOTS.
23. THE NEAREST BUS STOP IS LOCATED IN THE SOUTHWEST CORNER OF THE INTERSECTION OF JEFFREY ROAD AND PORTOLA PARKWAY AND IS APPROXIMATELY 1,100 FEET FROM THE TRACT'S NEAREST PEDESTRIAN ACCESS.
24. ALL SIDEWALKS SHALL CONFORM TO CITY OF IRVINE STANDARD PLAN 201. PUBLIC STREET CURB RETURNS AND SIDEWALK ACCESS RAMPS SHALL CONFORM TO CITY OF IRVINE STANDARD PLAN 202.
25. ALL INTERSECTIONS WILL MAINTAIN SIGHT DISTANCES PER CITY OF IRVINE STANDARD PLAN 403.
26. PRIOR TO THE RECORDATION OF A SUBDIVISION MAP, THE APPLICANT SHALL SUBMIT A FIRE MASTER PLAN TO ORANGE COUNTY FIRE AUTHORITY FOR REVIEW AND APPROVAL.
27. ALL STREETLIGHTS SHALL CONFORM TO CITY OF IRVINE DESIGN MANUAL SECTION 103.




## INDEX MAP

200' 0' 100' 200'
SCALE: 1" = 200'




## VICINITY MAP

### SHEET INDEX


| SHEET | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET, GENERAL NOTES |
| 2 | TYPICAL SECTIONS AND LOT SUMMARY |
| # | ################## |
| 4–9 | VESTING TENTATIVE TRACT MAP |


### ABBREVIATIONS

| | |
|---|---|
| ℄ | CENTERLINE |
| DW | DOMESTIC WATER |
| EX. | EXISTING |
| FS | FINISHED SURFACE |
| GB | GRADE BREAK |
| HP | HIGH POINT |
| LP | LOW POINT |
| P/L | PROPERTY LINE |
| PROP. | PROPOSED |
| R/W | RIGHT OF WAY |
| RW | RECLAIMED WATER |
| SD | STORM DRAIN |
| S | SEWER |

### LEGEND

- LOT LINE
- TRACT BOUNDARY
- CITY OF IRVINE TO ACQUIRE THIS AREA
- DW — DOMESTIC WATER
- RW — RECLAIMED WATER
- SS — SEWER
- SD — STORM DRAIN
- MWS — MODULAR WETLAND UNIT
- DETENTION BASIN
- SIGHT DISTANCE
- RETAINING WALL
- (1) LOT NUMBER

RECORD OWNER :

CITY OF IRVINE
1 CIVIC CENTER PLAZA
P.O. BOX 19575
IRVINE, CALIFORNIA 92623–9575
949.724.6000

SIGNATURE DATE
TITLE

SUBDIVIDER:

BROOKFIELD RESIDENTIAL
3200 PARK CENTER DRIVE, SUITE 1000
COSTA MESA, CA 92626
(714) 200–1500

SIGNATURE DATE
TITLE

REGISTERED PROFESSIONAL ENGINEER WINNIE THAM NO. 59269 CIVIL STATE OF CALIFORNIA

I HEREBY STATE THIS MAP WAS PREPARED UNDER MY SUPERVISION.

WINNIE THAM RCE 59269 11/27/2024 DATE

DEVELOPER:
**Brookfield Residential**

PREPARED BY:
FUSCOE ENGINEERING
15535 Sand Canyon Ave, Suite 100
Irvine, California 92618
949.474.1960 fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

TITLE SHEET, GENERAL NOTES

REVISIONS

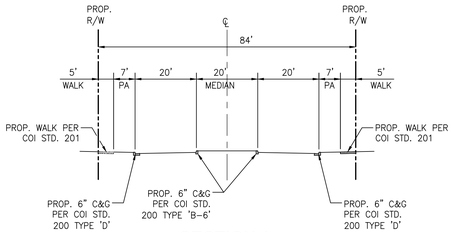
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
|---|---|---|---|---|---|
| | | | | | |

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

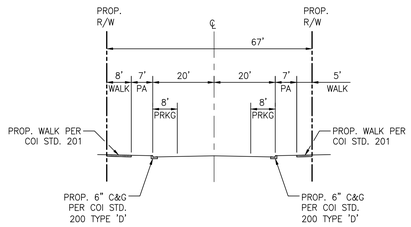
CITY FILE NO. XX-XX

SHEET 1 OF 9

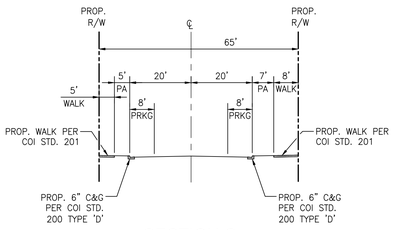
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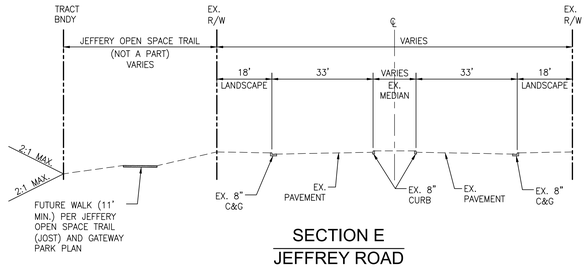

SECTION A
'A' SREET
1" = 20'



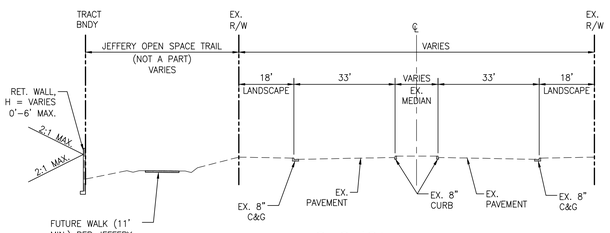

SECTION B
'B', 'D' AND 'E' STREETS
1" = 20'



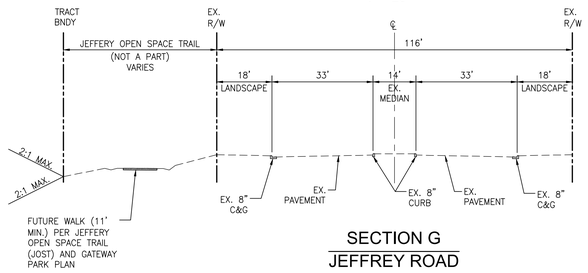

SECTION C
'C' STREET
1" = 20'



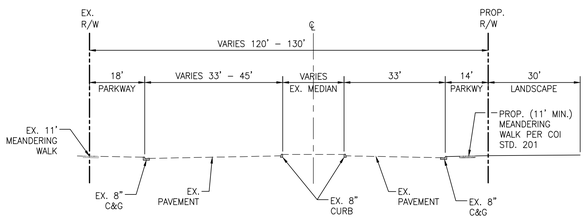

SECTION E
JEFFREY ROAD
1" = 20'



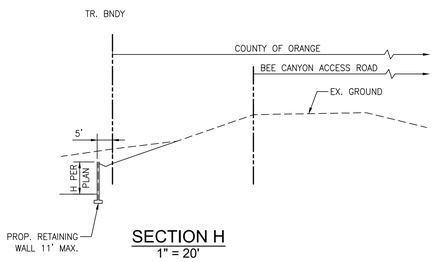

SECTION F
JEFFREY ROAD
1" = 20'



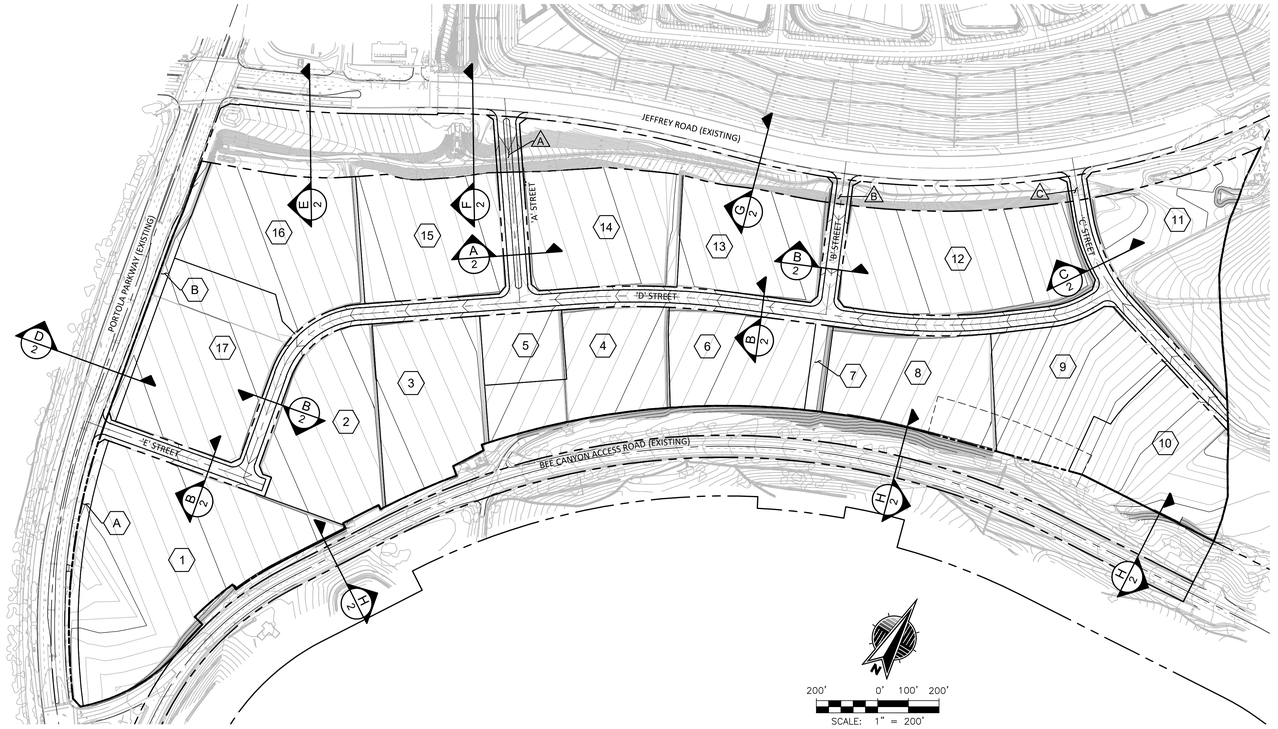

SECTION G
JEFFREY ROAD
1" = 20'




SECTION D
PORTOLA PARKWAY
1" = 20'




SECTION H
1" = 20'




| NUMBERED LOTS | | | |
|---|---|---|---|
| LOT # | LOT SIZE AREA (AC) | LOT SIZE AREA (sf) | LOT USE |
| 1 | 8.6 | 374,686 | RESIDENTIAL |
| 2 | 4.4 | 190,808 | RESIDENTIAL |
| 3 | 4.2 | 182,555 | RESIDENTIAL |
| 4 | 3.7 | 159,835 | RESIDENTIAL |
| 5 | 1.4 | 60,809 | REC. AREA |
| 6 | 3.2 | 138,812 | RESIDENTIAL |
| 7 | 0.4 | 16,351 | LINEAR PARK |
| 8 | 3.9 | 170,290 | RESIDENTIAL |
| 9 | 4.4 | 193,050 | RESIDENTIAL |
| 10 | 3.9 | 169,804 | RESIDENTIAL |
| 11 | 4.8 | 208,615 | PARK |
| 12 | 6.0 | 259,669 | RESIDENTIAL |
| 13 | 3.7 | 161,355 | RESIDENTIAL |
| 14 | 4.4 | 190,147 | RESIDENTIAL |
| 15 | 4.2 | 183,925 | RESIDENTIAL |
| 16 | 5.2 | 224,738 | RESIDENTIAL |
| 17 | 5.4 | 237,076 | RESIDENTIAL |
| TOTAL | 71.7 | 3,122,526 | |

| LETTERED LOTS | | | | |
|---|---|---|---|---|
| LOT # | LOT SIZE AREA (AC) | LOT SIZE AREA (sf) | LOT USE | MAINTENANCE |
| A | 0.6 | 26,059 | LANDSCAPE | HOA |
| B | 0.6 | 26,697 | LANDSCAPE | HOA |
| TOTAL | 1.2 | 52,757 | | |

| STREETS (PUBLIC) | | |
|---|---|---|
| STREETS | STREET SIZE AREA | STREET SIZE AREA |
| A | 0.7 | 31,090 |
| B | 0.5 | 20,618 |
| C | 1.3 | 58,665 |
| D | 4.8 | 210,373 |
| E | 0.9 | 40,624 |
| TOTAL | 8.3 | 361,370 |

| FUTURE OFFSITE DEDICATION FROM THE IRVINE COMPANY TO | AREA (AC) |
|---|---|
| A | 0.4 |
| B | 0.1 |
| C | 0.1 |
| TOTAL | 0.6 |

| UTILITY SUMMARY |
|---|
| STORM DRAIN |
| RCP - 10,220 LF |
| DOMESTIC WATER |
| 12" PVC - 4,740 LF |
| 10" PVC - 5,070 LF |
| RECLAIMED WATER |
| 6" PVC - 4,300 LF |
| 4" PVC - 850 LF |
| SEWER |
| 8" PVC - 4,910 LF |

| LOTS | AREA (AC) | AREA (sf) |
|---|---|---|
| NUMBERED LOTS | **71.7** | **3,122,526** |
| LETTERED LOTS | **1.2** | **52,757** |
| STREET LOTS | **8.3** | **361,370** |
| TOTAL | **81.2** | **3,536,653** |

DEVELOPER:
**Brookfield Residential**

PREPARED BY:
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Irvine, California 92618
949.474.1960
fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

TYPICAL SECTIONS AND LOT SUMMARY

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
| | | | | | |

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO. XX-XX

SHEET 2 OF 9

F:\PROJECTS\308\092\PLANS\UTILITIES\TENTATIVE TRACT MAP\308-092-TM02T.DWG (12-03-24 2:36:56PM) Plotted by: bmore




## EASEMENT NOTES

(8) EXISTING EASEMENT TO IRWD FOR WATER TRANSMISSION LINES PURPOSES TO BE QUITCLAIMED

(11) EXISTING EASEMENT TO THE COUNTY OF ORANGE FOR SLOPE AND DRAINAGE PURPOSES TO BE QUITCLAIMED

(15) EXISTING EASEMENT TO IRWD FOR UNDERGROUND PIPELINE PURPOSES TO BE QUITCLAIMED

(16) EXISTING EASEMENT TO SCE FOR STUB POLES, GUYWIRES AND ANCHORS PURPOSES TO BE QUITCLAIMED

(17) EXISTING EASEMENT TO SCE FOR UNDERGROUND ELECTRICAL SUPPLY STSTEMS AND COMMUNICATION SYSTEMS PURPOSES TO BE QUITCLAIMED

(19) EXISTING EASEMENT TO CITY OF IRVINE FOR PUBLIC STREET, SIDEWALK AND PEDESTRIAN PURPOSES TO BE QUITCLAIMED

(20) EXISTING EASEMENT TO IRWD FOR INGRESS AND EGRESS PURPOSES TO BE QUITCLAIMED

(21) EXISTING EASEMENT TO SCE FOR OVERHEAD AND UNDERGROUND ELECTRICAL SUPPLY SYSTEM PURPOSES TO BE QUITCLAIMED

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CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

##########

REVISIONS

| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
|---|---|---|---|---|---|
| | | | | | |

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO. XX-XX

SHEET # OF 9

F:\PROJECTS\33RVI\DEV\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\33RVI-DEV-TMAS01.DWG (12-03-24 2:39:27PM) Plotted by: bmuse

SEE SHEET 5




60' 0' 30' 60'

SCALE: 1" = 60'

## EASEMENT NOTES:

(A) EASEMENT TO IRWD FOR SEWER PURPOSES.

(B) EASEMENT TO CITY OF IRVINE FOR STORM DRAIN PURPOSES

| REVISIONS | | | | | |
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DEVELOPER:
**Brookfield Residential**

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949.474.1960 fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

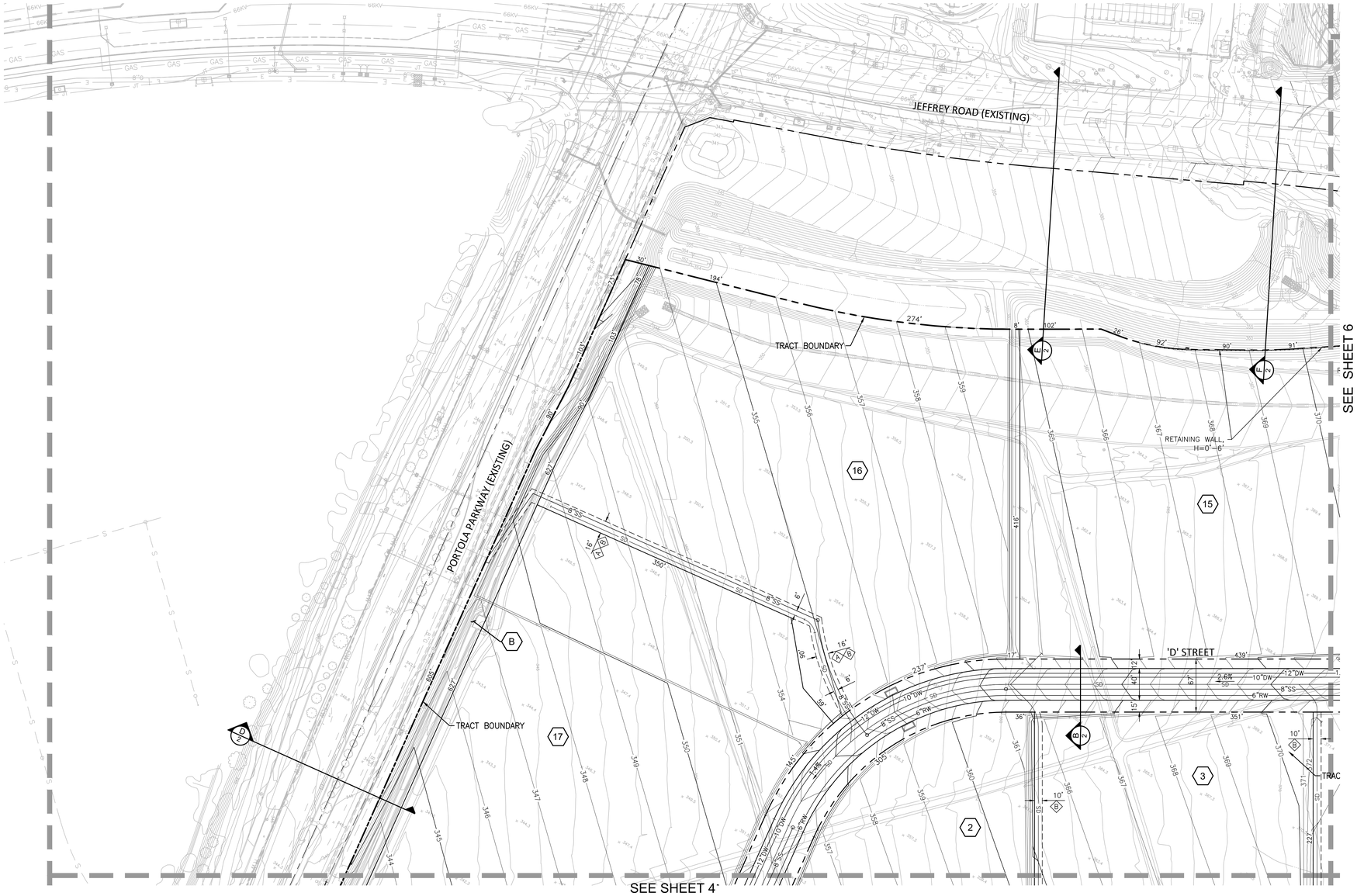
VESTING TENTATIVE TRACT MAP

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO.
XX-XX

SHEET 4 OF 9

F:\PROJECTS\30BR\09\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\30BR-092-19404-09TM.DWG (12-03-24 2:45:07PM) Plotted by: bmuse




60' 0' 30' 60'

SCALE: 1" = 60'

## EASEMENT NOTES:

(A) EASEMENT TO IRWD FOR SEWER PURPOSES.

(B) EASEMENT TO CITY OF IRVINE FOR STORM DRAIN PURPOSES

| REVISIONS | | | | | |
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DEVELOPER:
**Brookfield Residential**

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fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

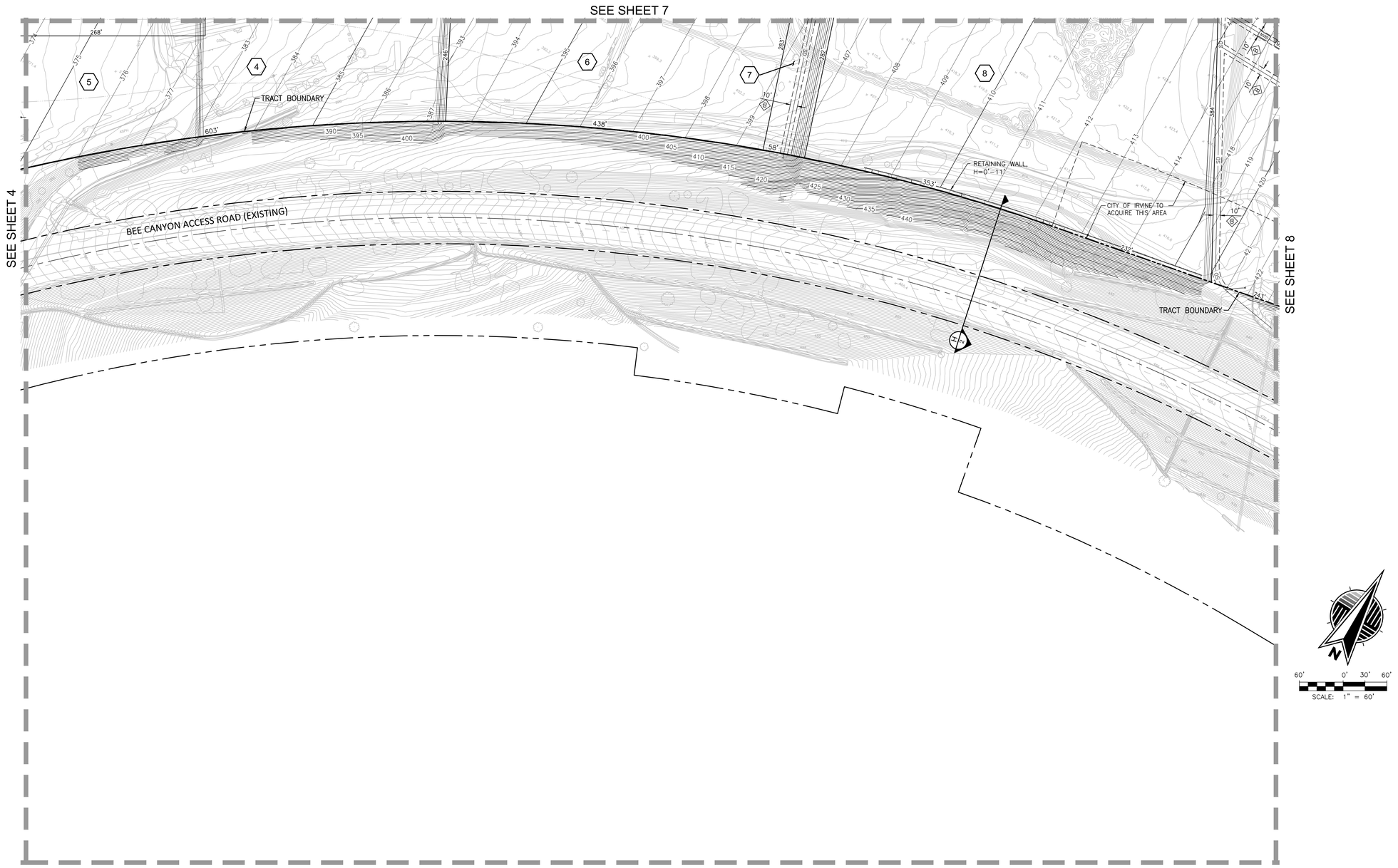
VESTING TENTATIVE TRACT MAP

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO.
XX-XX

SHEET 5 OF 9

F:\PROJECTS\308\093\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\308-093-TMXX-09TM.DWG (12-03-24 2:40:20PM) Plotted by: bmuse




## EASEMENT NOTES:

(A) EASEMENT TO IRWD FOR SEWER PURPOSES.

(B) EASEMENT TO CITY OF IRVINE FOR STORM DRAIN PURPOSES

| REVISIONS | | | | | |
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| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
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DEVELOPER:
**Brookfield Residential**

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fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

VESTING TENTATIVE TRACT MAP

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO.
XX-XX

SHEET 6 OF 9

F:\PROJECTS\3369\DWG\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\3369-092-TM04-OPNLDWG (12-03-24 2:40:38PM) Plotted by: bmuse




## EASEMENT NOTES:

(A) EASEMENT TO IRWD FOR SEWER PURPOSES.

(B) EASEMENT TO CITY OF IRVINE FOR STORM DRAIN PURPOSES

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
| | | | | | |

DEVELOPER:
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CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

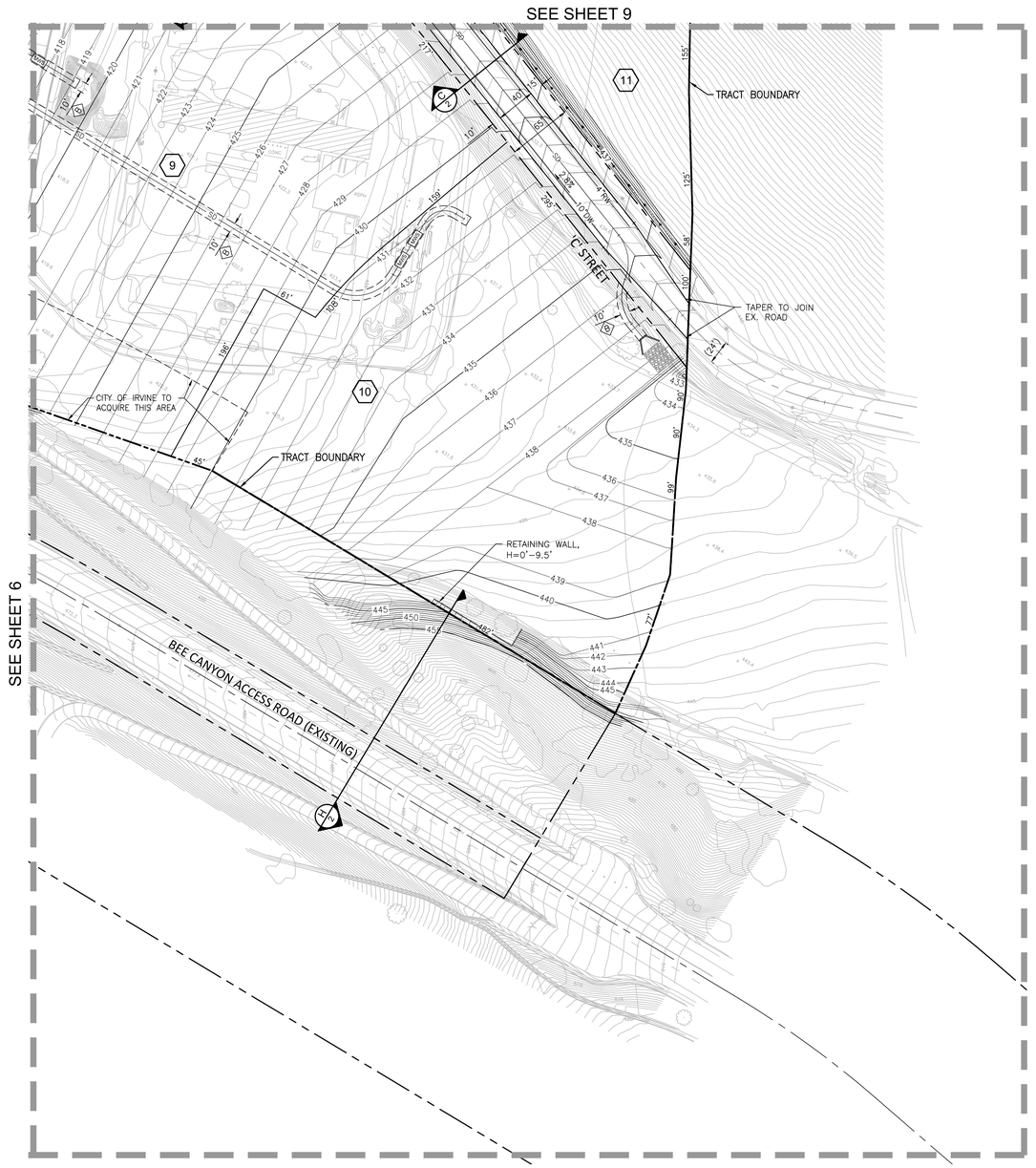
VESTING TENTATIVE TRACT MAP

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO.
XX-XX

SHEET 7 OF 9

F:\PROJECTS\308\092\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\308-092-TM04-09TM.DWG (17-01-24 2:40:58PM) Plotted by: bmuse




## EASEMENT NOTES:

(A) EASEMENT TO IRWD FOR SEWER PURPOSES.

(B) EASEMENT TO CITY OF IRVINE FOR STORM DRAIN PURPOSES

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
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DEVELOPER:
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fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

VESTING TENTATIVE TRACT MAP

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO.
XX-XX

SHEET 8 OF 9

F:\PROJECTS\208\099\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\208-099-TMXX-ENTMJMG (12-03-24 2:41:18PM) Plotted by: bmuse






60' 0' 30' 60'
SCALE: 1" = 60'

## EASEMENT NOTES:

(A) EASEMENT TO IRWD FOR SEWER PURPOSES.

(B) EASEMENT TO CITY OF IRVINE FOR STORM DRAIN PURPOSES

REVISIONS

| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
|---|---|---|---|---|---|
| | | | | | |

DEVELOPER:
**Brookfield Residential**

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Irvine, California 92618
949.474.1960 fuscoe.com

CITY OF IRVINE

VESTING TENTATIVE TRACT MAP 19352
PLANNING AREA 2

VESTING TENTATIVE TRACT MAP

DESIGNED BY: WT
DRAFTED BY: FEI
CHECKED BY: WT

CITY FILE NO.
XX-XX

SHEET 9 OF 9

F:\PROJECTS\308\05\PLANS\ENTITLEMENTS\TENTATIVE TRACT MAP\308-05PTMLDWG (12-03-24 2:41:58PM) Plotted by: bmoe

# SECTION VII EDUCATIONAL MATERIALS

The educational materials included in this WQMP are provided to inform people involved in future uses, activities, or ownership of the site about the potential pitfalls associated with careless storm water management. The educational materials that may be used for the proposed project are included in Appendix C of this WQMP and are listed below.

| EDUCATION MATERIALS | | | |
|---|---|---|---|
| Residential Materials (http://www.ocwatersheds.com) | Check If Attached | Business Materials (http://www.ocwatersheds.com) | Check If Attached |
| The Ocean Begins at Your Front Door | ☒ | Tips for the Automotive Industry | ☐ |
| Tips for Car Wash Fund-raisers | ☐ | Tips for Using Concrete and Mortar | ☐ |
| Tips for the Home Mechanic | ☐ | Tips for the Food Service Industry | ☐ |
| Homeowners Guide for Sustainable Water Use | ☒ | Proper Maintenance Practices for Your Business | ☐ |
| Household Tips | ☒ | Other Materials (http://www.ocwatersheds.com) (https://www.casqa.org/resources/bmp-handbooks) | Check If Attached |
| Proper Disposal of Household Hazardous Waste | ☒ | | |
| Recycle at Your Local Used Oil Collection Center (North County) | ☒ | DF-1 Drainage System Operation & Maintenance | ☒ |
| Recycle at Your Local Used Oil Collection Center (Central County) | ☐ | R-1 Automobile Repair & Maintenance | ☐ |
| Recycle at Your Local Used Oil Collection Center (South County) | ☐ | R-2 Automobile Washing | ☐ |
| Tips for Maintaining Septic Tank Systems | ☐ | R-3 Automobile Parking | ☐ |
| Responsible Pest Control | ☒ | R-4 Home & Garden Care Activities | ☒ |
| Sewer Spill | ☐ | R-5 Disposal of Pet Waste | ☒ |
| Tips for the Home Improvement Projects | ☐ | R-6 Disposal of Green Waste | ☐ |
| Tips for Horse Care | ☐ | R-7 Household Hazardous Waste | ☒ |
| Tips for Landscaping and Gardening | ☐ | R-8 Water Conservation | ☒ |
| Tips for Pet Care | ☒ | SD-10 Site Design & Landscape Planning | ☐ |
| Tips for Pool Maintenance | ☒ | SD-11 Roof Runoff Controls | ☐ |
| Tips for Residential Pool, Landscape and Hardscape Drains | ☒ | SD-12 Efficient Irrigation | ☒ |
| Tips for Projects Using Paint | ☐ | SD-13 Storm Drain Signage | ☒ |
| Tips for Protecting Your Watershed | ☒ | SD-31 Maintenance Bays & Docs | ☐ |
| Other: Children's Brochure | ☐ | SD-32 Trash Storage Areas | ☐ |

# APPENDICES

Appendix A Supporting Calculations
Appendix B Notice of Transfer of Responsibility
Appendix C Educational Materials
Appendix D BMP Maintenance Supplement / O&M Plan
Appendix E Conditions of Approval
Appendix F Geotechnical Report
Appendix G.....Hydrology Calculations

# Appendix A

## SUPPORTING CALCULATIONS

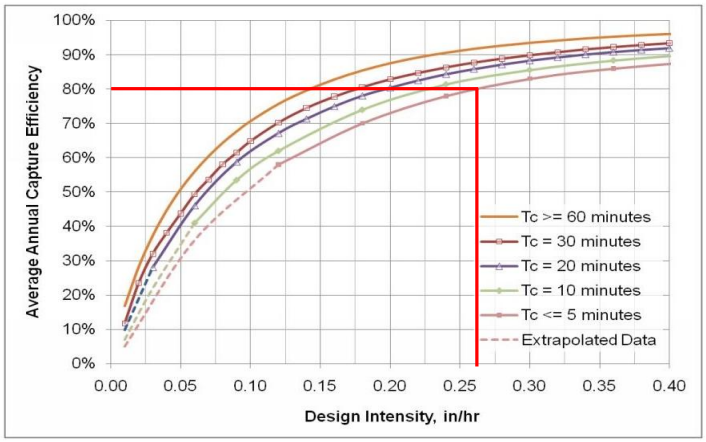
## Worksheet B: Simple Design Capture Volume Sizing Method

| | | | DMA A1 | DMA A2 | DMA A3 | DMA A4 | DMA A5 | DMA A6 | DMA A7 | DMA B1 | DMA C1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Step 1: Determine the design capture storm depth used for calculating volume*** | | | | | | | | | | | | |
| 1 | Enter design capture storm depth from Figure III.1, *d* (inches) | d= | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | inches |
| 2 | Enter the effect of provided HSCs, $d_{HSC}$ (inches) (Worksheet A) | $d_{HSC}$= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | inches |
| 3 | Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2) | $d_{remainder}$= | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | inches |
| ***Step 2: Calculate the DCV*** | | | | | | | | | | | | |
| 1 | Enter Project area tributary to BMP(s), *A* (acres) | A= | 3.90 | 4.40 | 2.40 | 1.80 | 0.80 | 0.40 | 0.30 | 64.60 | 6.70 | acres |
| 2 | Enter Project Imperviousness, *imp* (unitless) | imp= | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | % |
| 3 | Calculate runoff coefficient, *C= (0.75 x imp) + 0.15* | C= | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | |
| 4 | Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$ | $V_{design}$= | 8,925 | 10,069 | 5,492 | 4,119 | 1,831 | 915 | 687 | 147,828 | 15,332 | cu-ft |

## Worksheet D: Capture Efficiency Method for Flow-Based BMPs

| | | | DMA A1 | DMA A2 | DMA A3 | DMA A4 | DMA A5 | DMA A6 | DMA A7 | DMA B1 | DMA C1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Step 1: Determine the design capture storm depth used for calculating volume*** | | | | | | | | | | | | |
| 1 | Enter the time of concentration, $T_c$ (min) (See Appendix IV.2) | $T_c$= | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | min |
| 2 | Using Figure III.4, determine the design intensity at which the estimated time of concentration ($T_c$) achieves 80% capture efficiency, $I_1$ | $I_1$= | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | in/hr |
| 3 | Enter the effect depth of provided HSCs upstream, $d_{HSC}$ (inches) (Worksheet A) | $d_{HSC}$= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | inches |
| 4 | Enter capture efficiency corresponding to $d_{HSC}$, $Y_2$ (Worksheet A) | $Y_2$= | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 100% | % |
| 5 | Using Figure III.4, determine the design intensity at which the time of concentration ($T_c$) achieves the upstream capture efficiency ($Y_2$), $I_2$ | $I_2$= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | in/hr |
| 6 | Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$ | $I_{design}$= | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | 0.260 | in/hr |
| ***Step 2: Calculate the design flowrate*** | | | | | | | | | | | | |
| 1 | Enter Project area tributary to BMP(s), *A* (acres) | A= | 3.90 | 4.40 | 2.40 | 1.80 | 0.80 | 0.40 | 0.30 | 64.60 | 6.70 | acres |
| 2 | Enter Project Imperviousness, *imp* (unitless) | imp= | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | 85% | % |
| 3 | Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$ | C= | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | 0.788 | |
| 4 | Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$ | $Q_{design}$= | 0.799 | 0.901 | 0.492 | 0.369 | 0.164 | 0.082 | 0.061 | 13.235 | 1.373 | cfs |
| ***Supporting Calculations*** | | | | | | | | | | | | |
| Describe System: | | | | | | | | | | | | |
| | *Proprietary BioTreatment (BIO-7):* | | | | | | | | | | | |
| | *Unit Size / Model =* | | *MWS-L-8-16* | *MWS-L-8-16* | *MWS-L-8-20* | *MWS-L-8-16* | *MWS-L-4-15* | *MWS-L-4-8* | *MWS-L-4-6* | *Bioscape* | *MWS-L-8-24* | |
| | *Unit Size / Model Treatment Capacity =* | | *0.462* | *0.462* | *0.577* | *0.462* | *0.175* | *0.115* | *0.073* | *49,380 sf* | *0.693* | cfs |
| | *Number of Units Needed =* | | *2* | *2* | *1* | *1* | *1* | *1* | *1* | | *2* | |
| | *Total Bio-treatment Provided =* | | *0.924* | *0.924* | *0.577* | *0.462* | *0.175* | *0.115* | *0.073* | *13.200* | *1.386* | cfs |

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



**NOAA Atlas 14, Volume 6, Version 2**
**Location name: Irvine, California, USA***
**Latitude: 33.7115°, Longitude: -117.7379°**
**Elevation: 340 ft****
* source: ESRI Maps
** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

## PF tabular

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

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.116 (0.097-0.139) | 0.147 (0.123-0.177) | 0.190 (0.159-0.230) | 0.228 (0.189-0.278) | 0.284 (0.227-0.359) | 0.329 (0.257-0.426) | 0.379 (0.288-0.503) | 0.433 (0.320-0.593) | 0.513 (0.363-0.733) | 0.579 (0.395-0.859) |
| 10-min | 0.166 (0.139-0.200) | 0.210 (0.176-0.254) | 0.273 (0.228-0.330) | 0.327 (0.271-0.399) | 0.407 (0.325-0.514) | 0.472 (0.369-0.611) | 0.543 (0.414-0.721) | 0.621 (0.459-0.850) | 0.735 (0.520-1.05) | 0.830 (0.566-1.23) |
| 15-min | 0.201 (0.168-0.242) | 0.254 (0.213-0.307) | 0.330 (0.276-0.399) | 0.396 (0.328-0.483) | 0.492 (0.393-0.621) | 0.571 (0.446-0.738) | 0.657 (0.500-0.872) | 0.751 (0.555-1.03) | 0.889 (0.628-1.27) | 1.00 (0.684-1.49) |
| 30-min | 0.279 (0.234-0.336) | 0.354 (0.297-0.427) | 0.459 (0.383-0.555) | 0.550 (0.456-0.671) | 0.684 (0.546-0.865) | 0.795 (0.621-1.03) | 0.914 (0.696-1.21) | 1.04 (0.772-1.43) | 1.24 (0.874-1.77) | 1.40 (0.952-2.07) |
| 60-min | 0.390 (0.328-0.470) | 0.495 (0.414-0.596) | 0.641 (0.536-0.775) | 0.769 (0.637-0.938) | 0.956 (0.764-1.21) | 1.11 (0.867-1.44) | 1.28 (0.972-1.70) | 1.46 (1.08-2.00) | 1.73 (1.22-2.47) | 1.95 (1.33-2.90) |
| 2-hr | 0.570 (0.478-0.686) | 0.718 (0.601-0.865) | 0.931 (0.778-1.13) | 1.12 (0.929-1.37) | 1.41 (1.13-1.78) | 1.65 (1.29-2.14) | 1.92 (1.46-2.55) | 2.22 (1.64-3.04) | 2.68 (1.89-3.83) | 3.07 (2.09-4.55) |
| 3-hr | 0.711 (0.597-0.856) | 0.895 (0.750-1.08) | 1.16 (0.971-1.40) | 1.40 (1.16-1.71) | 1.76 (1.41-2.23) | 2.07 (1.62-2.68) | 2.42 (1.84-3.21) | 2.80 (2.07-3.84) | 3.39 (2.40-4.84) | 3.90 (2.66-5.78) |
| 6-hr | 1.02 (0.851-1.22) | 1.28 (1.08-1.55) | 1.67 (1.39-2.02) | 2.01 (1.66-2.45) | 2.52 (2.01-3.19) | 2.95 (2.31-3.82) | 3.42 (2.61-4.54) | 3.95 (2.92-5.40) | 4.74 (3.35-6.77) | 5.41 (3.68-8.02) |
| 12-hr | 1.34 (1.13-1.62) | 1.72 (1.44-2.08) | 2.24 (1.88-2.72) | 2.69 (2.23-3.28) | 3.33 (2.66-4.22) | 3.85 (3.01-4.98) | 4.41 (3.35-5.85) | 5.00 (3.70-6.84) | 5.86 (4.14-8.37) | 6.55 (4.46-9.71) |
| 24-hr | 1.76 (1.56-2.03) | 2.30 (2.03-2.66) | 3.02 (2.65-3.49) | 3.61 (3.15-4.22) | 4.43 (3.75-5.35) | 5.08 (4.21-6.25) | 5.75 (4.65-7.24) | 6.45 (5.08-8.35) | 7.42 (5.62-10.0) | 8.19 (6.00-11.4) |
| 2-day | 2.17 (1.92-2.50) | 2.87 (2.54-3.32) | 3.80 (3.35-4.41) | 4.58 (4.00-5.34) | 5.64 (4.77-6.80) | 6.48 (5.37-7.97) | 7.33 (5.94-9.24) | 8.23 (6.48-10.7) | 9.46 (7.16-12.8) | 10.4 (7.64-14.6) |
| 3-day | 2.40 (2.12-2.77) | 3.20 (2.83-3.70) | 4.27 (3.76-4.95) | 5.16 (4.50-6.02) | 6.38 (5.40-7.70) | 7.34 (6.08-9.04) | 8.33 (6.74-10.5) | 9.37 (7.38-12.1) | 10.8 (8.18-14.6) | 11.9 (8.74-16.6) |
| 4-day | 2.60 (2.30-3.00) | 3.48 (3.07-4.02) | 4.65 (4.10-5.39) | 5.63 (4.92-6.57) | 6.97 (5.90-8.41) | 8.03 (6.66-9.88) | 9.12 (7.38-11.5) | 10.3 (8.08-13.3) | 11.8 (8.95-15.9) | 13.1 (9.57-18.2) |
| 7-day | 2.99 (2.64-3.45) | 4.01 (3.54-4.63) | 5.35 (4.71-6.20) | 6.46 (5.64-7.54) | 7.98 (6.75-9.63) | 9.17 (7.60-11.3) | 10.4 (8.41-13.1) | 11.7 (9.19-15.1) | 13.4 (10.2-18.1) | 14.8 (10.8-20.6) |
| 10-day | 3.27 (2.89-3.77) | 4.38 (3.87-5.06) | 5.85 (5.15-6.78) | 7.06 (6.17-8.25) | 8.72 (7.38-10.5) | 10.0 (8.30-12.3) | 11.3 (9.18-14.3) | 12.7 (10.0-16.5) | 14.6 (11.1-19.7) | 16.1 (11.8-22.4) |
| 20-day | 3.94 (3.49-4.56) | 5.34 (4.72-6.18) | 7.21 (6.34-8.35) | 8.75 (7.65-10.2) | 10.9 (9.22-13.1) | 12.6 (10.4-15.5) | 14.3 (11.6-18.1) | 16.2 (12.7-20.9) | 18.7 (14.2-25.2) | 20.7 (15.2-28.9) |
| 30-day | 4.62 (4.09-5.34) | 6.29 (5.55-7.27) | 8.54 (7.52-9.90) | 10.4 (9.12-12.2) | 13.1 (11.1-15.8) | 15.3 (12.7-18.8) | 17.5 (14.2-22.1) | 19.9 (15.7-25.8) | 23.3 (17.6-31.4) | 26.0 (19.0-36.2) |
| 45-day | 5.42 (4.79-6.25) | 7.36 (6.49-8.50) | 10.1 (8.85-11.6) | 12.4 (10.8-14.5) | 15.7 (13.3-19.0) | 18.5 (15.3-22.7) | 21.4 (17.3-27.0) | 24.6 (19.4-31.9) | 29.2 (22.1-39.4) | 33.1 (24.2-46.1) |
| 60-day | 6.21 (5.49-7.17) | 8.38 (7.40-9.68) | 11.5 (10.1-13.3) | 14.2 (12.4-16.6) | 18.2 (15.4-21.9) | 21.5 (17.8-26.5) | 25.2 (20.4-31.7) | 29.2 (23.0-37.9) | 35.2 (26.7-47.5) | 40.3 (29.5-56.2) |

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

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

## PF graphical

# Worksheet J: Summary of Harvested Water Demand and Feasibility

| | | | | |
|---|---|---|---|---|
| 1 | What demands for harvested water exist in the tributary area (check all that apply): | | | |
| 2 | Toilet and urinal flushing | | | |
| 3 | Landscape irrigation | | **X** | |
| 4 | Other: _____ | | | |
| 5 | What is the design capture storm depth? (Figure III.1) | d | 0.80 | inches |
| 6 | What is the project size? | A | 85.30 | ac |
| 7 | What is the acreage of impervious area? | IA | 72.51 | ac |
| **For projects with multiple types of demand (toilet flushing, irrigation demand, and/or other demand)** | | | | |
| 8 | What is the minimum use required for partial capture? (Table X.6) | | NA | gpd |
| 9 | What is the project estimated wet season total daily use (Section X.2)? | | NA | gpd |
| 10 | Is partial capture potentially feasible? (Line 9 > Line 8?) | | No | |
| **For projects with only toilet flushing demand** | | | | |
| 11 | What is the minimum TUTIA for partial capture? (Table X.7) | | NA | |
| 12 | What is the project estimated TUTIA? | | NA | |
| 13 | Is partial capture potentially feasible? (Line 12 > Line 11?) | | No | |
| **For projects with only irrigation demand** | | | | |
| 14 | What is the minimum irrigation area required based on conservation landscape design? (Table X.8) | | 82.39 | ac |
| 15 | What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2) | | 12.80 | ac |
| 16 | Is partial capture potentially feasible? (Line 15 > Line 14?) | | No | |

Provide supporing assumptions and citations for controlling demand calculation:

| | | |
|---|---|---|
| *Minimum EIATA for Conservation-Type Landscaping per Table X.8 =* | *0.88* | *ac/ac* |
| *Minimum Irrigated Area for 100% Conservation Landscaping =* | *82.39* | *ac* |
| *Proposed Landscaping Type =* | *Conservation* | |
| *Total Proposed Irrigated Area for Conservation Type =* | *12.80* | *ac* |

**Table 2.7: Infiltration BMP Feasibility Worksheet**

| | *Infeasibility Criteria* | *Yes* | *No* |
|---|---|---|---|
| 1 | **Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VIII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria | | X |
| Provide basis:<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 2 | Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert):<br>- The BMP can only be located less than 50 feet away from slopes steeper than 15 percent<br>- The BMP can only be located less than eight feet from building foundations or an alternative setback.<br>- A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be | | X |
| Provide basis:<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 3 | Would infiltration of the DCV from drainage area **violate downstream water rights**? | | X |
| Provide basis:<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |

**Table 2.7: Infiltration BMP Feasibility Worksheet (continued)**

| | ***Partial Infeasibility Criteria*** | ***Yes*** | ***No*** |
|---|---|---|---|
| 4 | Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils? | X | |
| Provide basis:<br>Project site has D soils.<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 5 | Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in Appendix VII. | X | |
| Provide basis:<br>The following is an excerpt from the the Geotechnical Report by LGC, dated November 22, 2024, regarding their advisement against infiltration: “Based on our experience in the area and results of field infiltration testing indicating highly variable infiltration rates and soils with fines contents (silts and clays), COT data indicating highly layered native soils, we recommend against the intentional infiltration of stormwater into the subsurface soils.”<br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 6 | Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?** | | X |
| Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 7 | Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?** | | X |
| Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |

**Table 2.7: Infiltration BMP Feasibility Worksheet (continued)**

| **Infiltration Screening Results (check box corresponding to result):** | | |
|---|---|---|
| 8 | Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII)<br>Provide narrative discussion and supporting evidence:<br><br>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | |
| 9 | If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent.<br>Provide basis:<br><br>Summarize findings of infeasibiliy screening | |
| 10 | If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply<br>Provide basis:<br>Geotechncial engineer recommends against infiltration.<br><br>Summarize findings of infeasibiliy screening | X |
| 11 | If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable. | |

# Appendix B

## NOTICE OF TRANSFER OF RESPONSIBILITY

# NOTICE OF TRANSFER OF RESPONSIBILITY

# WATER QUALITY MANAGEMENT PLAN

Submission of this Notice Of Transfer of Responsibility constitutes notice to the City that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further described below.

I. Previous Owner/ Previous Responsible Party Information

| Company/ Individual Name: | | Contact Person: | |
|---|---|---|---|
| Street Address: | | Title: | |
| City: | State: | ZIP: | Phone: |

II. Information about Site Transferred

| Name of Project (if applicable): | |
|---|---|
| Title of WQMP Applicable to site: | |
| Street Address of Site (if applicable): | |
| Planning Area (PA) and/ or Tract Number(s) for Site: | Lot Numbers (if Site is a portion of a tract): |
| Date WQMP Prepared (and revised if applicable): | |

III. New Owner/ New Responsible Party Information

| Company/ Individual Name: | | Contact Person: | |
|---|---|---|---|
| Street Address: | | Title: | |
| City: | State: | ZIP: | Phone: |

IV. Ownership Transfer Information

| General Description of Site Transferred to New Owner: | General Description of Portion of Project/ Parcel Subject to WQMP Retained by Owner (if any): |
|---|---|
| Lot/ Tract Numbers of Site Transferred to New Owner: | |

| |
|---|
| Remaining Lot/ Tract Numbers Subject to WQMP Still Held by Owner (if any): |
| Date of Ownership Transfer: |

Note: When the Previous Owner is transferring a Site that is a portion of a larger project/ parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/ parcel no transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/ parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled as "Previously Transferred".

V. Purpose of Notice of Transfer

The purposes of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Order is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

| | |
|---|---|
| Printed Name of Previous Owner Representative: | Title: |
| Signature of Previous Owner Representative: | Date: |

B. New Owner

I certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

| | |
|---|---|
| Printed Name of New Owner Representative: | Title: |
| Signature: | Date: |

# Appendix C

## EDUCATIONAL MATERIALS

# The Ocean Begins at Your Front Door

***Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.***

## *Did You Know?*

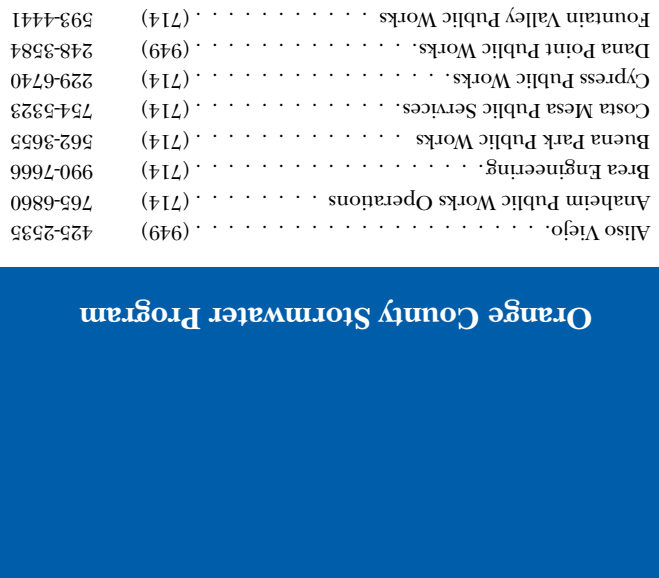
- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

## *Where Does It Go?*

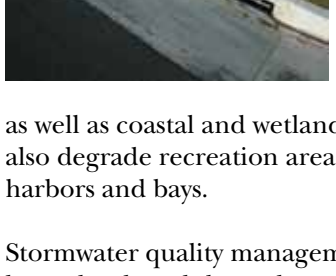
- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

## *Sources of Non-Point Source Pollution*

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.



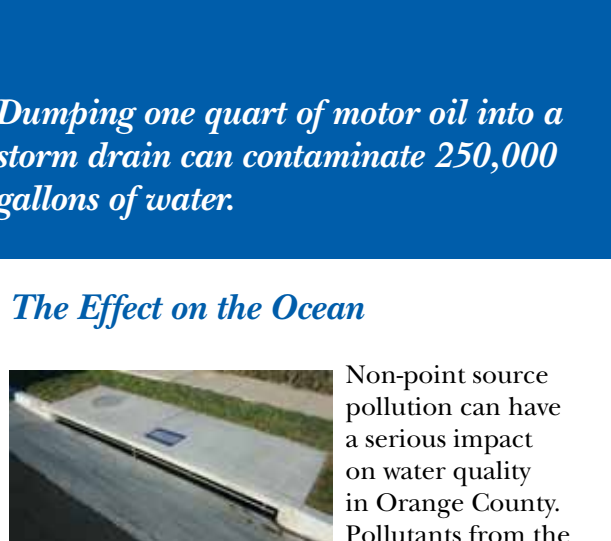
## *The Effect on the Ocean*



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.



***Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.***

# *For More Information*

**California Environmental Protection Agency**
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

**Earth 911** - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

**Health Care Agency’s Ocean and Bay Water Closure and Posting Hotline**
(714) 433-6400 or visit www.ocbeachinfo.com

**Integrated Waste Management Dept. of Orange County** (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

**O.C. Agriculture Commissioner**
(714) 447-7100 or visit www.ocagcomm.com

**Stormwater Best Management Practice Handbook**
Visit www.cabmphandbooks.com

**UC Master Gardener Hotline**
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

| | | |
|---|---|---|
| Aliso Viejo | (949) | 425-2535 |
| Anaheim Public Works Operations | (714) | 765-6860 |
| Brea Engineering | (714) | 990-7666 |
| Buena Park Public Works | (714) | 562-3655 |
| Costa Mesa Public Services | (714) | 754-5323 |
| Cypress Public Works | (714) | 229-6740 |
| Dana Point Public Works | (949) | 248-3584 |
| Fountain Valley Public Works | (714) | 593-4441 |
| Fullerton Engineering Dept. | (714) | 738-6853 |
| Garden Grove Public Works | (714) | 741-5956 |
| Huntington Beach Public Works | (714) | 536-5431 |
| Irvine Public Works | (949) | 724-6315 |
| La Habra Public Services | (562) | 905-9792 |
| La Palma Public Works | (714) | 690-3310 |
| Laguna Beach Water Quality | (949) | 497-0378 |
| Laguna Hills Public Services | (949) | 707-2650 |
| Laguna Niguel Public Works | (949) | 362-4337 |
| Laguna Woods Public Works | (949) | 639-0500 |
| Lake Forest Public Works | (949) | 461-3480 |
| Los Alamitos Community Dev. | (562) | 431-3538 |
| Mission Viejo Public Works | (949) | 470-3056 |
| Newport Beach, Code & Water Quality Enforcement | (949) | 644-3215 |
| Orange Public Works | (714) | 532-6480 |
| Placentia Public Works | (714) | 993-8245 |
| Rancho Santa Margarita | (949) | 635-1800 |
| San Clemente Environmental Programs | (949) | 361-6143 |
| San Juan Capistrano Engineering | (949) | 234-4413 |
| Santa Ana Public Works | (714) | 647-3380 |
| Seal Beach Engineering | (562) | 431-2527 x317 |
| Stanton Public Works | (714) | 379-9222 x204 |
| Tustin Public Works/Engineering | (714) | 573-3150 |
| Villa Park Engineering | (714) | 998-1500 |
| Westminster Public Works/Engineering | (714) | 898-3311 x446 |
| Yorba Linda Engineering | (714) | 961-7138 |
| Orange County Stormwater Program | (877) | 897-7455 |

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

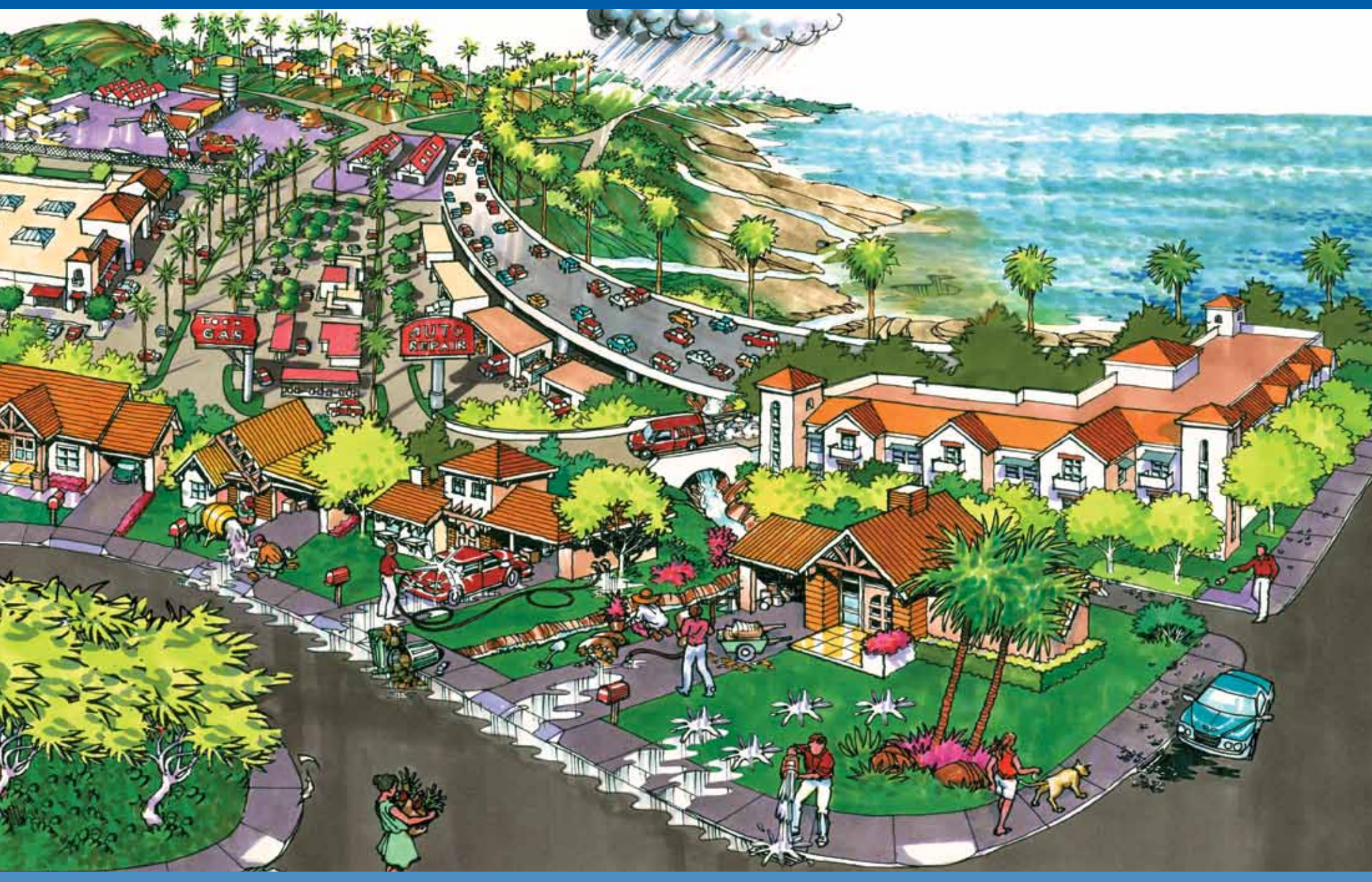
On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

Printed on Recycled Paper




Orange County Stormwater Program

# The Ocean Begins at Your Front Door




*Never allow pollutants to enter the street, gutter or storm drain!*

Follow these simple steps to help reduce water pollution:

## *Household Activities*

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

## *Automotive*

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

## *Pool Maintenance*

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

## *Landscape and Gardening*

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

## *Trash*

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

## *Pet Care*

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

## *Common Pollutants*

### *Home Maintenance*

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

### *Lawn and Garden*

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

### *Automobile*

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

# DF-1
## DRAINAGE FACILITY OPERATION AND MAINTENANCE

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and storm water that may contain certain pollutants. Consequently these pollutants may accumulate in the system and must be removed periodically. In addition, the systems must also be maintained to function properly hydraulically to avoid flooding. Maintaining the system may involve the following activities:

1. Inspection and Cleaning of Stormwater Conveyance Structures
2. Controlling Illicit Connections and Discharges
3. Controlling Illegal Dumping

This list of Model Maintenance Procedures can be utilized as an inspection checklist to determine where better compliance with Designated Minimum Best Management Practices (notated with checkmarks and capital letters) is needed, and to recommend Additional Best Management Practices (notated with bullet points and lower case letters) that may be applicable under certain circumstances, especially where there are certain Pollutant Constituents of Concern. BMPs applicable to certain constituents are notated as:

*Bacteria (BACT)* *Sediment (SED)* *Nutrients (NUT)* *Oil and Grease (O&G)* *Pesticides (PEST)*
*OtherToxic Compounds (TOX)* *Trash (TRASH)* *Hydrological Impacts (HYD)* *Any/All or General (ANY)*

Program/Facility Being Inspected: _____

Date: _____ Inspector Name: _____

When completed, the checklist should be attached to the General Inspection Form Cover Sheet and copies should be provided to the Supervisor of the Facility/Program being inspected.

**MAINTENANCE PROCEDURES:**

**1. Inspection and Cleaning of Drainage Facilities**

| Unsatisfactory | OK | General Guidelines |
|---|---|---|
| ☐ _____ | ☐ | T 1A. Annually inspect and clean drainage structures as needed. |
| ☐ _____ | ☐ | T 1B. Maintain appropriate records of cleaning and inspections. |
| ☐ _____ | ☐ | T 1C. Properly dispose of removed materials at a landfill or recycling facility. |
| ☐ _____ | ☐ | T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate. |
| ☐ _____ | ☐ | T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures. |
| ☐ _____ | ☐ | T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal. |
| ☐ _____ | ☐ | T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill. |

| Unsatisfactory | OK |
|---|---|
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
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| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |

**General Guidelines (cont.)**

- 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH)
- 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED)
- 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED)
- 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX)
- 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH)
- 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G)
- 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH)

**Storm Drain Flushing**

- 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH).
- 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED)

**Waste Management**

T 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH)
- 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).

## 2. Controlling Illicit Connections and Discharges

| Unsatisfactory | OK | General Guidelines |
|---|---|---|
| ☐ | ☐ | T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up. |
| ☐ | ☐ | T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.) |
| ☐ | ☐ | T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363. |
| ☐ | ☐ | T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline. |
| | | **Storm Drain Stenciling ("No Dumping—Drains to Ocean")** |
| ☐ | ☐ | T 2E. Implement and maintain a storm drain stenciling program. |
| ☐ | ☐ | • 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH). |

## 3. Controlling Illegal Dumping

| | | Field Investigation |
|---|---|---|
| ☐ | ☐ | T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up. |
| ☐ | ☐ | T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). |
| ☐ | ☐ | T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363. |
| ☐ | ☐ | T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline. |
| ☐ | ☐ | T 3E. If perpetrator can be identified, take appropriate enforcement action. |
| ☐ | ☐ | • 3a. Consider posting "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY) |

| Unsatisfactory | OK | Training/Education/Outreach |
|---|---|---|
| ☐ _____ | ☐ | T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping. |
| ☐ _____ | ☐ | T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363. |
| ☐ _____ | ☐ | • 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY) |

## LIMITATIONS:

Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.



***Do your part to prevent water pollution in our creeks, rivers, bays and ocean.***

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of household hazardous waste can lead to water pollution. Batteries, electronics, paint, oil, gardening chemicals, cleaners and other hazardous materials cannot be thrown in the trash. They also must never be poured or thrown into yards, sidewalks, driveways, gutters or streets. Rain or other water could wash the materials into the storm drain and eventually into our waterways and the ocean. In addition, hazardous waste must not be poured in the sanitary sewers (sinks and toilets).

***NEVER DISPOSE OF HOUSEHOLD HAZARDOUS WASTE IN THE TRASH, STREET, GUTTER, STORM DRAIN OR SEWER.***

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

**To Report Illegal Dumping of Household Hazardous Waste call 1-800-69-TOXIC**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

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Help Prevent Ocean Pollution:

# Proper Disposal of Household Hazardous Waste



**The Ocean Begins at Your Front Door**

PROJECT Pollution PREVENTION

**ORANGE COUNTY**

# Pollution Prevention

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "household hazardous waste" or "HHW." HHW can be found throughout your home, including the bathroom, kitchen, laundry room and garage.

*WHEN POSSIBLE, USE NON-HAZARDOUS OR LESS-HAZARDOUS PRODUCTS.*

Disposal of HHW down the drain, on the ground, into storm drains, or in the trash is illegal and unsafe.

Proper disposal of HHW is actually easy. Simply drop them off at a Household Hazardous Waste Collection Center (HHWCC) for free disposal and recycling. Many materials including anti-freeze, latex-based paint, motor oil and batteries can be recycled. Some centers have a "Stop & Swap" program that lets you take partially used home, garden, and automobile products free of charge. There are four HHWCCs in Orange County:

**Anaheim**:.....1071 N. Blue Gum St
**Huntington Beach**:.....17121 Nichols St
**Irvine**:..... 6411 Oak Canyon
**San Juan Capistrano**:... 32250 La Pata Ave

Centers are open Tuesday-Saturday, 9 a.m.-3 p.m. Centers are closed on rainy days and major holidays. For more information, call **(714) 834-6752** or visit **www.oclandfills.com.**

## *Common household hazardous wastes*

- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & thermostats)
- All forms of electronic waste including computers and microwaves
- Pool & spa chemicals
- Cleaners
- Medications
- Propane (camping & BBQ)
- Mercury-containing lamps
- Television & monitors (CRTs, flatscreens)

## *Tips for household hazardous waste*

- Never dispose of HHW in the trash, street, gutter, storm drain or sewer.
- Keep these materials in closed, labeled containers and store materials indoors or under a cover.
- When possible, use non-hazardous products.
- Reuse products whenever possible or share with family and friends.
- Purchase only as much of a product as you'll need. Empty containers may be disposed of in the trash.
- HHW can be harmful to humans, pets and the environment. Report emergencies to 911.



*Do your part to prevent water pollution in our creeks, rivers, bays and ocean.*

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common household activities can lead to water pollution if you're not careful.

*Remember the Water in Your Storm Drain is Not Treated BEFORE It Enters Our Waterways*

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure to help prevent water pollution.

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

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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RECYCLE USED OIL

Help Prevent Ocean Pollution:

# Household Tips



**The Ocean Begins at Your Front Door**

PROJECT Pollution PREVENTION

# Pollution Prevention

## *Household Activities*

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

## *Household Hazardous Wastes include:*

- ▲ **Batteries**
- ▲ **Paint thinners, paint strippers and removers**
- ▲ **Adhesives**
- ▲ **Drain openers**
- ▲ **Oven cleaners**
- ▲ **Wood and metal cleaners and polishes**
- ▲ **Herbicides and pesticides**
- ▲ **Fungicides/wood preservatives**
- ▲ **Automotive fluids and products**
- ▲ **Grease and rust solvents**
- ▲ **Thermometers and other products containing mercury**
- ▲ **Fluorescent lamps**
- ▲ **Cathode ray tubes, e.g. TVs, computer monitors**
- ▲ **Pool and spa chemicals**

## *Gardening Activities*

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

## *Washing and Maintaining Your Car*

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled "non-toxic," "phosphate free" or "biodegradable." Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.
- Do not use acid-based wheel cleaners and "hose off" engine degreasers at home. They can be used at a commercial facility, which can properly process the washwater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

*For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.*



**Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.**

**You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.**

For more information,
please call
University of California Cooperative
Extension Master Gardeners at
(714) 708-1646
or visit these Web sites:
www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen sample visit the Orange County Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the
**Orange County 24-Hour**
**Water Pollution Problem**
**Reporting Hotline**
**at 1-877-89-SPILL (1-877-897-7455).**

**For emergencies, dial 911.**

Information From:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental Horticulture Advisor; Carolyn L. Unruh, University of California Cooperative Extension staff writer. Photos courtesy of the UC Statewide IPM Program and Darren Haver.

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Help Prevent Ocean Pollution:

# Responsible Pest Control



# Tips for Pest Control

## *Key Steps to Follow:*

### *Step 1:* Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.



Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

### *Step 2:* Determine how many pests are present and causing damage.



Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.

UC CE University of California Cooperative Extension

### *Step 3:* If a pesticide must be used, choose the least toxic chemical.

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

### *Step 4:* Wear appropriate protective clothing.

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

### *Step 5:* Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

### *Step 6:* In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

### *Step 7:* Properly store and dispose of unused pesticides.



Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

**Household Hazardous Waste Collection Center**
**(714) 834-6752**
**www.oclandfills.com**

PROJECT Pollution PREVENTION



**Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.**

**You would never put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.**

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

To report a spill,
call the
**Orange County 24-Hour Water Pollution Problem Reporting Hotline**
**1-877-89-SPILL** (1-877-897-7455).

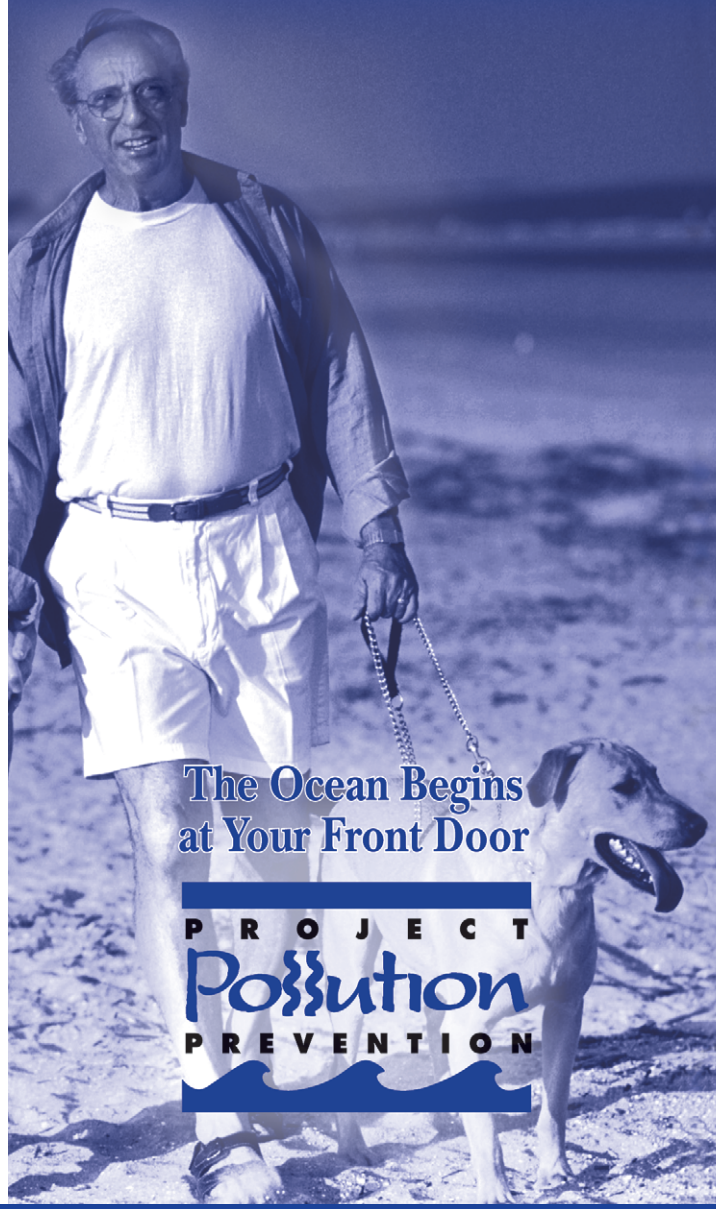
**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

# Tips for Pet Care



# Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

## *Washing Your Pets*

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.



## *Flea Control*

- Consider using oral or topical flea control products.

- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call **(714) 834-6752**.



## *Why You Should Pick Up After Your Pet*

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.



As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.



Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION



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

To report a spill,
call the
**Orange County 24-Hour Water Pollution Problem Reporting Hotline**
at **1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help prevent water pollution. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

# Tips for Residential Pool, Landscape and Hardscape Drains



**The Ocean Begins at Your Front Door**

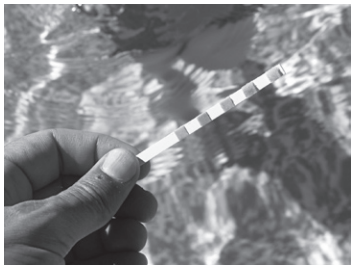
PROJECT Pollution PREVENTION

# Tips for Residential Pool, Landscape and Hardscape Drains

## Pool Maintenance

All pool water discharged to the curb, gutter or permitted pool drain from your property must meet the following water quality criteria:

- The residual chlorine does not exceed 0.1 mg/L (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration.
- There is no discharge of filter media or acid cleaning wastes.



Some cities have ordinances that do not allow pool water to be discharged to the storm drain. Check with your city.

## Landscape and Hardscape Drains

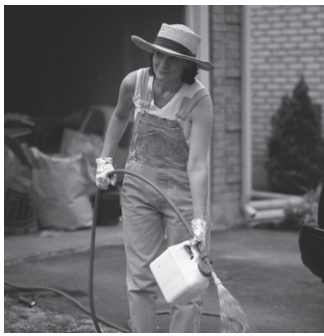
The following recommendations will help reduce or prevent pollutants from your landscape and hardscape drains from entering the street, gutter or storm drain. Unlike water that enters the sewer (from sinks and toilets), water that enters a landscape or hardscape drain is not treated before entering our creeks, rivers, bays and ocean.

## Household Activities

- Do not rinse spills of materials or chemicals to any drain.
- Use dry cleanup methods such as applying cat litter or another absorbent material, then sweep it up and dispose of it in the trash. If the material is hazardous, dispose of it at a Household Hazardous Waste Collection Center (HHWCC). For locations, call **(714) 834-6752** or visit **www.oclandfills.com**.
- Do not hose down your driveways, sidewalks or patios to your landscape or hardscape drain. Sweep up debris and dispose of it in the trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash.
- Do not store items such as cleaners, batteries, automotive fluids, paint products, TVs, or computer monitors uncovered outdoors. Take them to a HHWCC for disposal.

## Yard Maintenance

- Do not overwater. Water by hand or set automated irrigation systems to reflect seasonal water needs.
- Follow directions on pesticides and fertilizers (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Cultivate your garden often to control weeds and reduce the need to use chemicals.



## Vehicle Maintenance

- Never pour oil or antifreeze down your landscape or hardscape drain. Recycle these substances at a service station, a waste collection center or used oil recycling center. For locations, contact the Used Oil Program at **1-800-CLEANUP** or visit **www.CLEANUP.org**.
- Whenever possible, take your vehicle to a commercial car wash.
- If you do wash your vehicle at home, do not allow the washwater to go down your landscape or hardscape drain. Instead, dispose of it in the sanitary sewer (a sink or toilet) or onto an absorbent surface such as your lawn.
- Use a spray nozzle that will shut off the water when not in use.





**Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Swimming pools and spas are common in Orange County, but they must be maintained properly to guarantee that chemicals aren't allowed to enter the street, where they can flow into the storm drains and then into the waterways. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.**

**You would never dump pool chemicals into the ocean, so don't let it enter the storm drains. Follow these easy tips to help prevent water pollution.**

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

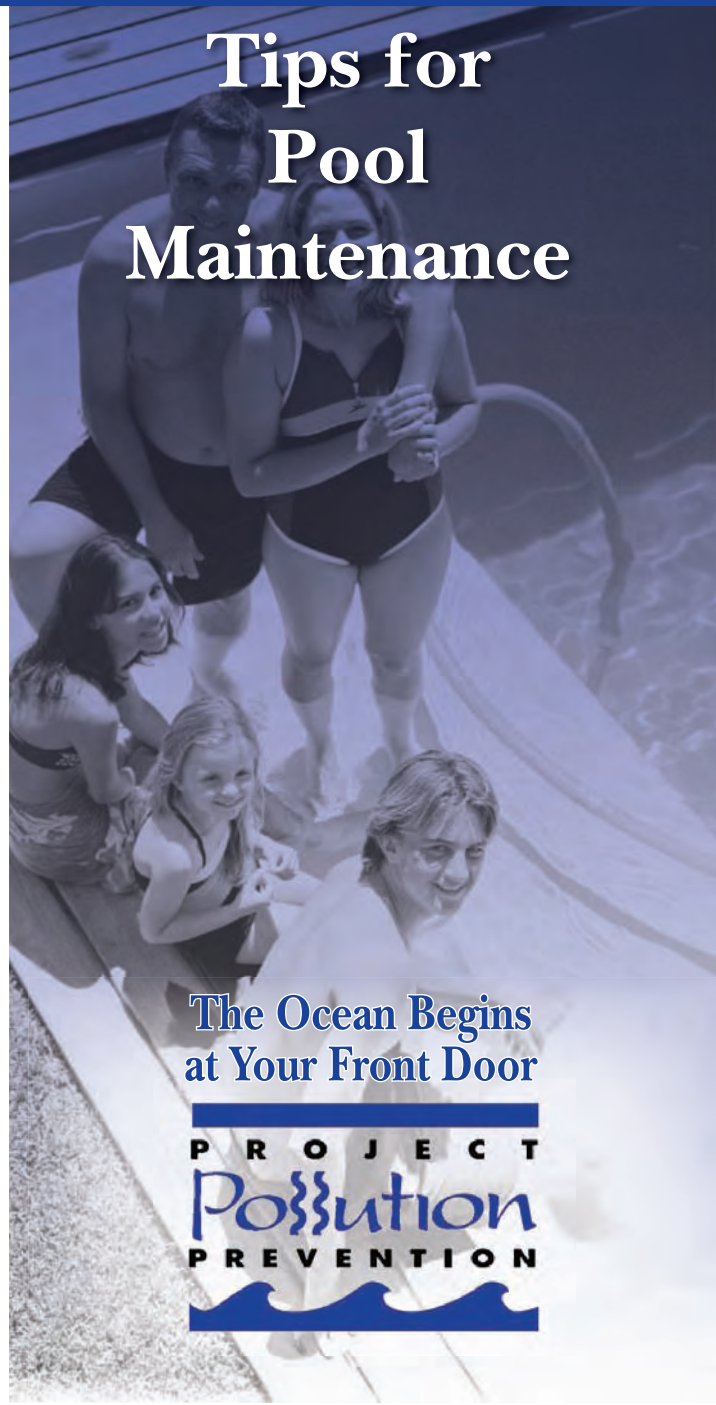
To report a spill,
call the
**Orange County 24-Hour**
**Water Pollution Reporting Hotline**
**1-877-89-SPILL** (1-877-897-7455).

**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help prevent water pollution while maintaining your pool. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Help Prevent Ocean Pollution:

# Tips for Pool Maintenance



**The Ocean Begins at Your Front Door**

PROJECT Pollution PREVENTION

# Tips for Pool Maintenance

Many pools are plumbed to allow the pool to drain directly to the sanitary sewer. If yours is not, follow these instructions for disposing of pool and spa water.



## *Acceptable and Preferred Method of Disposal*

When you cannot dispose of pool water in the sanitary sewer, the release of dechlorinated swimming pool water is allowed if all of these tips are followed:

- The residual chlorine does not exceed 0.1 mg/l (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration, dirt or algae.
- There is no discharge of filter media.
- There is no discharge of acid cleaning wastes.
- Some cities may have ordinances that do not allow pool water to be disposed into a storm drain. Check with your city.

## *How to Know if You're Following the Standards*

You can find out how much chlorine is in your water by using a pool testing kit. Excess chlorine can be removed by discontinuing the use of chlorine for a few days prior to discharge or by purchasing dechlorinating chemicals from a local pool supply company. Always make sure to follow the instructions that come with any products you use.





## *Doing Your Part*

By complying with these guidelines, you will make a significant contribution toward keeping pollutants out of Orange County's creeks, streams, rivers, bays and the ocean. This helps to protect organisms that are sensitive to pool chemicals, and helps to maintain the health of our environment.

PROJECT Pollution PREVENTION



# R-4
# HOME AND GARDEN CARE ACTIVITIES

| The activities outlined in this fact sheet target the following pollutants: | |
|---|---|
| Sediment | x |
| Nutrients | |
| Bacteria | x |
| Foaming Agents | x |
| Metals | x |
| Hydrocarbons | x |
| Hazardous Materials | x |
| Pesticides and Herbicides | |
| Other | x |

## HOME CARE

Many hazardous materials may be used in and around residences during routine maintenance activities (such as: oils, paints, cleaners, bleaches, pesticides, glues, solvents, and other products). Improper or excessive use of these products can increase the potential for pollutants to be transported to the storm drain by runoff. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting home care activities. Remember - The ocean starts at your front door.

## Required Activities

- Clean out painting equipment in an area where the waste can be contained and properly disposed of (latex – sewer, oil based – household hazardous waste center).
- Rinse off cement mixers and cement laden tools in a contained washout area. Dispose of dried concrete waste in household trash.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers. Dispose of them at a household hazardous waste center.
- Household wash waters (e.g. washer machine effluent, mop water, etc.) must be disposed of in the sanitary sewer.
- Pool and spa water may be discharged to the storm drain if residual chlorine is less than 0.1 mg/L, the pH is between 6.5 and 8.5, and the water is free from any unusual coloration. (Call 714-834-6107 to obtain information on a pool drain permit). Pool filter media must be contained and disposed of properly.

## Recommended Activities

- Only purchase the types and amounts of materials needed.
- Share unused portions of products with neighbors or community programs (latex paint)

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

## GARDEN CARE

Garden activities may contribute pollutants via soil erosion, green waste, fertilizer and pesticide use. Plant and garden care activities such as landscape maintenance, fertilization, and pesticide application have the potential to discharge significant quantities of pollutants to the storm drain system. Nonvegetated surfaces may allow for significant erosion leading to high sediment loads. Other pollutants such as pesticides may adsorb onto the soil particles and be transported off site. Excess fertilizer and pesticide pollutants from over application may be carried to the storm drain by dissolving in irrigation runoff or rainwater. Green wastes may also contain organic matter and may have adsorbed fertilizers and pesticides.

| The activities outlined in this fact sheet target the following pollutants: | |
|---|---|
| Sediment | x |
| Nutrients | x |
| Bacteria | x |
| Foaming Agents | |
| Metals | |
| Hydrocarbons | |
| Hazardous Materials | |
| Pesticides and Herbicides | x |
| Other | x |

Excessive irrigation is often the most significant factor in home and garden care activities. Pollutants may dissolve in irrigation water and then be transported to the storm drain, or particles and materials coated with fertilizers and pesticides may be suspended in the irrigation flow and carried to the storm drain. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting garden care activities. Remember - The ocean starts at your front door.

### Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Minimize the use of pesticides and fertilizers. Read the labels and follow directions to avoid improper use. Do not apply chemicals if it is windy or about to rain.
- Properly clean up and dispose of spills of gardening chemicals, fertilizes, or soils. If possible, return the spilled material to the container for future use.
- Lawn and garden care products must be stored in closed labeled containers, in covered areas, or off-ground and under protective tarps.
- Household hazardous waste must be properly disposed at a household hazardous waste center.
- Cover nonvegetated surfaces to prevent erosion.

### Recommended Activities

- Utilize xeroscaping and use of drought and insect resistant landscaping.
- Cultivate garden often to control weeds
- Use integrated pest management (IPM). Planting pest repelling plants (e.g. Marigolds) or using pest eating insects (e.g. ladybugs) may reduce the need for pesticides.
- Do not leave food (human or pet) outside overnight
- Remove fruit and garden waste

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



# R-5
# DISPOSAL OF PET WASTES

Pet wastes left in the environment may introduce solids, bacteria, and nutrients to the storm drain. The type and quantity of waste will dictate the proper disposal method. Small quantities of waste are best disposed with regular trash or flushed down a toilet. Large quantities of wastes from herbivore animals may be composted for subsequent use or disposal to landfill.

| The activities outlined in this fact sheet target the following pollutants: | |
|---|---|
| Sediment | x |
| Nutrients | x |
| Bacteria | x |
| Foaming Agents | |
| Metals | |
| Hydrocarbons | |
| Hazardous Materials | |
| Pesticides and Herbicides | |
| Other | |

Pick up after your pet! It's as easy as 1-2-3. 1) Bring a bag. 2) Clean it up. 3) Dispose of it properly (toilet or trash). The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before you dispose of any pet wastes. Remember - The ocean starts at your front door.

## Required Activities

- All pet wastes must be picked up and properly disposed of. Pet waste should be disposed of in the regular trash, flushed down a toilet, or composted as type and quantities dictate.
- Properly dispose of unused flea control products (shampoo, sprays, or collars).
- Manure produced by livestock in uncovered areas should be removed at least daily for composting, or storage in water-tight container prior to disposal. Never hose down to stream or storm drain. Composting or storage areas should be configured and maintained so as not to allow contact with runoff. Compost may be donated to greenhouses, nurseries, and botanical parks. Topsoil companies and composting centers may also accept composted manure.
- Line waste pits or trenches with an impermeable layer, such as thick plastic sheeting.
- When possible, allow wash water to infiltrate into the ground, or collect in an area that is routed to the sanitary sewer.
- Confine livestock in fenced in areas except during exercise and grazing times. Restrict animal access to creeks and streams, preferably by fencing.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

- Install gutters that will divert roof runoff away from livestock areas.

## Recommended Activities

- In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.

- Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.

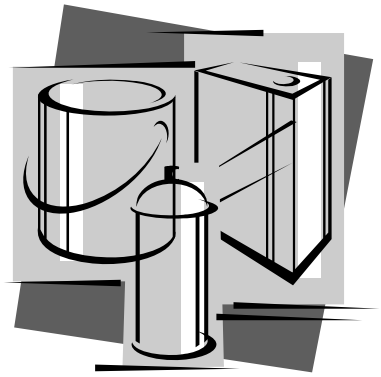
- Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.

- Maintain healthy and vigorous pastures with at least three inches of leafy material.

- Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.

- Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant form nearby creeks or storm drains.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



# R-7
# HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

| The activities outlined in this fact sheet target the following pollutants: | |
|---|---|
| Sediment | |
| Nutrients | |
| Bacteria | |
| Foaming Agents | x |
| Metals | x |
| Hydrocarbons | x |
| Hazardous Materials | x |
| Pesticides and Herbicides | x |
| Other | x |

List of most common HHW products:
- Drain openers
- Oven cleaners
- Wood and metal cleaners and polishes
- Automotive oil and fuel additives
- Grease and rust solvents
- Carburetor and fuel injection cleaners
- Starter fluids
- Batteries
- Paint Thinners
- Paint strippers and removers
- Adhesives
- Herbicides
- Pesticides
- Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

RECYCLE USED OIL

## Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

## Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

*The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.*

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



# R-8
# WATER CONSERVATION

| The activities outlined in this fact sheet target the following pollutants: | |
|---|---|
| Sediment | x |
| Nutrients | x |
| Bacteria | x |
| Foaming Agents | x |
| Metals | x |
| Hydrocarbons | x |
| Hazardous Materials | x |
| Pesticides and Herbicides | x |
| Other | x |

Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

Hosing off outside areas to wash them down not only consumes large quantities of water, but also transports any pollutants, sediments, and waste to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before using water. Remember - The ocean starts at your front door.

## Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Do not hose off outside surfaces to clean, sweep with a broom instead.

## Recommended Activities

- Fix any leaking faucets and eliminate unnecessary water sources.
- Use xeroscaping and drought tolerant landscaping to reduce the watering needs.
- Do not over watering lawns or gardens. Over watering wastes water and promotes diseases.
- Use a bucket to re-soak sponges/rags while washing automobiles and other items outdoors. Use hose only for rinsing.
- Wash automobiles at a commercial car wash employing water recycling.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



***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.

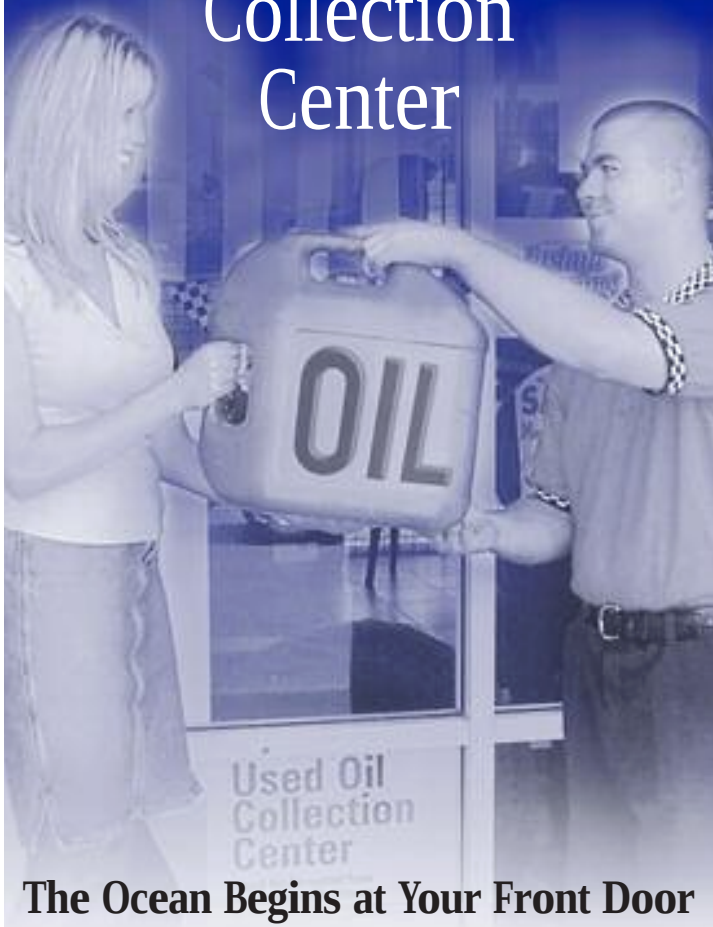
RECYCLE USED OIL

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

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# Help Prevent Ocean Pollution:

# Recycle at Your Local Used Oil Collection Center




**The Ocean Begins at Your Front Door**

PROJECT Pollution PREVENTION

NORTH COUNTY

# Used Oil Collection Centers

## *Anaheim*

**All Seasons Tire and Auto Center, Inc.**
817 S Brookhurst St., Anaheim, CA 92804
(714)772-6090( )
CIWMB#: 30-C-03177

**AutoZone #3317**
423 N Anaheim Blvd., Anaheim, CA 92805
(714)776-0787( )
CIWMB#: 30-C-05263

**AutoZone #5226**
2145 W Lincoln Ave., Anaheim, CA 92801
(714)533-6599( )
CIWMB#: 30-C-04604

**Bedard Automotive**
3601 E Miraloma Ave., Anaheim, CA 92806
(714)528-1380( )
CIWMB#: 30-C-02205

**Classic Chevrolet**
1001 Weir Canyon Rd., Anaheim, CA 92807
(714)283-5400( )
CIWMB#: 30-C-05223

**Econo Lube N' Tune #4**
3201 W Lincoln Ave., Anaheim, CA 92801
(714)821-0128( )
CIWMB#: 30-C-01485

**EZ Lube Inc - Savi Ranch #43**
985 N Weir Canyon Rd., Anaheim, CA 92807
(714)556-1312( )
CIWMB#: 30-C-06011

**Firestone Store #71C7**
1200 S Magnolia Ave., Anaheim, CA 92804
(949)598-5520( )
CIWMB#: 30-C-05743

**Great Western Lube Express**
125 N Brookhurst St., Anaheim, CA 92801
(714)254-1300( )
CIWMB#: 30-C-05542

**HR Pro Auto Service Center**
3180 W Lincoln Ave., Anaheim, CA 92801
(714)761-4343( )
CIWMB#: 30-C-05927

**Ira Newman Automotive Services**
1507 N State College Blvd., Anaheim, CA 92806
(714)635-2392( )
CIWMB#: 30-C-01482

**Jiffy Lube #1028**
2400 W Ball Rd., Anaheim, CA 92804
(714)761-5211( )
CIWMB#: 30-C-00870

**Jiffy Lube #1903**
2505 E Lincoln Ave., Anaheim, CA 92806
(714)772-4000( )
CIWMB#: 30-C-05511

**Jiffy Lube #2340**
2181 W Lincoln Ave., Anaheim, CA 92801
(714)533-1000( )
CIWMB#: 30-C-04647

**Kragen Auto Parts #1303**
1088 N State College Blvd., Anaheim, CA 92806
(714)956-7351( )
CIWMB#: 30-C-03438

**Kragen Auto Parts #1399**
2245 W Ball Rd., Anaheim, CA 92804
(714)490-1274( )
CIWMB#: 30-C-04094

**Kragen Auto Parts #1565**
2072 Lincoln Ave., Anaheim, CA 92806
(714)502-6992( )
CIWMB#: 30-C-04078

**Kragen Auto Parts #1582**
3420 W Lincoln Ave., Anaheim, CA 92801
(714)828-7977( )
CIWMB#: 30-C-04103

**Pep Boys #613**
10912 Katella Ave., Anaheim, CA 92804
(714)638-0863( )
CIWMB#: 30-C-01756

**Pep Boys #663**
3030 W Lincoln Anaheim, CA 92801
(714)826-4810( )
CIWMB#: 30-C-03417

**Pep Boys #809**
8205 E Santa Ana Cyn Rd., Anaheim, CA 92808
(714)974-0105( )
CIWMB#: 30-C-03443

**Pick Your Part**
1235 S Beach Blvd., Anaheim, CA 92804
(714)527-1645( )
CIWMB#: 30-C-03744

**PK Auto Performance**
3106 W. Lincoln Ave., Anaheim, CA 92801
(714)826-2141( )
CIWMB#: 30-C-05628

**Quick Change Lube and Oil**
2731 W Lincoln Ave., Anaheim, CA 92801
(714)821-4464( )
CIWMB#: 30-C-04363

**Saturn of Anaheim**
1380 S Auto Center Dr., Anaheim, CA 92806
(714)648-2444( )
CIWMB#: 30-C-06332

**Sun Tech Auto Service**
105 S State College Blvd., Anaheim, CA 92806
(714)956-1389( )
CIWMB#: 30-C-06455

**Vonic Truck Services**
515 S Rose St., Anaheim, CA 92805
(714)533-3333( )
CIWMB#: 30-C-01142

## *Anaheim Hills*

**Anaheim Hills Car Wash & Lube**
5810 E La Palma Ave., Anaheim Hills, CA 92807
(714)777-6605( )
CIWMB#: 30-C-01387

## *Brea*

**Firestone Store #27A9**
891 E Imperial Hwy., Brea, CA 92821
(714)529-8404( )
CIWMB#: 30-C-01221

**Oil Can Henry's**
230 N Brea Blvd., Brea, CA 92821
(714)990-1900( )
CIWMB#: 30-C-04273

## *Buena Park*

**Firestone Store #71F7**
6011 Orangethorpe Buena Park, CA 90620
(714)670-7912( )
CIWMB#: 30-C-01218

**Firestone Store #71T8**
8600 Beach Blvd., Buena Park, CA 90620
(714)827-5300( )
CIWMB#: 30-C-02121

**Kragen Auto Parts #1204**
5303 Beach Blvd., Buena Park, CA 90621
(714)994-1320( )
CIWMB#: 30-C-02623

## *Cypress*

**AutoZone #5521**
5471 Lincoln Ave., Cypress, CA 90630
(714)995-4644( )
CIWMB#: 30-C-00836

**Big O Tires**
6052 Cerritos Ave., Cypress, CA 90630
(714)826-6334( )
CIWMB#: 30-C-04245

**Econo Lube N' Tune #213**
5497 Cerritos Ave., Cypress, CA 90630
(714)761-0456( )
CIWMB#: 30-C-06240

**Jiffy Lube #851**
4942 Lincoln Ave., Cypress, CA 90630
(626)965-9689( )
CIWMB#: 30-C-06182

**M & N Coastline Auto & Tire Service**
4005 Ball Rd., Cypress, CA 90630
(714)826-1001( )
CIWMB#: 30-C-04387

**Masterlube #103**
5904 Lincoln Cypress, CA 90630
(714)826-2323( )
CIWMB#: 30-C-01071

**Masterlube #104**
5971 Ball Rd., Cypress, CA 90630
(714)220-1555( )
CIWMB#: 30-C-04682

**Metric Motors of Cypress**
6042 Cerritos Ave., Cypress, CA 90630
(714)821-4702( )
CIWMB#: 30-C-05157

## *Fullerton*

**AutoZone #2898**
146 N. Raymond Ave., Fullerton, CA 92831
(714)870-9772( )
CIWMB#: 30-C-04488

**AutoZone #5522**
1801 Orangethorpe W. Fullerton, CA 92833
(714)870-8286( )
CIWMB#: 30-C-06062

**AutoZone #5523**
102 N Euclid Fullerton, CA 92832
(714)870-8286( )
CIWMB#: 30-C-04755

**EZ Lube #17**
4002 N Harbor Blvd., Fullerton, CA 92835
(714)871-9980( )
CIWMB#: 30-C-03741

**Firestone Store #27EH**
1933 N Placentia Ave., Fullerton, CA 92831
(714)993-7100( )
CIWMB#: 30-C-02122

**Fox Service Center**
1018 W Orangethorpe Fullerton, CA 92833
(714)879-1430( )
CIWMB#: 30-C-02318

**Fullerton College Automotive Technology**
321 E Chapman Ave., Fullerton, CA 92832
(714)992-7275( )
CIWMB#: 30-C-03165

**Kragen Auto Parts #0731**
2978 Yorba Linda Fullerton, CA 92831
(714)996-4780( )
CIWMB#: 30-C-02628

**Kragen Auto Parts #4133**
904 W Orangethorpe Ave., Fullerton, CA 92832
(714)526-3570( )
CIWMB#: 30-C-06256

**Pep Boys #642**
1530 S Harbor Blvd., Fullerton, CA 92832
(714)870-0700( )
CIWMB#: 30-C-01755

**Sunnyside 76 Car Care Center**
2701 N Brea Blvd., Fullerton, CA 92835
(714)256-0773( )
CIWMB#: 30-C-01381

## *Garden Grove*

**76 Pro Lube Plus**
9001 Trask Ave., Garden Grove, CA 92844
(714)393-0590( )
CIWMB#: 30-C-05276

**AutoZone #5527**
13190 Harbor Blvd., Garden Grove, CA 92843
(714)636-5665( )
CIWMB#: 30-C-04760

**David Murray Shell**
12571 Vly View St., Garden Grove, CA 92845
(714)898-0170( )
CIWMB#: 30-C-00547

**Express Lube & Wash**
8100 Lampson Ave., Garden Grove, CA 92841
(909)316-8261( )
CIWMB#: 30-C-06544

**Firestone Store #7180**
10081 Chapman Ave., Garden Grove, CA 92840
(714)530-4630( )
CIWMB#: 30-C-01224

**Firestone Store #71W3**
13961 Brookhurst St., Garden Grove, CA 92843
(714)590-2741( )
CIWMB#: 30-C-03690

**Jiffy Lube #1991**
13970 Harbor Blvd., Garden Grove, CA 92843
(714)554-0610( )
CIWMB#: 30-C-05400

**Kragen Auto Parts #1251**
13933 N Harbor Blvd., Garden Grove, CA 92843
(714)554-3780( )
CIWMB#: 30-C-02663

**Kragen Auto Parts #1555**
9851 Chapman Ave., Garden Grove, CA 92841
(714)741-8030( )
CIWMB#: 30-C-04079

**Nissan of Grarden Grove**
9670 Trask Ave., Garden Grove, CA 92884
(714)537-0900( )
CIWMB#: 30-C-06553

**Toyota of Garden Grove**
9444 Trask Ave., Garden Grove, CA 92844
(714)895-5595( )
CIWMB#: 30-C-06555

## *La Habra*

**AutoZone #5532**
1200 W Imperial Hwy., La Habra, CA 90631
(562)694-5337( )
CIWMB#: 30-C-04784

**Burch Ford**
201 N Harbor Blvd., La Habra, CA 90631
(562)691-3225( )
CIWMB#: 30-C-05179

**Firestone Store #2736**
1071 S Beach Blvd., La Habra, CA 90631
(562)691-1731( )
CIWMB#: 30-C-01169

**Kragen Auto Parts #1569**
1621 W Whittier Blvd., La Habra, CA 90631
(562)905-2538( )
CIWMB#: 30-C-04076

**Pep Boys #997**
125 W Imperial Hwy., La Habra, CA 90631
(714)447-0601( )
CIWMB#: 30-C-04026

**SpeeDee Oil Change & Tune-Up**
1580 W Imperial Hwy., La Habra, CA 90631
(562)697-3513( )

## *Los Alamitos*

**Jiffy Lube #1740**
3311 Katella Ave., Los Alamitos, CA 90720
(562)596-1827( )
CIWMB#: 30-C-03529

## *Midway City*

**Bolsa Transmission**
8331 Bolsa Ave., Midway City, CA 92655
(714)799-6158( )
CIWMB#: 30-C-05768

## *Placentia*

**Advanced Auto & Diesel**
144 S Bradford Placentia, CA 92870
(714)996-8222( )
CIWMB#: 30-C-06242

**Castner's Auto Service**
214 S. Bradford Ave., Placentia, CA 92870
(714)528-1311( )
CIWMB#: 30-C-06452

**Econo Lube N' Tune**
100 W Chapman Ave., Placentia, CA 92870
(714)524-0424( )
CIWMB#: 30-C-06454

**Fairway Ford**
1350 E Yorba Linda Blvd., Placentia, CA 92870
(714)524-1200( )
CIWMB#: 30-C-01863

## *Seal Beach*

**M & N Coastline Auto & Tire Service**
12239 Seal Beach Blvd., Seal Beach, CA 90740
(714)826-1001( )
CIWMB#: 30-C-04433

**Seal Beach Chevron**
12541 Seal Beach Blvd., Seal Beach, CA 90740
(949)495-0774(14 )
CIWMB#: 30-C-06425

## *Stanton*

**AutoZone #2806**
11320 Beach Blvd., Stanton, CA 90680
(714)895-7665( )
CIWMB#: 30-C-04563

**Joe's Auto Clinic**
11763 Beach Blvd., Stanton, CA 90680
(714)891-7715( )
CIWMB#: 30-C-03253

**Kragen Auto Parts #1742**
11951 Beach Blvd., Stanton, CA 90680
(714)799-7574( )
CIWMB#: 30-C-05231

**Scher Tire #20**
7000 Katella Ave., Stanton, CA 90680
(714)892-9924( )
CIWMB#: 30-C-05907

**USA 10 Minute Oil Change**
8100 Lampson Ave., Stanton, CA 92841
(714)373-4432( )
CIWMB#: 30-C-05909

## *Westminster*

**AutoZone #5543**
6611 Westminster Blvd., Westminster, CA 92683
(714)898-2898( )
CIWMB#: 30-C-04964

**AutoZone #5544**
8481 Westminster Blvd., Westminster, CA 92683
(714)891-3511( )
CIWMB#: 30-C-04966

**City of Westminster Corporate Yard**
14381 Olive St., Westminster, CA 92683
(714)895-2876(292 )
CIWMB#: 30-C-02008

**Honda World**
13600 Beach Blvd., Westminster, CA 92683
(714)890-8900( )
CIWMB#: 30-C-03639

**Jiffy Lube #1579**
6011 Westminster Blvd., Westminster, CA 92683
(714)899-2727( )
CIWMB#: 30-C-02745

**John's Brake & Auto Repair**
13050 Hoover St., Westminster, CA 92683
(714)379-2088( )
CIWMB#: 30-C-05617

**Kragen Auto Parts #0762**
6562 Westminster Blvd., Westminster, CA 92683
(714)898-0810( )
CIWMB#: 30-C-02590

**Midway City Sanitary District**
14451 Cedarwood St., Westminster, CA 92683
(714)893-3553( )
CIWMB#: 30-C-01626

**Pep Boys #653**
15221 Beach Blvd., Westminster, CA 92683
(714)893-8544( )
CIWMB#: 30-C-03415

## *Yorba Linda*

**AutoZone #5545**
18528 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)970-8933( )
CIWMB#: 30-C-04971

**Econo Lube N' Tune**
22270 La Palma Ave., Yorba Linda, CA 92887
(714)692-8394( )
CIWMB#: 30-C-06513

**EZ Lube Inc. #41**
17511 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)556-1312( )
CIWMB#: 30-C-05739

**Firestone Store #27T3**
18500 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)779-1966( )
CIWMB#: 30-C-01222

**Jiffy Lube #1532**
16751 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)528-2800( )
CIWMB#: 30-C-03777

**Mike Schultz Import Service**
4832 Eureka Ave., Yorba Linda, CA 92886
(714)528-4411( )
CIWMB#: 30-C-04313

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

# Efficient Irrigation SD-12



**Design Objectives**

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

## Description

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

## Approach

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

## Suitable Applications

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

## Design Considerations

### *Designing New Installations*

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

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

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

***Redeveloping Existing Installations***

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

## Other Resources

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

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

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

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

# Storm Drain Signage SD-13




**Design Objectives**

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

## Description

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

## Approach

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

## Suitable Applications

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

## Design Considerations

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

### *Designing New Installations*

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

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

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

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

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

### *Redeveloping Existing Installations*

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

## Additional Information

### *Maintenance Considerations*

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

### *Placement*

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

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

## Supplemental Information

### *Examples*

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

## Other Resources

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

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

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

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

# Trash Storage Areas SD-32

## Description

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

## Approach

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

**Design Objectives**

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

## Suitable Applications

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

## Design Considerations

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

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

### *Designing New Installations*

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

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

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

### *Redeveloping Existing Installations*

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

## Additional Information

### *Maintenance Considerations*

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

## Other Resources

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

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

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

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

# The Pollution Solution

Several residential activities can result in water pollution. Among these activities are car washing and hosing off driveways and sidewalks. Both activities can waste water and result in excess runoff. Water conservation methods described in this pamphlet can prevent considerable amounts of runoff and conserve water. By taking your car to a commercial car wash and by sweeping driveways and sidewalks, you can further prevent the transport of pollutants to Orange County waterways. Here are some of the common pollutants for which you can be part of the solution:

## 1 Pesticides and Fertilizer



- **Pollution:** The same pesticides that are designed to be toxic to pests can have an equally lethal impact on our marine life. The same fertilizer that promotes plant growth in lawns and gardens can also create nuisance algae blooms, which remove oxygen from the water and clog waterways when it decomposes.

- **Solution:** Never use pesticides or fertilizer within 48 hours of an anticipated rainstorm. Use only as much as is directed on the label and keep it off driveways and sidewalks.

## 2 Dirt and Sediment

- **Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through waterways and deposits downstream. Pollutants can attach to sediment, which can then be transported through our waterways.

- **Solution:** Protect dirt stockpiles by covering them with tarps or secure plastic sheets to prevent wind or rain from allowing dirt or sediment to enter the storm drain system.

## 3 Metals

- **Pollution:** Metals and other toxins present in car wash water can harm important plankton, which forms the base of the aquatic food chain.

- **Solution:** Take your car to a commercial car wash where the wash water is captured and treated at a local wastewater treatment plant.

***DID YOU KNOW?***

***Did you know that most of the pollution found in our waterways is not from a single source, but from a "non-point" source meaning the accumulation of pollution from residents and businesses throughout the community***

## 4 Pet Waste

- **Pollution:** Pet waste carries bacteria through our watersheds and eventually will be washed out to the ocean. This can pose a health risk to swimmers and surfers.

- **Solution:** Pick up after your pets!

## 5 Trash and Debris



- **Pollution:** Trash and debris can enter waterways by wind, littering and careless maintenance of trash receptacles. Street sweeping collects some of this trash; however, much of what isn't captured ends up in our storm drain system where it flows untreated out to the ocean.

- **Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup Day, which is held in September.

## 6 Motor Oil / Vehicle Fluids

- **Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.



- **Solution:** Fix any leaks from your vehicle and keep the maintenance up on your car. Use absorbent material such as cat litter on oil spills, then sweep it up and dispose of it in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.



## A TEAM EFFORT

The Orange County Stormwater Program has teamed with the Municipal Water District of Orange County (MWDOC) and the University of California Cooperative Extension Program (UCCE) to develop this pamphlet.

Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

## Thank you for making water protection a priority!

For more information, please visit www.ocwatersheds.com/publiced/

www.mwdoc.com

www.uccemg.com




To report a spill, call the Orange County 24-Hour Water Pollution Prevention Reporting Hotline at 1-877-89-SPILL \(1-877-897-7455)

**Special Thanks to**
The City of Los Angeles Stormwater Program for the use of its artwork

The Metropolitan Water District of Southern California for the use of the California-Friendly Plant and Native Habitat photos



# Homeowners Guide for Sustainable Water Use

**Low Impact Development, Water Conservation & Pollution Prevention**



The Ocean Begins at Your Front Door







# RUNOFF, RAINWATER AND REUSE

## Where Does Water Runoff Go?

Stormwater, or water from rainfall events, and runoff from outdoor water use such as sprinklers and hoses flows from homes directly into catch basins and the storm drain system. After entering the storm drain, the water flows untreated into streams, rivers, bays and ultimately the Pacific Ocean. Runoff can come from lawns, gardens, driveways, sidewalks and roofs. As it flows over hard, impervious surfaces, it picks up pollutants. Some pollutants carried by the water runoff include trash, pet waste, pesticides, fertilizer, motor oil and more.

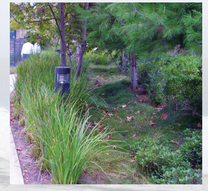




## Water Conservation

Pollution not only impairs the water quality for habitat and recreation, it can also reduce the water available for reuse. Runoff allowed to soak into the ground is cleaned as it percolates through the soil, replenishing depleted groundwater supplies. Groundwater provides at least 50% of the total water for drinking and other indoor household activities in north and central Orange County. When land is covered with roads, parking lots, homes, etc., there is less land to take in the water and more hard surfaces over which the water can flow.

In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater basin.



### What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of an area. LID provides a more sustainable and pollution-preventative approach to water management.

New water quality regulations require implementation of LID in larger new developments and encourage implementation of LID and other sustainable practices in existing residential areas. Implementing modifications to your lawn or garden can reduce pollution in our environment, conserve water and reduce your water bill.



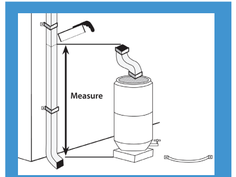
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

# OPTIONS FOR RAINWATER HARVESTING AND REUSE

Rainwater harvesting is a great way to save money, prevent pollution and reduce potable water use. To harvest your rainwater, simply redirect the runoff from roofs and downspouts to rain barrels. Rain gardens are another option; these reduce runoff as well as encourage infiltration.

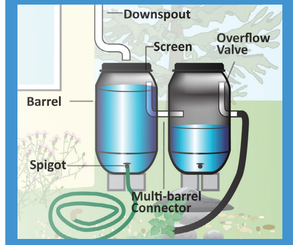
## Downspout Disconnection/Redirection

Disconnecting downspouts from pipes running to the gutter prevents runoff from transporting pollutants to the storm drain. Once disconnected, downspouts can be redirected to rain gardens or other vegetated areas, or be connected to a rain barrel.




## Rain Barrels

Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow tube to allow for excess water to run out and a connector if you wish to connect multiple barrels to add capacity of water storage.




Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals and humans. Regular application of these products is essential. Please visit the Orange County Vector Control website for more information at www.ocvcd.org/mosquitoes3.php.

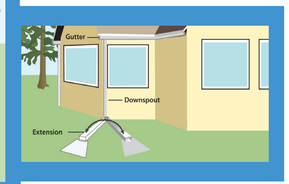




## Rain Gardens

Rain gardens allow runoff to be directed from your roof downspout into a landscaped area. Vegetation and rocks in the garden will slow the flow of water to allow for infiltration into the soil. Plants and soil particles will absorb pollutants from the roof runoff. By utilizing a native plant palate, rain gardens can be maintained all year with minimal additional irrigation. These plants are adapted to the semi-arid climate of Southern California, require less water and can reduce your water bill.

Before modifying your yard to install a rain garden, please consult your local building and/or planning departments to ensure your garden plan follows pertinent building codes and ordinances. Besides codes and ordinances, some home owner associations also have guidelines for yard modifications. If your property is in hill areas or includes engineered slopes, please seek professional advice before proceeding with changes.




For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2009 at www.larainwaterharvesting.org/

# OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

## Native Vegetation and Maintenance

"California Friendly" plants or native vegetation can significantly reduce water use. These plants often require far less fertilizers and pesticides, which are two significant pollutants found in Orange County waterways. Replacing water "thirsty" plants and grass types with water efficient natives is a great way to save water and reduce the need for potentially harmful pesticides and fertilizer.

Please see the California Friendly Garden Guide produced by the Metropolitan Water District of Southern California and associated Southern California Water Agencies for a catalog of California friendly plants and other garden resources at www.bewaterwise.com/Gardensoft.

## Weed Free Yards

Weeds are water thieves. They often reproduce quickly and rob your yard of both water and nutrients. Weed your yard by hand if possible. If you use herbicides to control the weeds, use only the amount recommended on the label and never use it if rain is forecast within the next 48 hours.



## Soil Amendments

Soil amendments such as green waste (e.g. grass clippings, compost, etc.) can be a significant source of nutrients and can help keep the soil near the roots of plants moist. However, they can cause algal booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

# IRRIGATE EFFICIENTLY



Water runoff from sprinklers left on too long will carry pollutants into our waterways.

## 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 control sprinklers will automatically shut off.

Check with your local water agency for available rebates on irrigation controllers and smart timers.

- Aim your sprinklers at your lawn, not the sidewalk – By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.
- **Set a timer for your sprinklers** – lawns absorb the water they need to stay healthy within a few minutes of turning on the sprinklers. Time your sprinklers; when water begins running off your lawn, you can turn them off. Your timer can be set to water your lawn for this duration every time.
- **Water at Sunrise** – Watering early in the morning will reduce water loss due to evaporation. Additionally, winds tend to die down in the early morning so the water will get to the lawn as intended.
- **Water by hand** – Instead of using sprinklers, consider watering your yard by hand. Hand-watering ensures that all plants get the proper amount of water and you will prevent any water runoff, which wastes water and carries pollutants into our waterways.
- **Fix leaks** - Nationwide, households waste one trillion gallons of water a year to leaks – that is enough water to serve the entire state of Texas for a year. If your garden hose is leaking, replace the nylon or rubber hose washer and ensure a tight connection. Fix broken sprinklers immediately.



Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, if we are not careful, our daily activities can lead directly to water pollution problems. Water that drains through your watershed can pick up pollutants which are then transported to our waterways and beautiful ocean.

You can prevent water pollution by taking personal action and by working with members of your watershed community to prevent urban runoff from entering your waterway.

For more information, please call the **Orange County Stormwater Program** at **1.877.89.SPILL** or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1.877.89.SPILL**.

**For emergencies, dial 911.**

The tips contained in this brochure provide useful information to help protect your watershed. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Printed on Recycled Paper

# Help Prevent Ocean Pollution: Tips For Protecting Your Watershed




The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

# Tips for Protecting Your Watershed

## *My Watershed. Our Ocean.*

**Water + shed,** *noun: A region of land within which water flows down into a specified water body, such as a river, lake, sea, or ocean; a drainage basin or catchment basin.*

Orange County is comprised of 11 major watersheds into which most of our water flows, connecting all of Orange County to the Pacific Ocean.



As water from rain (stormwater) or sprinklers and hoses (urban runoff) runs down your driveway and into your neighborhood streets, sidewalks and gutters, it flows into storm drains that lead to waterways within your watershed. The waterways from other cities merge as they make their way through our watersheds until all the runoff water in Orange County meets at the Pacific Ocean. The water that reaches our ocean is not pure. As it flows through the watershed, it picks up pollutants such as litter, cigarette butts, fertilizer, pesticides, pet waste, motor oil and lawn clippings. Unlike water that enters the sewer (from sinks and toilets), water that enters the storm drain is not treated before it flows, ultimately, to the ocean.



Water quality can be improved by "Adopting Your Watershed." Through this effort, we are challenging citizens and organizations to join the Orange County Stormwater Program and others who are working to protect and restore our creeks, rivers, bays and ocean.

**There are many opportunities to get involved:**

- Appreciate your watershed - explore the creeks, trails and ocean and make observations about its conditions. If you see anything abnormal (such as dead fish, oil spills, leaking barrels, and other pollution) contact the Orange County 24-hour water pollution problem reporting hotline at 1.877.89.SPILL to report the problem.
- Research your watershed. Learn about what watershed you live in by visiting www.ocwatersheds.com.
- Find a watershed organization in your community and volunteer to help. If there are no active groups, consider starting your own.
- Visit EPA's Adopt Your Watershed's Catalog of Watershed Groups at www.epa.gov/adopt to locate groups in your community.
- Organize or join in a creek, river, bay or ocean cleanup event such as Coastal & Inner Coastal Cleanup Day that takes place the 3rd Saturday of every September. For more information visit www.coast4u.org.

**Follow these simple tips to protect the water quality of your watershed:**

- **Sweep up debris and dispose of it in the trash. Do not hose down driveways or sidewalks into the street or gutter.**
- **Use dry cleanup methods such as cat litter to absorb spills and sweep up residue.**
- **Set your irrigation systems to reflect seasonal water needs or use weather-based controllers. Inspect for runoff regularly.**
- **Cover trashcans securely.**
- **Take hazardous waste to a household hazardous waste collection center. (For example, paint, batteries and petroleum products)**
- **Pick up after your pet.**
- **Follow application and disposal directions for pesticides and fertilizers.**
- **If you wash your car at home, wash it on your lawn or divert the runoff onto a landscaped area. Consider taking your car to a commercial car wash, where the water is reclaimed or recycled.**
- **Keep your car well maintained.**
- **Never pour oil or antifreeze in the street, gutter or storm drain.**



# Appendix D

## BMP Maintenance Supplement / O&M Plan

# OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

Gateway Village

Portola Parkway at Bee Canyon Access Road and Jeffrey Road,
Irvine CA 92618

APN 104-118-09, 71, 73, 97, 98

Owner Information:

| | |
|---|---|
| Contact Name: | Derek Spalding |
| Company: | Development Director |
| Address: | 3200 Park Center, Suite 1000, Costa Mesa, CA 92626 |
| Phone: | (714) 200-1636 |
| Email: | derek.spalding@brookfieldpropertiesdevelopment.com |

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| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 | N1. Education for Property Owners, Tenants and Occupants<br>Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. | Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C of this WQMP. Tenants will be provided these materials by the Property Management prior to occupancy and annually thereafter.<br>Frequency: Annually | Owner |
| Yes | N2. Activity Restrictions<br>The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution. | The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing.<br>Frequency: Ongoing | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 |
| Yes | N3. Common Area Landscape Management<br>The Owner shall be responsible for ongoing maintenance and management of landscaped areas on the project site, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as City standards. Program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by the owner and/or contractors. | Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets.<br>Frequency: Monthly | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 |
| Yes | N4. BMP Maintenance<br>The Owner will be responsible for the implementation and maintenance of each applicable LID and structural BMP prescribed for the project. Inspection and maintenance will be carried out by property management staff and/or contractors. | Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request.<br>Frequency: Ongoing | Owner |
| No | N5. Title 22 CCR Compliance (How development will comply) | Not Applicable | |
| No | N6. Local Industrial Permit Compliance | Not Applicable | |
| No | N7. Spill Contingency Plan | Not Applicable | |
| No | N8. Underground Storage Tank Compliance | Not Applicable | |
| No | N9. Hazardous Materials Disclosure Compliance | Not Applicable | |
| No | N10. Uniform Fire Code Implementation | Not Applicable | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 |
| Yes | N11. Common Area Litter Control<br>The property management will be responsible for performing trash pickup and sweeping of littered common areas as needed, and weekly at a minimum. Any trash/debris waste collected shall be properly disposed of in accordance with local regulations. Responsibilities will also include noting improper disposal of materials and reporting such violations for further investigation. | Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.<br>Frequency: Weekly | Owner |
| Yes | N12. Employee Training<br>All employees of the property owner/management and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, and housekeeping practices. | The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix D.<br>Frequency: Annually | Owner |
| No | N13. Housekeeping of Loading Docks | Not Applicable | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 |
| Yes | N14. Common Area Catch Basin Inspection<br>All on-site storm drain inlets shall be inspected by the Owner, and cleaned when the sump is 40% full and annually at a minimum. | Catch basin inlets and other drainage facilities shall be inspected annually. Inlets and other facilities shall be cleaned when the sump is 40% full and annually at a minimum.<br>Frequency: Monthly (inspections), Annually (cleanout) | Owner |
| Yes | N15. Street Sweeping Private Streets and Parking Lots<br>The Owner shall be responsible for sweeping all roadways (i.e. fire access road) and uncovered parking areas within the project on a monthly basis. | Parking areas and drive aisles within the project shall be swept at a minimum frequency monthly as well as once per year prior to the storm season, no later than October 1st each year.<br>Frequency: Monthly | Owner |
| No | N16. Retail Gasoline Outlets | Not Applicable | |
| STRUCTURAL SOURCE CONTROL BMPs | | | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 |
| Yes | S1. Provide storm drain system stenciling and signage<br>The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy. | Stenciling shall be inspected for legibility no later than the beginning of the rainy season on October 1st of each year. Stenciling must be re-stenciled to maintain legibility as necessary and when deemed necessary by the local inspecting agency.<br>Frequency: Annually | Owner |
| No | S2. Design and construct outdoor material storage areas to reduce pollution introduction | Not Applicable | |
| No | S3. Design and construct trash and waste storage areas to reduce pollution introduction | Not Applicable | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 |
| Yes | S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control<br>The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. Includes implementation of efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. | In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system.<br>Frequency: Monthly | Owner |
| No | S5. Protect slopes and channels and provide energy dissipation | Not Applicable | |
| No | S6. Dock areas | Not Applicable | |
| No | S7. Maintenance bays | Not Applicable | |
| No | S8. Vehicle wash areas | Not Applicable | |
| No | S9. Outdoor processing areas | Not Applicable | |
| No | S10. Equipment wash areas | Not Applicable | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | | |
|---|---|---|---|
| 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 | S11. Fueling areas | Not Applicable | |
| No | S12. Hillside landscaping | Not Applicable | |
| No | S13. Wash water control for food preparation areas | Not Applicable | |
| No | S14. Community car wash racks | Not Applicable | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | |
|---|---|---|
| BMP Name and BMP Implementation, Maintenance and Inspection Procedures | Implementation, Maintenance, and Inspection Frequency and Schedule | Person or Entity with Operation & Maintenance Responsibility |
| LOW IMPACT DEVELOPMENT BMPs | | |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | |
|---|---|---|
| BMP Name and BMP Implementation, Maintenance and Inspection Procedures | Implementation, Maintenance, and Inspection Frequency and Schedule | Person or Entity with Operation & Maintenance Responsibility |
| Biotreatment BMP # 1: Modular Wetland Systems (MWS) Modular Wetlands by Contech are proprietary biotreatment systems that utilize multi-stage treatment processes. The pre-treatment chamber contains the first three stages of treatment, and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system. | Inspect system at a minimum of once every six months, prior to the start of the rainy season (October 1), and after major storm events. Typical maintenance includes removing trash & debris from the catch basin screening filter (by hand), removal of sediment and solids in the settlement chamber (vacuum truck), replacement of the BioMediaGREENTM filter cartridge, and replacement of the BioMediaGREENTM drain down filter. In the Separation Chamber, spray down pollutants accumulated on walls and cartridge filters. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace the screening device, grate, or manhole cover when complete. In addition, plants within the wetland chamber will require trimming in conjunction with landscape maintenance activities. See attached manufacturer's specifications for additional requirements.<br>Frequency: 2x per year | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | |
|---|---|---|
| BMP Name and BMP Implementation, Maintenance and Inspection Procedures | Implementation, Maintenance, and Inspection Frequency and Schedule | Person or Entity with Operation & Maintenance Responsibility |
| Biotreatment BMP # 2: Bioscape<br>Bioscape by Contech is a proprietary biotreatment system. Stormwater enters the Bioscape through a pipe, curb inlet, or sheet flow and ponds over the pretreatment mulch layer, capturing heavy sediment and debris. Organics and microorganisms within the mulch trap and degrade metals and hydrocarbons. The mulch also provides water retention for the system's vegetation. Stormwater flows through engineered Filterra media which filters fine pollutants and nutrients. Organic material in the media removes dissolved metals and acts as a food source for root-zone microorganisms. Treated water exits through an underdrain pipe or infiltrates (if designed accordingly). Rootzone microorganisms digest and transform pollutants into forms easily absorbed by plants. Plant roots absorb stormwater and pollutants that were transformed by microorganisms, regenerating the media's pollutant removal capacity. The roots grow, provide a hospitable environment for the rootzone microorganisms and penetrate the media, maintaining hydraulic conductivity. The plant trunk and foliage utilize nutrients such as Nitrogen and Phosphorus for plant health, sequester heavy metals into the biomass, and provide evapotranspiration of residual water within the system. | Inspect system at a minimum of once every six months, prior to the start of the rainy season (October 1), and after major storm events.<br>Typical maintenance includes:<br>1. Inspection of Filterra® Bioscape® and surrounding area<br>2. Removal of erosion control stones<br>3. Removal of debris, trash and mulch<br>4. Removal and disposal of erosion control sock from system perimeter (should be completed at 6 month or 12 month maintenance depending upon site characteristics). A new erosion control sock is no longer needed after the first year.<br>5. Mulch replacement<br>6. Plant health evaluation and pruning or replacement as necessary<br>7. Clean area around Filterra®<br>8. Complete paperwork See attached manufacturer's specifications for additional requirements.<br>Frequency: 2x per year | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | |
|---|---|---|
| BMP Name and BMP Implementation, Maintenance and Inspection Procedures | Implementation, Maintenance, and Inspection Frequency and Schedule | Person or Entity with Operation & Maintenance Responsibility |
| Pump System: The pump system should be inspected for power supply, blockages, and faulty mechanical parts. The proposed system will need to be maintained in accordance with the manufacturer's specifications. Buildup of debris may block the inlet or outlet pipe which could result in ineffective operation of the system. Typical maintenance may include removal of a buildup of grease or debris, resupplying the proper power source, or replacing a faulty mechanical part of the system. | Inspection of the mechanical seal should be done every two years.<br>Frequency: 2x per year of overall pump function | Owner |
| PRE-TREATMENT/GROSS SOLIDS REMOVAL BMPs | | |
| Detention BMP # 1: StormTrap Single Trap - Detention StormTrap underground stormwater detention systems temporarily store runoff in large underground chambers before releasing it at a controlled rate. This mitigates erosion, flooding, and many harmful effects of high volume stormwater runoff. | Inspect access entry covers, check for leaks, minor sediment in cistern bottom, vector control issues. Clean out screenings and first flush diverter. Inspect from clean out port and remove sediment, trash, debris, and oil. Identify any needed corrective maintenance that will require site specific design.<br>Frequency: 2x per year | Owner |

| BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX | | |
|---|---|---|
| BMP Name and BMP Implementation, Maintenance and Inspection Procedures | Implementation, Maintenance, and Inspection Frequency and Schedule | Person or Entity with Operation & Maintenance Responsibility |
| Treatment Control BMP # 1: BioClean Connector Pipe Screens (CPS)<br>Inspections should occur annually or after major storm events to check for the following and remove accordingly: standing water, sediment, and trash & debris. Maintenance should occur when the inlet is at 40% capacity. Typical maintenance will include removal of sediment and solids. | Remove trash in inlet and support structure.<br>Inspect inlet for breakage.<br>Inspect support structure and anchor bolts, tighten if necessary.<br>Ensure no gaps between mounting hardware and vault wall.<br>Frequency: Twice a year and before October 1st of each year. | Owner |

## Required Permits

Permits are not required for the implementation, operation, and maintenance of the BMPs.

## Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

## Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

## Waste Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

| BMP Name<br>(As Shown in O&M Plan) | Brief Description of Implementation, Maintenance, and Inspection Activity Performed |
|---|---|
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RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

| BMP Name<br>(As Shown in O&M Plan) | Brief Description of Implementation, Maintenance, and Inspection Activity Performed |
|---|---|
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# Filterra Bioscape Owner's Manual

(No Precast Vault Provided)

filterra®

Bioscape®

CONTECH®
ENGINEERED SOLUTIONS

This Owner's Manual applies to Filterra Bioscape ONLY (Filterra installed directly into an excavated basin or other customer provided container, such as a large cast-in-place vault).







filterra® Bioscape®

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CONTECH® ENGINEERED SOLUTIONS

# Introduction

Thank you for your purchase of the Filterra® Bioscape® System. Filterra® is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

Included with your purchase is a Supervised Activation service as well as a 1-year warranty from delivery of the system. In some cases, a Final Site Assessment (assessment of unit condition, mulch replacement, debris removal and pruning) may also be included for systems smaller than 1000 sf in size. Check your order documentation for further information.

Filterra® Bioscape® systems should not be activated until the site is stabilized to prevent construction related runoff from entering and contaminating the system. For Filterra® Bioscape® systems installed within an excavated basin, Contech provides an erosion control sock around the perimeter to provide an extra layer of protection. However, these protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra® Bioscape® system.

# Design and Installation

Each project presents different scopes for the use of Filterra® Bioscape® systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra® Bioscape® sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra® Bioscape® systems as shown in approved plans. A comprehensive installation manual is available from Contech.

# Activation Overview

Activation of the Filterra® Bioscape® system is a procedure completed by the contractor to place the system into working condition. This involves the following items:

- Installation of the Filterra® Bioscape® underdrain system
- Installation of the Filterra® media layer
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra® systems



## Minimum Requirements

The minimum requirements for Filterra® Bioscape®Activation are as follows:

1. The purchaser must have sourced vegetation meeting the requirements outlined in the Filterra® Bioscape® Activation Package
2. A pre-construction meeting is required to discuss site requirements, logistics planning and activation FAQ and red flags.
3. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.
4. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra® system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra® system.
5. All immediate upstream and downstream structures should be placed with piping into the system already installed for connection during activation.

An Activation Checklist is included in the Filterra® Bioscape® Activation Package to ensure proper conditions are met for Activation. A charge of $1500.00 will be invoiced for each Supervised Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

## Filterra Plant Selection Overview

A Plant List is available on the Contech website highlighting recommended plants for Filterra® Bioscape® systems in your area. Keep in mind that plants are subject to availability due to seasonality. Plants installed in the Filterra® Bioscape® system shall be container-grown plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation. It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® Bioscape® system. The "Filterra® Bioscape® Activation Package" document is included as an appendix and discusses proper selection of the plants within Filterra® Bioscape® systems.

## Warranty Overview

Refer to the Contech® Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra® Bioscape® system's warranty and waive the manufacturer provided Final Site Assessment (if applicable):

- Unauthorized activation or performance of any of the items listed in the activation overview without Contech supervision or input
- Removal of any Filterra® system components
- Failure to prevent construction related runoff from entering the Filterra® system
- Failure to properly store and protect any Filterra® components (including media and underdrain stone) that are shipped separately to the site

## Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra® Bioscape® system should last as long as traditional bioretention media. Routine maintenance can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

## Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra® media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra® Bioscape® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

## When to Maintain?

Maintenance visits are typically scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally recommended; In regions with less rainfall often only (1) one visit per annum is sufficient. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Manufacturer and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the maintenance provider of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology.

## Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not included as part of the Final Site Assessment (if applicable). Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

## Maintainenance Visit Summary

Maintenance visits are typically scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

1. Inspection of Filterra® Bioscape® and surrounding area
2. Removal of erosion control stones
3. Removal of debris, trash and mulch
4. Removal and disposal of erosion control sock from system perimeter (should be completed at 6 month or 12 month maintenance depending upon site characteristics). A new erosion control sock is no longer needed after the first year.
5. Mulch replacement
6. Plant health evaluation and pruning or replacement as necessary
7. Clean area around Filterra®
8. Complete paperwork

# Plant Care for Filterra® Systems

After Activation, the Contractor is responsible for proper care of the vegetation until the site is handed over to the Owner. After that, it is the Site Owner's responsibility to care for the vegetation. Contech recommends the following care for the plants:

1. To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
2. Plant staking may be required.
3. With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
4. Contech recommends irrigation of the Filterra® Vegetation. The following guidance will help to ensure the vegetation is properly irrigated.

## Irrigation Recommendations:

- Each Filterra® system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra® plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required.

*** Five gallons per square yard approximates 1 inch of water. Therefore for a 6' x 6 foot Filterra® approximately 20-60 gallons of applied water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate. Then calculate the time needed to irrigate the Filterra®, For example is the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6'x6' filter.*

## Plant Replacement:

In some cases, plants will require replacement. Please follow the procedures below to ensure a properly functioning Filterra® system.

1. Remove the existing plant, and leave as much of the Filterra® media in place as possible.
2. Select a replacement per the Filterra® Bioscape® Activation Package.
3. Prior to removing the plant from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
4. Cut away any roots which are growing out of the container drain holes.
5. Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively, the pot can be cut away to minimize root ball disturbance.
6. Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
7. Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
8. All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
9. Reinstall or add mulch to a depth of 3" per Contech's mulch specifications for Filterra® systems.

# Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

## 1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

| | |
|---|---|
| Standing Water | yes \| no |
| Is Bypass Clear | yes \| no |

If yes answered to any of these observations, record with close-up photograph (numbered).

## 2. Removal of erosion control stones

- Set aside erosion control stones for reuse after mulch has been replaced.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Is scour present around the inlet areas? yes | no

If answering yes, consider adding additional erosion control stone.

## 3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

| | |
|---|---|
| Silt/Clay | yes \| no |
| Bypass Clear | yes \| no |
| Leaves | yes \| no |
| # of Buckets Removed | _____ |

## 4. Removal and Disposal of Erosion Control Sock

- Remove and dispose of erosion control sock if site conditions allow (site should be fully stabilized). Erosion control sock is no longer needed after 1-year post activation.

## 5. Mulch Replacement

- Add mulch evenly across entire system to a depth of three inches.

## 6. Vegetation health evaluation and pruning

- Examine the vegetation health and replace if necessary. Prune vegetation to encourage growth in the correct directions. Since Filterra® Bioscape® systems can contain many plants, only notation of individual damaged or unhealthy plants is necessary.
  - » Record on Maintenance Report the following:
  - » Vegetation Health
  - » Vegetation Damage

Document damaged or unhealthy plants with photographs.

## 7. Clean side slopes and area around the Filterra Bioscape system

- Remove all trash and debris to be disposed of appropriately.

## 8. Complete paperwork

- Complete Maintenance Report. Some jurisdictions require submission of maintenance reports in accordance with approvals. It is the responsibility of the owner to comply with local regulations.



## Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing, barricades when working in close proximity to traffic and safety hats, glasses, and shoes.

Most visits require minor trash removal and a full replacement of mulch. Mulch should be a double shredded, hardwood variety.

# Maintenance Checklist

| Drainage System Failure | Problem | Conditions to Check | Condition that Should Exist | Actions |
|---|---|---|---|---|
| Inlet | Excessive sediment or trash accumulation. | Accumulated sediments or trash impair free flow of water into Filterra. | Inlet should be free of obstructions allowing free distributed flow of water into Filterra. | Sediments and/or trash should be removed. |
| Mulch Cover | Trash and floatable debris accumulation. | Excessive trash and/or debris accumulation. | Minimal trash or other debris on mulch cover. | Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used. |
| Mulch Cover | "Ponding" of water on mulch cover. | "Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils. | Stormwater should drain freely and evenly through mulch cover. | Recommend contact manufacturer and replace mulch as a minimum. |
| Vegetation | Plants not growing or in poor condition. | Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants. | Plants should be healthy and pest free. | Contact manufacturer for advice. |
| Vegetation | Plant growth excessive. | Plants should be appropriate to the species and location of Filterra. | | Trim/prune plants in accordance with typical landscaping and safety needs. |
| *Maintenance is ideally to be performed twice annually.* | | | | |

# Filterra Inspection & Maintenance Log

**Filterra System Size/Model:**_____ **Location:** _____

| Date | Mulch & Debris Removed | Depth of Mulch Added | Mulch Brand | Vegetation Species | Issues with System | Comments |
|---|---|---|---|---|---|---|
| *1/1/17* | *5 – 5 gal Buckets* | *3"* | *Lowe's Premium Brown Mulch* | *Galaxy Magnolia* | *- Standing water in downstream structure* | *- Removed blockage in downstream structure* |
| | | | | | | |
| | | | | | | |
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# Appendix 1 – Filterra® Bioscape® Activation Package

## FILTERRA® BIOSCAPE® ACTIVATION PACKAGE

(No Precast Vaults Provided)

CONTECH® ENGINEERED SOLUTIONS

It is the purchaser's responsibility to Activate the Filterra Bioscape System and provide adequate measures to prevent construction related runoff from entering the Filterra Bioscape system.

Included with your purchase is Supervised Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system. The purchaser must ensure that the site is acceptable for Filterra Bioscape Activation. A checklist (included as page 2 of this document must be completed and submitted to the Contech Activation Coordinator. The minimum requirements for Filterra Bioscape Activation are as follows:

1. The purchaser must have sourced vegetation meeting the requirements outlined in "Plant Selection for Filterra Systems" below.
2. A pre-construction meeting is required to discuss site requirements, logistics planning and activation FAQ and red flags.
3. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.
4. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.
5. All immediate upstream and downstream structures should be placed with piping into the system already installed for connection during activation.



## Plant Selection for Filterra® Bioscape® Systems

All Filterra systems require vegetation for proper long-term performance. As indicated in the Filterra Bioscape Activation Package, the Contractor is responsible for sourcing the proper vegetation prior to Supervised Activation. Contech or a Contech representative will supervise installation the vegetation during the Activation process.

Contractors must ensure the vegetation meets the following 3 requirements:

1. Select plant(s) as specified in the engineering plans and specifications AND that are listed on Contech's Configuration Specific Plant Lists.
2. All plants MUST be container-grown in nursery containers no larger than 15 gallons. Crated and/or Ball/Burlap plants are NOT permitted.
3. Quantities should be selected based on plant palette options found starting on page 3 of this document.

If Contech or Contech's representative shows up for Supervised Activation and any of the 3 requirements above are not met, Activation cannot be performed and the Contractor will be billed a $1,500 Unprepared Site fee*.

* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

# Filterra® Contractor Activation Checklist

Requested Activation Date: _____ System Designation: _____

Project Name: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

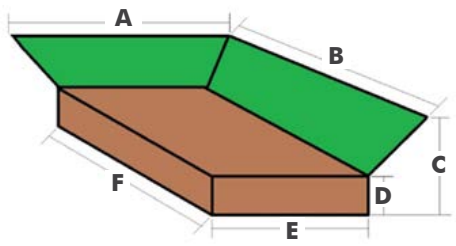
Please complete the following checklist, sign, date, and submit with your activation request to your Contech Project Consultant. Along with the checklist, fill out the as-built dimensions of the Filterra Bioscape system excavation(s), and attach photos of the Filterra Bioscape excavation(s). This information is essential to ensure the proper amount of material is provided.

## Checklist:

- ☐ Upstream drainage area to Filterra Bioscape system is stabilized.
- ☐ Filterra Bioscape excavated per plan dimensions to bottom of Filterra underdrain stone depth. Surface area of media area must match order quantities.
- ☐ If additional depth of drain rock is required per site plans, additional drain rock is installed to the Filterra Bioscape underdrain pipe elevation.
- ☐ Excavation sides vertical from bottom of excavation to top of mulch (Approximately 34" when 6" underdrain is utilized).
- ☐ Excavation sides maximum slope 3:1 from top of mulch to finished grade.
- ☐ Side slopes above top of mulch elevation stabilized with sod or other slope stabilization.
- ☐ Bioscape Inlet (BSI) structure or other inlet/bypass structure installed and properly backfilled with maximum 3:1 slopes to top of mulch elevation.
- ☐ Inflow pipe(s) connected from BSI or other inlet structure to edge of Filterra Bioscape system excavation.
- ☐ Outflow pipe(s) connected from edge of Filterra Bioscape system excavation to downstream structure.
- ☐ Outflow pipe(s) are SDR35, properly sized per site plan underdrain pipe size(s).
- ☐ Excavation is dry and free from construction related sediment and debris.
- ☐ Bottom of excavation is properly scarified.
- ☐ Excavation is accessible by standard construction equipment.
- ☐ Plants have been purchased in accordance with the guidance in "Plant Selection for Filterra Bioscape Systems"
- ☐ Photos attached.

NOTE: Please ensure that all of the above conditions have been met prior to activation request. A mobilization fee (minimum $1000.00) applies for each activation visit requested by Customer where Contech determines that the site does not meet the above conditions suitable for activation.

## As-Built Dimensions




| | | |
|---|---|---|
| A. | OVERALL EXCAVATION WIDTH: | _____FT |
| B. | OVERALL EXCAVATION LENGTH: | _____FT |
| C. | OVERALL EXCAVATION HEIGHT: | _____FT |
| D. | FILTERRA BED HEIGHT: | _____FT |
| E. | FILTERRA MEDIA BED WIDTH: | _____FT |
| F. | FILTERRA MEDIA BED LENGTH: | _____FT |

Signature _____ Date _____

* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

# Filterra® Bioscape Plant Palettes

**KEY:** (refer to plant lists for species sizing)



**A. EXTRA SMALL GRASS**
- Up to 2′ mature spread
- 1-2 gallon typical (1 gal. minimum)

**B. SMALL GRASS/SHRUB**
- 2′-4′ mature spread
- 1-7 gallon typical

**C. MEDIUM SHRUB**
- 4′-6′ mature spread
- 1-7 gallon typical

**D. LARGE SHRUB OR EXTRA LARGE SHRUB OR TREE**
- 6′ mature spread and greater, 30′ max. mature height
- Up to 15 gallon maximum

**NOTE**: *For larger vaults and in-ground Filterra Bioscape systems, palettes can be scaled (i.e. Qty 6 of the 175 SF Palette can be used for a 1056 SF Filterra Bioscape).*

**MIX & MATCH SUBSTITUTION OPTIONS:**

1 Large Shrub or Extra Large Shrub or Tree
- 2 Medium Shrubs
- 4 Small Grass/SHrubs
- 12 Extra Small Grasses

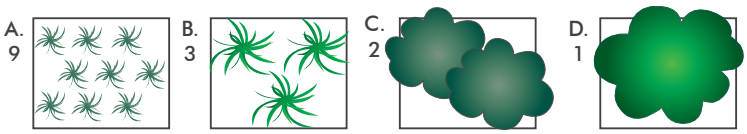
1 Medium Shrub
- 2 Small Grass/Shrubs
- 6 Extra Small Grasses

1 Small Grass/Shrub
- 3 Extra Small Grasses

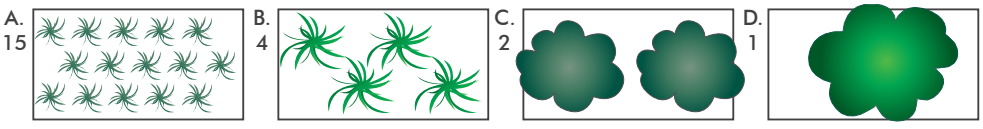
25 SF example



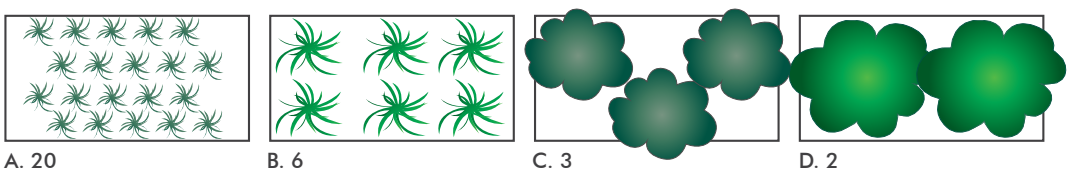

50 SF example




75 SF example

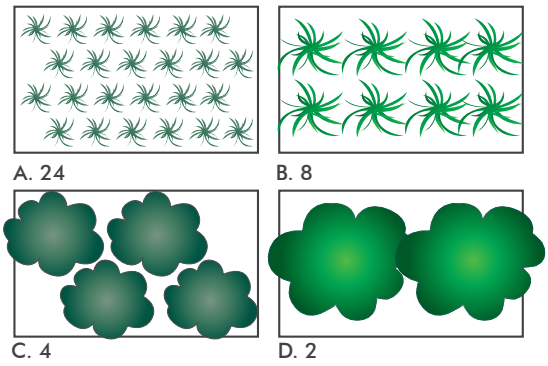



100 SF example




* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*

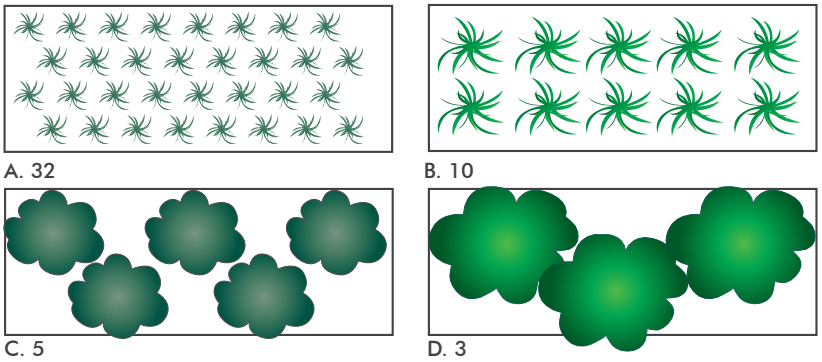
125 SF example



A. 24 B. 8

C. 4 D. 2

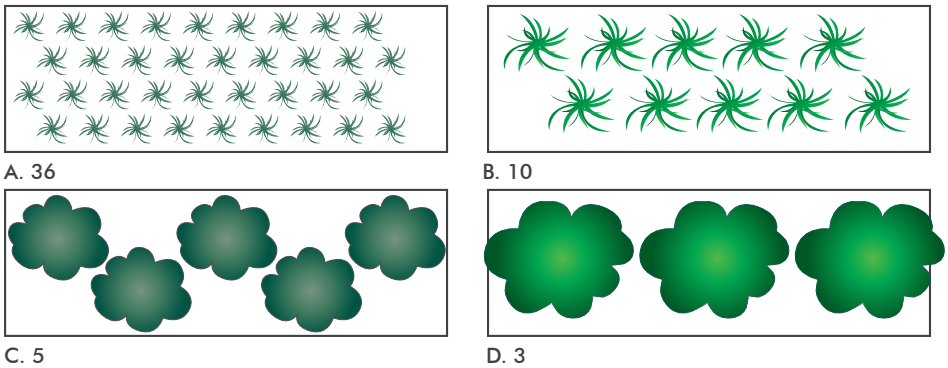
150 SF example



A. 32 B. 10

C. 5 D. 3

175 SF example



A. 36 B. 10

C. 5 D. 3

In some cases, Contech may consider alternate plant species as approved by the Product Manager. Please list the plant name in the space below and submit this sheet to your Contech Activation Coordinator. If the plant species is approved, either the Product Manager or the Activation Coordinator will sign the form and return to you for inclusion with your Activation Checklist.

Requested Plant Species: _____ Approved: _____

Date: _____

* *UNPREPARED SITE FEE NOTE: A charge of $1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor.*



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## NOTES







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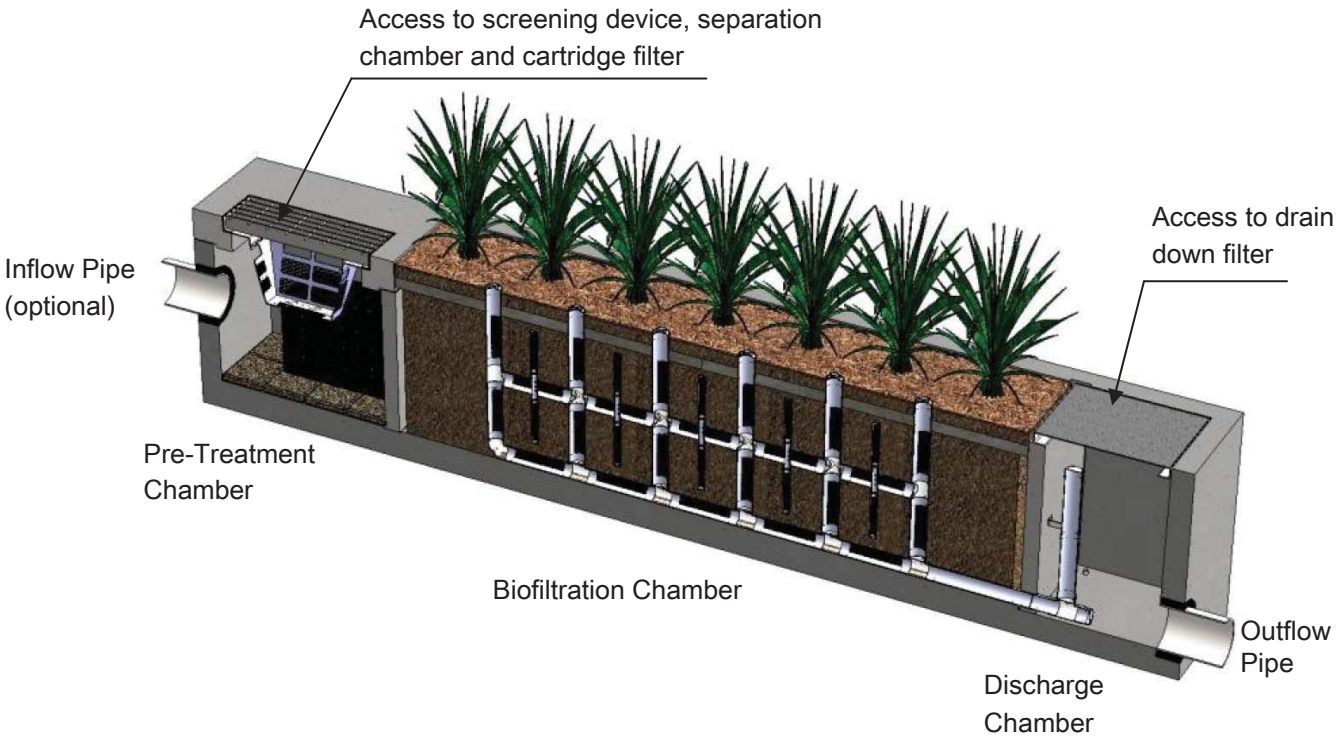
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# Maintenance Guidelines for Modular Wetland System - Linear

## 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

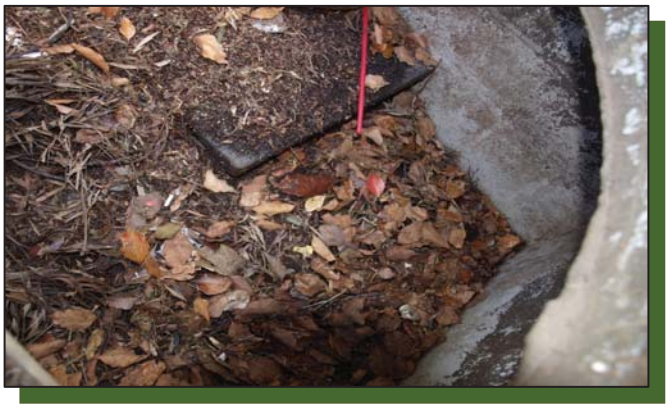
## Screening Device

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.

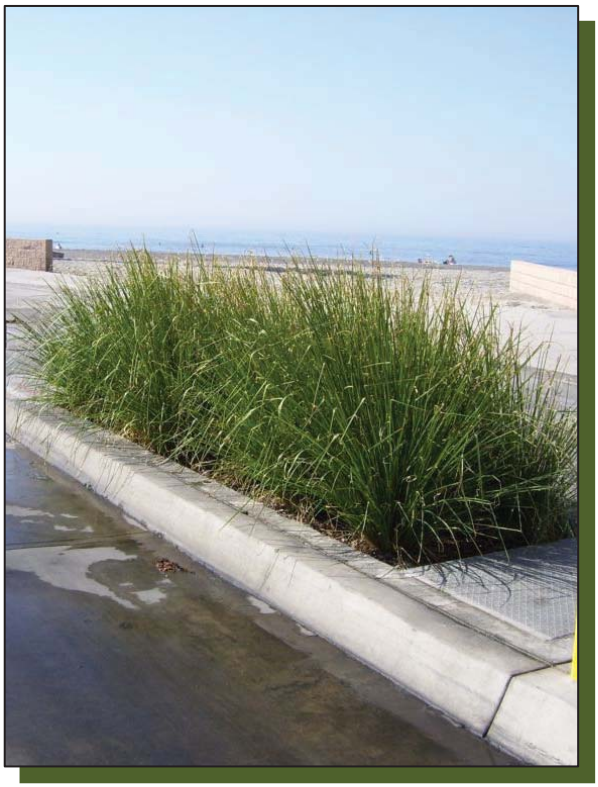


## Trim Vegetation

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

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. |

## 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




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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:<br>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

Bio Clean

A Forterra Company

# Bio Clean CPS

## A Stormwater Trash Capture Solution

# OPERATION & MAINTENANCE MANUAL

5796 Armada Drive Suite 250 | Carlsbad, CA 92008 | 855.566.3938

stormwater@forterrabp.com | biocleanenvironmental.com

# OPERATION & MAINTENANCE

CPS devices should be maintained by individuals who are trained in proper disposal procedures, confined space entry and traffic safety regulations. When servicing a Bio Clean CPS device be sure to follow all safety and traffic control protocols as well as wearing all proper personal protection equipment such as gloves, safety glasses, hard-hat, safety vest and work boots.



*Visual Inspection*

1. Begin by inspecting the inflow of the catch basin where the Bio Clean CPS device is located. Check for any obstructions to inflow of the CB unit. If any large obstructions are found, have them removed. Once the inflow inspection is completed, remove the man-hole cover for further inspection. (Note: Confined Space Entry Procedures may apply if trained personnel intend to enter the interior space of any Catch Basin. Please follow all applicable confined space entry procedures)

2. Remove the manhole cover and visually estimate the amount and types of debris found in the CB unit. Look for any visual signs of damage that may compromise the CB unit to function properly. Inspect for any standing water in the CB unit as well as for large amounts of sediment and debris surrounding the CPS device. If standing water and high sediment volume is found, remove water, sediment and debris by vacuum truck or by other debris removal methods.

*Cleaning Procedures and Frequencies*

1. Like all other storm water BMP's, Bio Clean CPS devices require periodic maintenance. Routine inspection and maintenance intervals for all CPS devices are typically twice per year for inspections and once per year for maintenance service. Bio Clean CPS devices may require more frequent maintenance service if the device is located in a high debris loading drainage area, such as certain downtown areas, retail/restaurant, or residential areas where a significant amount of vegetation/foliage is located. In such cases, Bio Clean CPS devices may require more frequent inspection and maintenance service, which could range from twice per year to monthly inspection and maintenance service, depending on pollutant load conditions.

2. To begin Bio Clean CPS cleaning procedures, conduct a visual inspection of the CPS device and the surrounding area to ensure a safe working environment. Setup appropriate barriers and signage as necessary to establish a work zone surrounding the catch basin. Once the work zone has been established, remove the manhole cover from the catch basin.

3. Once the manhole cover is removed from the basin the Bio Clean CPS is ready for servicing. All debris can be removed by either a vacuum truck or manually removing sediment and debris by hand.

4. Bio Clean CPS devices shall be cleaned using a pressure washer as may be necessary if any materials are found to cause occlusion or clogging of the screen.

*Disposal*

1. All trash and debris removed from the Bio Clean CPS unit shall be disposed of in accordance with local, state and federal regulation.

2. Solid waste disposal can be coordinated with local landfills. Liquids may need to be disposed of by wastewater treatment plant, municipal vacuum truck decant facility or approved facility.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

# Appendix E

## CONDITIONS OF APPROVAL

Appendix F

# GEOTECHNICAL REPORT

November 22, 2024 Project No. 23203-01

Mr. Derek Spalding
***Brookfield Properties***
3200 Park Center, Suite 1000
Costa Mesa, CA 92626

***Subject:*** ***Preliminary Geotechnical Subsurface Evaluation, Proposed Residential Development, Gateway Village, Irvine, California***

In accordance with your request, LGC Geotechnical, Inc. has performed a geotechnical subsurface evaluation for the proposed residential development, Gateway Village, in the City of Irvine, California. This report summarizes the results of our background review, subsurface exploration, and geotechnical analyses of the data collected, and presents our findings, conclusions, and preliminary recommendations for the proposed residential project.

If you should have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Respectfully,

***LGC Geotechnical, Inc.***

Katie Maes, CEG 2216
Director of Geology

Dennis Boratynec, GE 2770
Vice President

Branden Petersen, EIT
Project Engineer

DJB/KTM/BPP/amm

Distribution: (1) Addressee (electronic copy, wet signed copies can be provided upon request)

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## *1.0 INTRODUCTION*

### *1.1 Purpose and Scope of Services*

This report presents the results of our geotechnical subsurface evaluation for the proposed residential development, Gateway Village, located southeast of Portola Parkway and Jeffrey Road in the City of Irvine, California (see Site Location Map, Figure 1). The purpose of our work was to collect subsurface data to confirm that the site can be developed from a geotechnical perspective. Our scope of services included:

- Review of pertinent readily available previous geotechnical reports, geotechnical information and geologic maps (Appendix A).
- Subsurface evaluation including excavation, sampling, and logging of fifteen small-diameter hollow stem borings and seventeen exploratory geotechnical test pits.
- Infiltration testing performed within ten of the small-diameter hollow-stem borings.
- Laboratory testing of representative samples obtained during our subsurface evaluation (Appendix C).
- Geotechnical analysis and evaluation of the data obtained, including:
  - Suitability of the site for the proposed development from a geotechnical standpoint;
  - Description of the site geology, and subsurface soil and groundwater conditions;
  - Evaluation of the seismic conditions at the site, including seismic design criteria based on the 2022 California Building Code (CBC); and
  - Recommendations for remedial grading operations and site preparation.
- Preparation of this report presenting our findings, conclusions and recommendations with respect to the proposed site development.

### *1.2 Background*

The approximately 70-acre site is bound to the north by Jeffrey Road, to the west by Portola Parkway, to the south by Bee Canyon Access Road and east by undeveloped land and agricultural uses. Review of historical aerial photographs suggests the site was mostly undeveloped with the exception of a few residences prior to 1963. By 1963, the land began to be utilized for agricultural farming purposes. By 1972, multiple structures had been built on the eastern portion of the site to support the farming operations; including a reported buried septic tank and leach field. Over the years the on-site drainages have been filled and diverted and/or channelized. By 2012, the majority of farming infrastructure had been removed from the eastern portion of the site where soils from other sites within the Irvine Ranch were being stockpiled. Numerous structures remain onsite as of the date of this report.

Geotechnical data from previous subsurface evaluations within the areas surrounding the subject site have been compiled herein. Selected borings from offsite areas were reviewed including; investigations summarized in NMG Geotechnical, 2023, by Woodward-Clyde (1990), Leighton & Associates (2007), Lawson & Associates (2011), and NMG Geotechnical (2019). The exploration data from these reports are presented on the Preliminary Geotechnical Map (Sheet 1).

An on-site geotechnical evaluation was performed by NMG Geotechnical during 2023 as part of a

larger overall area report (NMG, 2023 & unpublished update). The evaluation consisted of the excavation of fourteen hollow-stem auger borings ranging in depth from approximately 31 to 101 feet below existing grade, fifteen exploratory test pits ranging in depth from approximately 4 to 17 feet below existing grade, seven Cone Penetrometer Tests (CPTs) up to depths approximately 67 feet below existing grade, and four hollow-stem infiltration borings at a depth ranging from 10 to 15 feet below existing grade. Groundwater was encountered at depths ranging from 64 to 99 feet. Laboratory testing included in-situ dry density and moisture content, laboratory compaction, expansion index, grain size distribution, Atterberg Limits, direct shear, collapse, consolidation, R-value and corrosion. The boring logs and laboratory data by others is presented in Appendix B and Appendix C, respectively. Borings and laboratory data by multiple other consultants within or adjacent to the subject site have also been included.

### *1.3 Project Description*

The proposed project will consist of approximately 70-acres of residential development with associated improvements including streets, parks, water quality , and open space. An open space area for the proposed Jeffery Open Space Trail (JOST) that will run adjacent to the site along the northern boundary, will be constructed by others. Based on review of the preliminary Rough Grading Exhibit by Fuscoe, 2024, a series of superpads are proposed to be constructed to the limits of the southern boundary with limited small cuts into the base of the ascending slopes where they encroach into the limits of the site. It is our understanding that the northeastern corner of the subject site and prominent bedrock ridge there will be preserved as a park and/or open space. Site elevations range from a high of approximate elevation 440 within the southeast corner to a low of approximate elevation 330 feet at the southwest corner of the proposed development area.

Site development will include removal of unsuitable soils and debris, removal of existing structures and associated utilities, septic systems and leach fields, removal of the High Line Canal Tunnel that bisects the site, rough grading to design grades, and construction of new homes and associated improvements.

We expect the proposed residential development will be at-grade with relatively light building loads (column and wall loads assumed to be a maximum of approximately 30 kips and 3 kips per lineal foot, respectively). At this time it is our understanding that design cuts will be on the order of up to approximately 30 feet within the onsite stockpile, and design fills up to 11 feet or more in the current detention basin at the southwest corner of the site. However, the majority of the site has proposed cuts/fills on the order of approximately 5 feet.

The recommendations provided herein are based upon the estimated structural loading, potential grade changes, and expected layout information above. We understand that the project plans are currently being developed at this time; LGC Geotechnical should be provided with updated project plans (including grading, foundation, retaining walls, etc.) and any changes to the assumed structural loads when they become available, to either confirm or modify the preliminary recommendations provided herein.

## *1.4 Subsurface Evaluation*

LGC Geotechnical performed a subsurface geotechnical evaluation of the site consisting of the excavation of fifteen hollow-stem auger borings and seventeen exploratory geotechnical test pits.

Fifteen hollow-stem borings (HS-1 through HS-5 & I-1 through I-10) were drilled to depths ranging from approximately 5 to 30 feet below existing grade. Infiltration testing was performed within borings I-1 through I-10, as discussed in the section below. An LGC Geotechnical representative observed the drilling operations, logged the borings, and collected soil samples for laboratory testing. The borings were excavated using a truck-mounted drill rig equipped with 8-inch-diameter hollow-stem augers. Driven soil samples were collected by means of the Standard Penetration Test (SPT) and Modified California Drive (MCD) sampler generally obtained at 2.5 to 5-foot vertical increments for borings HS-1 through HS-5, and at depth for infiltration borings I-1 through I-10. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch-tall brass rings. The SPT sampler and MCD sampler were driven using a 140-pound automatic hammer falling 30 inches to advance the sampler a total depth of 18 inches. The raw blow counts for each 6-inch increment of penetration were recorded on the boring logs. Bulk samples were also collected and logged at select depths for laboratory testing. At the completion of drilling, the borings were backfilled with the native soil cuttings and tamped. Some settlement of the backfill soils may occur over time.

Seventeen exploratory geotechnical test pits (TP-1 through TP-17) were excavated utilizing a standard backhoe to estimate removal depths and obtain samples for laboratory testing. An engineering geologist observed the operation, logged the geotechnical test pits and collected soil samples. The exploratory geotechnical test pits were subsequently backfilled with tamped native soils. Some settlement of the backfill soils may occur over time.

The approximate locations of borings and geotechnical test pits are shown on the Preliminary Geotechnical Map (Sheet 1). Boring and test pit logs are presented in Appendix B.

## *1.5 Field Percolation Testing*

Ten falling head field percolation tests (I-1 through I-10) were performed in the approximate locations indicated on our Preliminary Geotechnical Map (Sheet 1). Estimation of infiltration rates for the site was accomplished in general accordance with the guidelines set forth by the County of Orange County (2013). A 3-inch diameter perforated PVC pipe with filter sock was placed in the borehole, and the annulus was backfilled with gravel, including placement of approximately 2 inches of gravel at the bottom of the borehole. The infiltration wells were pre-soaked the day prior to testing. During the pre-test, if the water level dropped more than 6 inches in 25 minutes for two consecutive readings, the test procedure for coarse-grained soils was followed. If the water level did not drop 6 inches in one or both pre-test readings, the procedure for fine-grained soils was followed. The procedure for coarse-grained soils requires performing the test for one hour and taking one reading every 10 minutes from a fixed reference point. The procedure for fine-grained soils requires performing the test for six hours and taking one reading every 30 minutes from a fixed reference point.

The pre-tests indicated the procedure for fine-grained soils should be followed for seven of the

infiltration test locations, and the procedure for coarse-grained soils followed for five of the infiltration test locations. The calculated infiltration is normalized relative to the three-dimensional flow that occurs within the field test and is converted to a one-dimensional flow out of the bottom of the boring only (i.e., "Porchet Method"). The measured infiltration rates (for feasibility purposes only) are provided in Table 1 below. Please note that subsurface water infiltration potential for the site is discussed in Section 4.8 below and field data is provided in Appendix D.

Please note that the values provided in Table 1 do not include reduction factors associated with the test procedure, site variability, and long-term siltation plugging that are used to calculate the design infiltration rate.

***TABLE 1***

***Summary of Field Infiltration Testing***

| Infiltration Test No. | Approx. Depth Below Existing Grade (ft) | Measured Infiltration Rate* (in./hr.) |
|---|---|---|
| I-1 | 30 | 0.06 |
| I-2 | 5 | 0.53 |
| I-3 | 30 | 0.46 |
| I-4 | 5 | 0.07 |
| I-5 | 30 | 3.61 |
| I-6 | 5 | 0.43 |
| I-7 | 30 | 0.08 |
| I-8 | 5 | 1.14 |
| I-9 | 30 | 0.70 |
| I-10 | 5 | 6.61 |

*Measured Infiltration Rates Do Not Include Factor of Safety.

## *1.6 Laboratory Testing*

Laboratory testing was performed on representative soil samples obtained from our subsurface evaluation. Laboratory testing included in-situ moisture and density tests, expansion index, fines content, Atterberg Limits, laboratory compaction, consolidation and collapse.

The following is a summary of the laboratory test results.

- Dry density of the samples collected ranged from approximately 96 pounds per cubic foot (pcf) to 117 pcf, with an average of approximately 109 pcf. Field moisture contents ranged from approximately 1 percent to 23 percent, with an average of approximately 9 percent.
- Four samples were tested for fines content indicated a fines content (passing No. 200 sieve) ranging from 24 to 66 percent. According to the Unified Soils Classification System (USCS), the 3 of the tested samples are classified as "coarse-grained" soil and 1 of the

tested samples is classified as “fine-grained” soil.

- One Atterberg Limit (liquid limit and plastic limit) test was performed. The result was a Plasticity Index (PI) value of 18.
- Three Expansion Index (EI) tests were performed. The result indicated an EI value ranging from 7 to 30, corresponding to “Very Low” to “Low” expansion potential.
- Five laboratory compaction tests of near surface samples indicated a maximum dry density ranging from 126 to 128.5 with an optimum moisture content of 9.5 percent.
- Six swell/collapse tests were performed. The plots are provided in Appendix C.
- One consolidation test was performed. The deformation versus vertical stress plot is provided in Appendix C.

A summary of the results is presented in Appendix C. The moisture and dry density test results are presented on the boring logs in Appendix B.




| | |
|---|---|
| PROJECT NAME | Brookfield - Gateway Village |
| PROJECT NO. | 23203-01 |
| ENG. / GEOL. | DJB |
| SCALE | Not to Scale |
| DATE | November 2024 |

LGC Geotechnical, Inc.

**FIGURE 1**
**Site Location Map**

## *2.0 GEOTECHNICAL CONDITIONS*

### *2.1 Regional Geology*

The subject site is located along the southeastern margin of the Los Angeles Basin, a large structural depression within the Peninsular Ranges geomorphic province of California. The site is specifically located in the eastern-most portion of the Tustin Plain, and it is within the mouth of a tributary drainage of the San Diego Creek Watershed (CDMG, 2000), that reaches the ocean at Newport Bay. The site is located within the relatively narrow Hicks Canyon at the base of the foothills that support the Santa Ana Mountain Range to the northeast of the site. Bedrock hills to the north and south of the site generally consist of the bedrock units that form the foothills, the Tertiary Vaqueros and Sespe Formations. The site is underlain by interfingered alluvial fan and alluvial deposits that thicken to the west where the relatively low relief neighborhoods located west of Portola Parkway were constructed. To the east of the site, there are branches of smaller tributary drainages from the foothills, and a localized stream channel crosses the site.

### *2.2 Site Geology and Generalized Subsurface Conditions*

Generalized subsurface conditions at the site are summarized in the sections below, from youngest to oldest. Detailed descriptions of the subsurface conditions from previous and recent subsurface investigations are presented on the boring and geotechnical trench logs, Appendix B. Approximate limits of soils are presented on the Preliminary Geotechnical Map, Sheet 1.

It should be noted that borings and exploratory test pits are only representative of the location and time where/when they are performed, and varying subsurface conditions may exist outside of the performed location. In addition, subsurface conditions can change over time. The soil descriptions provided should not be construed to mean that the subsurface profile is uniform, and that soil is homogenous within the project area.

#### *Undocumented Artificial Fill*

Native onsite alluvial deposits are generally overlain by a thin veneer of older artificial fill and/or agricultural till (Map Symbol: afu), that was found to range from approximately 1 to 7 feet below existing grade during our evaluation and previous evaluations on-site. Material was observed to be similar to the alluvium, generally consisting of brown, clayey to silty sand and sandy silt. Areas of deeper undocumented artificial fills and possible refuse may be encountered due to previous filling of drainages for leveling the agricultural fields such as for the buried high line canal tunnel (not encountered during site investigations).

A stockpile located on the eastern portion of the site consists of two lobes with irregular topography. Stockpiled soils were reportedly imported since 2018, from various locations within the Irvine Ranch (NMG, 2023). Material in the stockpile was observed to be a varied mix of soils including loosely layered, dark brown, light reddish brown, and orangish brown sandy silt, silty sand and clayey silt, with scattered fragments of

construction debris and organics.

***Artificial Fill by Others***

Approximate limits of older artificial fills placed under observation and testing by others (Map Symbol: afo) were not encountered during the recent site investigation; however, approximate limits of older artificial fills related to the cut and fill grading of the Bee Canyon Access Road along the southern boundary, Portola Parkway along the western boundary, fills placed in preparation for the future Jeffery Open Space Trail, Jeffery Road, and the ascending slope in support of the large residential development to the north of Jeffery, are presented on the Geotechnical Map.

***Slopewash***

Limited areas of material identified as slopewash (Map Symbol: Qsw) were mapped by others as a relatively thin mantle of eroded material built up at the toe of bedrock slope areas around the southern and eastern perimeter of the site. It has been described by others as a layer or layers of material similar to topsoil or colluvium, that interfingers with the alluvium and is considered potentially compressible. Slopewash is recommended to be removed from areas within influence future construction. The material was not specifically encountered during LGC Geotechnical's recent subsurface investigation.

***Quaternary Alluvium***

Based on regional mapping and our observations of the site, it is generally underlain by Quaternary Alluvial Deposits (Map Symbol: Qal). The alluvial deposits are described as Holocene to Late Pleistocene Epoch deposits predominantly consisting of brown, reddish brown, and light yellowish brown, sandy silt to silty sand, clayey sand, and silty to sandy clay, slightly moist to moist, loose to medium dense. Site alluvium was observed by others extend up to approximately 90 feet below the site.

***Tertiary Vaqueros & Sespe Formations***

A narrow zone of bedrock, partially covered with variable thickness of slopewash, is present along the southern boundary of the site along a relatively small slope ascending to the Bee Canyon Access Road that runs parallel to the southern portion of the site. The large slope at the eastern-most portion of the site is also a bedrock ridge with variable slopewash around the toe of slope. The Tertiary Vaqueros Formation & Tertiary Sespe Formation bedrock units, undifferentiated in some areas, are present on the slopes noted above, and underlie the alluvial deposits at depth throughout the site.

The Tertiary Vaqueros bedrock unit (Map Symbol: Tv) is described as massive to thickly bedded marine sandstone and sandy siltstone unit, while the Tertiary Sespe Formation

(Map Symbol: Ts) is described as massive to thickly bedded, marine and non-marine, conglomeratic sandstone, clayey to silty sandstone or various colors (Morton, 2004 & NMG, 2023). Areas of bedrock indicated to be Tertiary Vaqueros & Sespe, Undifferentiated (Map Symbol: Tvs) are labeled as both formations due to similarities and localized interfingering of the units.

Geologic bedding and structure of the bedrock formations were observed to be massive to thickly bedded, steeply north-dipping, gently folded and tectonically sheared where observed in off-site borings by others. Where observed by LGC Geotechnical during recent site investigation, the material was fractured and highly weathered clayey sandstone to sandy claystone, and generally observed to be dipping moderately steeply to the northwest.

## *2.3 Groundwater*

Groundwater was not encountered by LGC Geotechnical to the maximum explored depth of 30 feet below existing grade. During a previous evaluation (NMG, 2023) groundwater was encountered at depths ranging from approximately 64 to 99 feet below existing grade. Regional mapping indicates the historic high groundwater table at a depth ranging from 20 to 40 feet below existing grade (CDMG, 2000). Based on the recent findings from NMG and eventual removal of the crops and irrigation from the area, we believe groundwater will be encountered at a deeper depth than currently described. Groundwater is not expected to be a major constraint to the project. However, please note that seepage may be encountered in the bedrock areas on the southern edge of the subject site.

In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Groundwater conditions below the site may be variable, depending on numerous factors including seasonal rainfall, local irrigation, and groundwater pumping, among others.

## *2.4 Faulting and Seismic Hazards*

Prompted by damaging earthquakes in California, State legislation and policies concerning the classification and land-use criteria associated with faults have been developed. Their purpose was to prevent the construction of urban developments across the trace of active faults, resulting in the Alquist-Priolo Earthquake Fault Zoning Act. Earthquake Fault Zones have been delineated along the traces of active faults within California. Where developments for human occupation are proposed within these zones, the State requires detailed fault evaluations be performed so that engineering geologists can mitigate the hazards associated with active faulting by identifying the location of active faults and allowing for a setback from zones of previous ground rupture.

The subject site is not located within an Alquist-Priolo Earthquake Fault Zone and no faults were identified on the site during our site evaluation (CGS, 2018 & 2024). The possibility of damage due to ground rupture is considered low since no active faults are known to cross the site.

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include ground lurching, shallow ground rupture, soil liquefaction and dynamic settlement. These secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependent on the distance between the site and causative fault and the onsite geology. Some of the major active nearby faults that could produce these secondary effects include the San Joaquin Hills, Whittier-Elsinore, Newport-Inglewood, San Jacinto and San Andreas, among others (CGS, 2018). A discussion of these secondary effects is provided in the following sections.

### *2.4.1 Liquefaction and Dynamic Settlement*

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions coexist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that loose, saturated, near-surface, cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils, and cohesive soils exhibit low to negligible liquefaction potential. In general, cohesive soils are not considered susceptible to liquefaction. Effects of liquefaction on level ground include settlement, sand boils, and bearing capacity failures below structures. Furthermore, dynamic settlement of dry sands can occur as the sand particles tend to settle and densify as a result of a seismic event.

Based on our review of the State of California Seismic Hazard Zone for liquefaction potential (CDMG, 2001 & CGS, 2024), the subject site is located within a liquefaction hazard zone. However, site soils are not generally susceptible to liquefaction due to a lack of groundwater in the upper 50 feet. Isolated layers may be susceptible to dry sand seismic settlement. Seismically induced dry sand settlements were estimated utilizing CPT data and seismic parameters per the 2022 CBC. Based on the data obtained from the previous field evaluation, seismic settlement due to dry sands is estimated to be on the order of about 2-inches or less. Differential settlement may be estimated as half of the total settlement over a horizontal span of 40 feet.

### *2.4.2 Lateral Spreading*

Lateral spreading is a type of liquefaction induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move downslope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements and such movement typically damages pipelines, utilities, bridges, and structures.

Due to the low liquefaction potential and lack of a free face the potential for lateral spreading is considered very low.

## *2.5 Seismic Design Criteria*

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2022 California Building Code (CBC) and applicable portions of ASCE 7-16 which has been adopted by the CBC. Please note that the following seismic parameters are only applicable for code-based acceleration response spectra and are not applicable for where site-specific ground motion procedures are required by ASCE 7-16. Representative site coordinates of latitude 33.716344 degrees north and longitude -117.739227 degrees west were utilized in our analyses. The maximum considered earthquake (MCE) spectral response accelerations ($S_{MS}$ and $S_{M1}$) and adjusted design spectral response acceleration parameters ($S_{DS}$ and $S_{D1}$) for Site Class D are provided in Table 2 on the following page. Since site soils are Site Class D, additional adjustments are required to code acceleration response spectrums as outlined below and provided in ASCE 7-16. The structural designer should contact the geotechnical consultant if structural conditions (e.g., number of stories, seismically isolated structures, etc.) require site-specific ground motions.

***TABLE 2***

***Seismic Design Parameters***

| **Selected Parameters from 2022 CBC, Section 1613 - Earthquake Loads** | **Seismic Design Values** | **Notes/Exceptions** |
|---|---|---|
| Distance to applicable faults classifies the site as a "Near-Fault" site. | | Section 11.4.1 of ASCE 7 |
| Site Class | D* | Chapter 20 of ASCE 7 |
| Ss (Risk-Targeted Spectral Acceleration for Short Periods) | 1.302g | From SEAOC, 2024 |
| $S_1$ (Risk-Targeted Spectral Accelerations for 1-Second Periods) | 0.463g | From SEAOC, 2024 |
| $F_a$ (per Table 1613.2.3(1)) | 1.0 | For Simplified Design Procedure of Section 12.14 of ASCE 7, $F_a$ shall be taken as 1.4 (Section 12.14.8.1) |
| $F_v$ (per Table 1613.2.3(2)) | 1.837 | Value is only applicable per requirements/exceptions per Section 11.4.8 of ASCE 7 |
| $S_{MS}$ for Site Class D [Note: $S_{MS} = F_aS_S$] | 1.302g | - |
| $S_{M1}$ for Site Class D [Note: $S_{M1} = F_vS_1$] | 0.851g | Value is only applicable per requirements/exceptions per Section 11.4.8 of ASCE 7 |
| $S_{DS}$ for Site Class D [Note: $S_{DS} = (^2/_3)S_{MS}$] | 0.868g | - |
| $S_{D1}$ for Site Class D [Note: $S_{D1} = (^2/_3)S_{M1}$] | 0.567g | Value is only applicable per requirements/exceptions per Section 11.4.8 of ASCE 7 |
| $C_{RS}$ (Mapped Risk Coefficient at 0.2 sec) | 0.939 | ASCE 7 Chapter 22 |
| $C_{R1}$ (Mapped Risk Coefficient at 1 sec) | 0.931 | ASCE 7 Chapter 22 |
| *Since site soils are Site Class D and S1 is greater than or equal to 0.2, the seismic response coefficient Cs is determined by Eq. 12.8-2 for values of T ≤ 1.5Ts and taken equal to 1.5 times the value calculated in accordance with either Eq. 12.8-3 for TL ≥ T > Ts, or Eq. 12.8-4 for T > TL. Refer to ASCE 7-16. Site Class F modified to Site Class D, seismic parameters only applicable for structure period ≤ 0.5 second, refer to discussion above. | | |

A deaggregation of the PGA based on a 2,475-year average return period (MCE) indicates that an earthquake magnitude of 6.56 at a distance of approximately 15.56 km from the site would contribute the most to this ground motion. A deaggregation of the PGA based on a 475-year average return period (Design Earthquake) indicates that an earthquake magnitude of 6.56 at a distance of approximately 20.74 km from the site would contribute the most to this ground motion (USGS, 2014).

Section 1803.5.12 of the 2022 CBC (per Section 11.8.3 of ASCE 7) states that the maximum considered earthquake geometric mean ($MCE_G$) Peak Ground Acceleration (PGA) should be used for liquefaction potential. The $PGA_M$ for the site is equal to 0.592g (SEAOC, 2024). The design PGA is equal to 0.394g (2/3 of $PGA_M$).

## *2.6 Oversized Material*

Oversized materials (material larger than 8 inches in maximum dimension) are not anticipated to be encountered during site grading based on our subsurface evaluation. If encountered, recommendations are provided for appropriate handling of oversized materials in Appendix E.

## *2.7 Expansion Potential*

Based on the results of laboratory testing from our and previous evaluations and from nearby sites, finished grade soils are anticipated to have a "Very Low to Medium" expansion potential. Final expansion potential of site soils should be determined at the completion of grading.

## *2.8 Soils Susceptible to Hydro-Collapse*

Soils that are typically susceptible to hydro-collapse (or collapsible soils) are predominately sand and silt held in a loose honeycomb structure. This relatively loose honeycomb structure is held together by small amounts clay or calcium carbonate acting as a temporary (soluble) cementing agent. If the soil remains dry the soil maintains its structure, however the addition of water to the soil will greatly weaken the honeycomb structure and the soil can subsequently experience immediate collapses. This collapse results in rapid soil settlement and potential damage to any improvements which are located without the zone of influence of the collapsible soils.

Laboratory testing for hydro-collapse is typically performed per American Society for Testing and Materials (ASTM) Test Method D5333 or ASTM D 2435. The two most common categorizations of hydro-collapse potential are ASTM D5333 and the Naval Facilities Engineering Command (NFEC, 1986) are shown in Table 3A and 3B below.

***TABLE 3A***

***Classification of Soil Collapsibility per ASTM D 5333***

| Collapse Index (Ie) | Collapse (%) | Collapse Potential |
|---|---|---|
| 0 | 0 | None |
| 0.001 - 0.02 | 0.1 - 2 | Slight |
| 0.021 - 0.60 | 2.1 - 6 | Moderate |
| 0.60 - 0.10 | 6 - 10 | Moderately Severe |
| > 0.10 | > 10 | Severe |

***TABLE 3B***

***Classification of Soil Collapsibility per NFEC, 1986***

| Collapse Potential (%) | Severity of Problem |
|---|---|
| 0-1 | No Problem |
| 1-5 | Moderate Trouble |
| 5-10 | Trouble |
| 10-20 | Severe Trouble |
| 20 | Very Severe Trouble |

A summary of the onsite soils with their tested collapse potential are provided in Table 4 on the following page. The measured collapse potential ranged from approximately 0.06 percent to 0.36 percent and therefore is not considered a significant issue.

***TABLE 4***

***Summary of Hydro-Collapse Laboratory Test Results***

| Boring | Laboratory Measured Collapse (%) |
|---|---|
| HS-1 @ 7.5 feet | 0.06 |
| HS-3 @ 15 feet | 0.06 |
| HS-4 @ 10 feet | 0.36 |
| HS-4 @ 20 feet | 0.28 |
| HS-5 @ 7.5 feet | 0.21 |
| HS-5 @ 10 feet | 0.24 |

## *3.0 CONCLUSIONS*

Based on the results of our subsurface geotechnical evaluation, it is our opinion that the proposed improvements are feasible from a geotechnical standpoint, provided that the recommendations contained in the following sections are incorporated during site development. A summary of our geotechnical conclusions are as follows:

- In general, exploratory test pits and borings excavated at the subject site indicate the native soils generally consist of clayey to silty sand and sandy clay. Native alluvial materials were found to be locally overlain by a relatively thin variable veneer of old artificial fill and/or agricultural till associated with previous uses of the site. Limited areas of bedrock encountered in the southern perimeter of the project to consist of clayey sandstone to sandy claystone, where observed.
- The near-surface loose and compressible native soils, undocumented artificial fill soils, and stockpiled soils, are not suitable for the planned improvements in their present condition (refer to Section 4.1). Approximate remedial grading depths are presented on the Preliminary Geotechnical Map, Sheet 1.
- Bedrock is exposed within the small ascending slope along the southern boundary of the site, and within the prominent ridgeline at the eastern-most portion of the site. Pending final design grades, stabilization fill keyways may be recommended for the design cut slopes. Additionally, areas of bedrock exposed at design cut pad grade are recommended to be overexcavated a minimum of 5 feet below design grade. These details will be provided in a forthcoming grading plan review report.
- Groundwater was not encountered to the maximum explored depth of 30 feet below existing grade. During a previous evaluation (NMG, 2023) groundwater was encountered at depths ranging from approximately 64 to 99 feet below existing grade. Groundwater is not expected to be a major constraint to the project.
- The subject study area is not located within a mapped State of California Earthquake Fault Zone, and based upon our review of published geologic mapping, no known active or potentially active faults are known to exist within or in the immediate vicinity of the site. Therefore, the potential for ground rupture due to faulting is considered very low.
- The main seismic hazard that may affect the site is ground shaking from one of the active regional faults. The subject site will likely experience strong seismic ground shaking during its design life.
- Site soils are generally not considered susceptible to liquefaction due to a lack of groundwater in the upper 50 feet. However, isolated layers may be susceptible to dry sand seismic settlement. Based on data obtained from the previous field evaluation, seismic settlement due to dry sands is estimated to be on the order of about 2-inches or less. Differential settlement may be estimated as half of the total settlement over a horizontal span of 40 feet
- Based on the results of preliminary laboratory testing, site soils are anticipated to have “Very Low to Medium” expansion potential. Final design expansion potential must be determined at the completion of grading.
- Excavations into the existing site soils should be feasible with heavy construction equipment in good working order. We anticipate that soils generated from the excavations will be generally suitable for re-use as compacted fill, provided they are relatively free of rocks larger than 8 inches in dimension, construction debris, and significant organic material.

- Oversized materials (greater than 8 inches in maximum dimension) are not likely to be encountered during site grading. If encountered, recommendations are provided for appropriate handling of oversized materials in Appendix E.
- The majority of onsite soils are not suitable for backfill of site retaining walls. Therefore, import of sandy soils meeting project recommendations will likely be required.
- Field testing resulted in a measured infiltration rate ranging from 0.06 to 6.61 inches per hour. The measured infiltration rates do not include a factor of safety. Discussion regarding infiltration is provided in Section 4.8.
- The site soils were tested to have a low potential for hydro-collapse.
- Pre-soaking of the subgrade for building slabs (and flatwork) will be required due to site expansive soils. The duration and process varies greatly based on the chosen method and is also dependent on factors such as soil type and weather conditions. Time duration for presoaking from completion of rough grading to trenching of foundations should be accounted for in the construction schedule (typically 1 to 2 weeks).

## *4.0 RECOMMENDATIONS*

The following recommendations are to be considered preliminary and should be confirmed upon completion of grading and earthwork operations. In addition, they should be considered minimal from a geotechnical viewpoint, as there may be more restrictive requirements from the architect, structural engineer, building codes, governing agencies, or the owner.

It should be noted that the following geotechnical recommendations are intended to provide sufficient information to develop the site in general accordance with the 2022 CBC requirements. With regard to the possible occurrence of potentially catastrophic geotechnical hazards such as fault rupture, earthquake-induced landslides, liquefaction, etc. the following geotechnical recommendations should provide adequate protection for the proposed development to the extent required to reduce seismic risk to an "acceptable level." The "acceptable level" of risk is defined by the California Code of Regulations as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project" [Section 3721(a)]. Therefore, repair and remedial work of the proposed improvement may be required after a significant seismic event. With regards to the potential for less significant geologic hazards to the proposed development, the recommendations contained herein are intended as a reasonable protection against the potential damaging effects of geotechnical phenomena such as expansive soils, fill settlement, groundwater seepage, etc. It should be understood, however, that our recommendations are intended to maintain the structural integrity of the proposed development and structures given the site geotechnical conditions but cannot preclude the potential for some cosmetic distress or nuisance issues to develop as a result of the site geotechnical conditions.

The geotechnical recommendations contained herein must be confirmed to be suitable or modified based on the actual as-graded conditions.

### *4.1 Site Earthwork*

Rough grading shall include remedial earthwork grading and placement of engineered compacted fill to design grades. Geotechnical recommendations for precise grading and construction of the proposed new improvements will be provided in our forthcoming report(s).

We recommend that earthwork onsite be performed in accordance with the following recommendations, future grading plan review report(s), the 2022 CBC/City of Irvine requirements, and the General Earthwork and Grading Specifications for Rough Grading included in Appendix E. In case of conflict, the following recommendations shall supersede those included in Appendix E. The following recommendations may be revised within future grading plan review reports or based on the actual conditions encountered during site grading.

#### *4.1.1 Site Preparation*

Prior to grading, areas to be developed should undergo complete demolition, removal of all vegetation, and clearing of pavements, existing utilities, foundation and slab elements from the site. Vegetation, debris from the previous land use and excessive organic

material should be removed and properly disposed of offsite. Holes resulting from removals of buried obstructions, which extend below proposed remedial and/or finish grades, should be replaced with suitable compacted fill material. If the demolition contractor removes subsurface utilities below the proposed remedial grading depth we recommend the excavations either be left open until grading operations begin or properly compacted to the depth of remedial grading.

The existing canal tunnel that runs through the middle of the site will need to be removed and properly disposed of offsite. At this time we do not know the depth of the tunnel but if the tunnel is deeper than the necessary remedial grading in the area then the excavations will need to be properly backfilled.

If cesspools or septic systems are encountered, they should be removed in their entirety. The resulting excavation should be backfilled with properly compacted fill soils. As an alternative, cesspools can be backfilled with lean sand-cement slurry. Any encountered wells should be properly abandoned in accordance with regulatory requirements.

### *4.1.2 Removal Depths and Limits*

In order to provide a relatively uniform bearing condition for the planned improvements, we recommend the near-surface potentially compressible soils be temporarily removed and recompacted as engineered fill. If any undocumented artificial fill is encountered within the influence of the proposed building pads, the soils should be removed to competent native materials.

In order to promote more uniform soil conditions, soils shall be temporarily removed and recompacted to a minimum depth ranging from approximately 5 to 12 feet below existing grade or 3 feet below the bottom of proposed foundations, whichever is deeper. Additionally, existing undocumented fill and unsuitable topsoil encountered within the building footprints should be temporarily removed and recompacted as compacted fill. Where space is available, the envelope for removal and recompaction should extend laterally a minimum distance equal to the depth of removal and recompaction below finish grade or 5 feet beyond the edges of the proposed building improvements, whichever is larger.

Local conditions may be encountered during excavation that could require additional over-excavation beyond the above noted minimum in order to obtain an acceptable subgrade. The actual depths and lateral extents of grading will be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Removal areas and areas to be over-excavated should be accurately staked in the field by the Project Surveyor.

### *4.1.3 Temporary Excavations*

Temporary excavations should be performed in accordance with project plans, specifications, and applicable Occupational Safety and Health Administration (OSHA)

requirements. Excavations should be laid back or shored in accordance with OSHA requirements before personnel or equipment are allowed to enter. Based on our field investigation, the majority of site soils are anticipated to be OSHA Type "B" soils (refer to the attached boring logs). Sandy soils are present and should be considered susceptible to caving. Soil conditions should be regularly evaluated during construction to verify conditions are as anticipated. The contractor shall be responsible for providing the "competent person" required by OSHA standards to evaluate soil conditions. Close coordination with the geotechnical consultant should be maintained to facilitate construction while providing safe excavations. Excavation safety is the sole responsibility of the contractor.

Where proposed improvements will be adjacent to property lines, the potential for impacting existing offsite improvements may be reduced by performing "ABC" slot cuts while performing earthwork removal and recompaction. "ABC" slot cuts are defined as excavations perpendicular to sensitive property boundaries that are divided into multiple "slots" of equal width. If slots are labeled A, B, C, A, B, C, etc., then all "A" slots can be excavated at the same time but must be backfilled before all "B" slots can be excavated, etc. Any given slot should be backfilled immediately with properly compacted fill to finish grade prior to excavation of the adjacent two slots. Please note some sands susceptible to caving are present at the site. Recommendations for slot cut dimensions should be evaluated during grading. Protection of the existing offsite improvements during grading is the responsibility of the contractor.

Vehicular traffic, stockpiles, and equipment storage should be set back from the perimeter of excavations a minimum distance equivalent to a 1:1(horizontal to vertical) projection from the bottom of the excavation or 5 feet, whichever is greater. Once an excavation has been initiated, it should be backfilled as soon as practical. Prolonged exposure of temporary excavations may result in some localized instability. Excavations should be planned so that they are not initiated without sufficient time to shore/fill them prior to weekends, holidays, or forecasted rain.

It should be noted that any excavation that extends below a 1:1 (horizontal to vertical) projection of an existing foundation will remove existing support of the structure foundation. If requested, temporary shoring parameters will be provided.

### *4.1.4 Removal Bottoms and Subgrade Preparation*

In general, removal bottoms, over-excavation bottoms and areas to receive compacted fill should be scarified to a minimum depth of 6 inches, brought to a near-optimum moisture condition (generally within optimum and 2 percent above optimum moisture content), and re-compacted per project recommendations.

Removal bottoms, over-excavation bottoms and areas to receive fill should be observed and accepted by the geotechnical consultant prior to subsequent fill placement.

### *4.1.5 Material for Fill*

From a geotechnical perspective, the onsite soils are generally considered suitable for use as general compacted fill, provided they are screened of significant organic materials, construction debris and any oversized material (8 inches in greatest dimension).

From a geotechnical viewpoint, import soils for general fill (i.e., non-retaining wall backfill) should consist of clean, granular soils of Low expansion potential (expansion index 50 or less based on ASTM D4829). Import for retaining wall backfill should meet the criteria outlined in the paragraph below. Source samples should be provided to the geotechnical consultant for laboratory testing a minimum of three working days prior to any planned importation.

Retaining wall backfill should consist of imported sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve) per ASTM Test Method D1140 (or ASTM D6913/D422) and a "Very Low" expansion potential (EI of 20 or less per ASTM D4829). Soils should also be screened of organic materials, construction debris, and any material greater than 3 inches in maximum dimension.

Aggregate base should conform to the requirements of Section 200-2 of the most recent version of the Standard Specifications for Public Works Construction ("Greenbook") for untreated base materials and/or City of Irvine requirements.

The placement of demolition materials in compacted fill is acceptable from a geotechnical viewpoint provided the demolition material is broken up into pieces approximately 2 to 4 inches in maximum dimension and well blended into fill soils with essentially not resulting voids. Demolition material placed in fills must be free of construction debris (wood, organics, etc.) and reinforcing steel. If you elect to incorporate asphalt concrete fragments into the fill materials, approval from an environmental viewpoint and/or local agency may be required and is not the purview of the geotechnical consultant. From our previous experience, if you elect to do this, we recommend that asphalt concrete fragments be limited to fill areas within planned street areas (i.e., not within building pad areas) or exported.

### *4.1.6 Placement and Compaction of Fills*

Material to be placed as fill should be brought to near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content) and recompacted to at least 90 percent relative compaction (per ASTM D1557). Moisture conditioning of site soils will be required to achieve adequate compaction. Drying and/or mixing of very moist soil will be required prior to reusing the materials in compacted fills. Some soils will require additional moisture to achieve the required compaction.

The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in compacted thickness. Each lift should be thoroughly compacted and accepted prior to subsequent lifts. Generally, placement and compaction of fill should

be performed in accordance with local grading ordinances and with observation and testing by LGC Geotechnical. Oversized material as previously defined should be removed from site fills.

During backfill of excavations, the fill should be properly benched into firm and competent soils of temporary backcut slopes as it is placed in lifts.

Aggregate base material should be compacted to a minimum of 95 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Subgrade below aggregate base should be compacted to a minimum of 90 percent relative compaction per ASTM D1557 at near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content).

If gap-graded ¾-inch rock is used for backfill (around storm drain storage chambers, retaining wall backfill, etc.) it will require compaction. Rock shall be placed in thin lifts (typically not exceeding 6 inches) and mechanically compacted with observation by geotechnical consultant. Backfill rock shall meet the requirements of ASTM D2321. Gap-graded rock is required to be wrapped in filter fabric to prevent the migration of fines into the rock backfill.

### *4.1.7 Trench and Retaining Wall Backfill and Compaction*

The onsite materials may generally be suitable as trench backfill provided the soils are screened of organic matter and rocks greater than 6 inches in diameter. Trench backfill should be compacted in uniform lifts (generally not exceeding 12 inches in compacted thickness) by mechanical means to at least 90 percent relative compaction (per ASTM Test Method D1557). A representative from LGC Geotechnical should observe and test the backfill to verify compliance with the project recommendations.

The onsite soils will generally be suitable as trench backfill, provided the soils are screened of rocks and other material greater than 6 inches in diameter, construction debris and organic matter. If trenches are shallow or the use of conventional equipment may result in damage to the utilities, sand having a sand equivalent (SE) of 20 or greater (per California Test Method [CTM] 217) may be used to bed and shade the pipes. Sand backfill within the pipe bedding zone may be densified by jetting or flooding and then tamped to ensure adequate compaction. Sand grains should be from a natural source with rounded shape. Manufactured sand from crushed rock or recycled material is not suitable for jetting/flooding as the grains are typically angular in shape and do not densify well enough with these methods. Manufactured sand can be used as shading material when mechanical compaction efforts are used. Subsequent trench backfill should be compacted in uniform thin lifts by mechanical means to at least a minimum 90 percent relative compaction (per ASTM D1557). If any ¾-inch rock is used for backfill, see Section 4.1.6 for filter fabric requirements.

Retaining wall backfill should consist of sandy soils as outlined in preceding Section 4.1.5. The limits of select sandy backfill should extend at minimum ½ the height of the retaining wall or the width of the heel (if applicable), whichever is greater, refer to Figure 2 (rear of

text). Retaining wall backfill soils should be compacted in relatively uniform thin lifts to at least 90 percent relative compaction (per ASTM D1557). Jetting or flooding of retaining wall backfill materials should not be permitted.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, typically sand-cement slurry may be substituted for compacted backfill. The slurry should contain about one sack of cement per cubic yard. When set, such a mix typically has the consistency of compacted soil. Sand cement slurry placed near the surface within landscape areas should be evaluated for potential impacts on planned improvements.

A representative from LGC Geotechnical should observe and test the backfill to verify compliance with the project recommendations

### *4.1.8 Shrinkage and Subsidence*

The following table is an estimate of shrinkage and bulking factors for the various geologic units found onsite. These estimates are based on in-place densities of the various materials, the estimated average degree of relative compaction during grading and our experience. Subsidence due to earthwork equipment is expected to be 0.1 feet.

***TABLE 5***

***Summary of Estimated Shrink/Bulk***

| Soil Type | Allowance | Estimated Range |
|---|---|---|
| Stockpiles | Shrinkage | 15% to 25% |
| Topsoil (Upper 1 Foot) | Shrinkage | 10% to 20% |
| Alluvium | Shrinkage | 8% to 12% |

It should be stressed that these values are only estimates and that an actual shrinkage factor would be extremely difficult to predetermine. The effective change in volume of onsite soils will depend primarily on the type of compaction equipment, method of compaction used onsite by the contractor, and accuracy of the topographic survey.

Due to the combined variability in topographic surveys, inability to precisely model the removals and variability of on-site near-surface conditions, it is our opinion that the site will not balance at the end of grading. If importing/exporting a large volume of soils is not considered feasible or economical, we recommend a balance area be designated onsite that can fluctuate up or down based on the actual volume of soil. We recommend a “balance” area that can accommodate on the order of 5 percent (plus or minus) of the total grading volume be considered.

### *4.1.9 Slopes*

It is our understanding that the existing slopes in the eastern and southern portions of the subject site will not be disturbed during grading and will generally be outside the limits of the Gateway development. Once a grading plan is available, any design cut and fill slopes should be evaluated. Design cut/fill and/or natural slopes may need to be evaluated for slope stability once a 40-scale grading plan is available.

## *4.2 Preliminary Foundation Recommendations*

Provided that the remedial grading recommendations provided herein are implemented, the site may be considered suitable for the support of the residential structures using a post-tensioned foundation system designed to resist the impacts of expansive soils. Site soils are anticipated to contains Low to Medium expansion potential (EI of 90 or less per ASTM D4829). However, this must be verified based on as-graded conditions. Please note that the following foundation recommendations are preliminary and must be confirmed by LGC Geotechnical at the completion of project plans (i.e., foundation, grading and site layout plans) as well as completion of earthwork. Recommended soil bearing and estimated static settlement are provided in Section 4.3. Recommendations for both Low and Medium expansion potential have been provided below.

### *4.2.1 Provisional Post-Tensioned Foundation Design Parameters*

The geotechnical parameters provided herein may be used for post-tensioned slab foundations with a perimeter footing or a post-tensioned mat slab. These parameters have been determined in general accordance with the Post-Tensioning Institute (PTI) Standard Requirements for Design of Shallow Post-Tensioned Concrete Foundations on Expansive Soils, referenced in Chapter 18 of the 2022 CBC. In utilizing these parameters, the foundation engineer should design the foundation system in accordance with the allowable deflection criteria of applicable codes and the requirements of the structural designer/architect. Other types of stiff slabs may be used in place of the CBC post-tensioned slab design provided that, in the opinion of the foundation structural designer, the alternative type of slab is at least as stiff and strong as that designed by the CBC/PTI method.

Our design parameters are based on our experience with similar projects, test results onsite, and the anticipated nature of the soil (with respect to expansion potential). Please note that implementation of our recommendations will not eliminate foundation movement (and related distress) should the moisture content of the subgrade soils fluctuate. It is the intent of these recommendations to help maintain the integrity of the proposed structures and reduce (not eliminate) movement, based upon the anticipated site soil conditions. Should future owners and/or property maintenance personnel not properly maintain the areas surrounding the foundation, for example by overwatering, then we anticipate for highly expansive soils the maximum differential movement of the perimeter of the foundation to the center of the foundation to be on the order of a couple of inches. Soils of lower expansion potential are anticipated to show less movement.

***TABLE 6***

***Preliminary Post-Tensioned Foundation Design Parameters (Low EI)***

| Parameter | PT Slab with Perimeter Footing | PT Mat with Thickened Edge |
|---|---|---|
| Expansion Potential | Low | Low |
| Thornthwaite Moisture Index | -20 | -20 |
| Constant Soil Suction | PF 3.9 | PF 3.9 |
| Center Lift<br>Edge moisture variation distance, $e_m$<br>Center lift, $y_m$ | <br>9.0 feet<br>0.25 inch | <br>9.0 feet<br>0.3 inch |
| Edge Lift<br>Edge moisture variation distance, $e_m$<br>Edge lift, $y_m$ | <br>5.5 feet<br>0.55 inches | <br>5.5 feet<br>0.66 inches |
| Modulus of Subgrade Reaction, k (assuming presoaking as indicated below) | 200 pci | 200 pci |
| Minimum perimeter footing/thickened edge embedment below finish grade | 12 inches | 6 inches |
| Minimum Slab Thickness | 5 inches[2] | 8 inches[2] |
| Presoak | 100% of Opt.<br>12 inches | 100% of Opt.<br>12 inches |

1. Expansion index is for preliminary design purposes. Further evaluation is needed at the completion of grading.
2. Recommendations for foundation reinforcement and slab thickness are ultimately the purview of the foundation engineer/structural engineer based upon geotechnical criteria and structural engineering considerations.
3. Recommendations for vapor retarders below slabs are also the purview of the foundation engineer/structural engineer and should be provided in accordance with applicable code requirements.

***TABLE 7***

***Preliminary Post-Tensioned Foundation Design Parameters (Medium EI)***

| Parameter | PT Slab with Perimeter Footing | PT Mat with Thickened Edge |
|---|---|---|
| Expansion Potential | Medium | Medium |
| Thornthwaite Moisture Index | -20 | -20 |
| Constant Soil Suction | PF 3.9 | PF 3.9 |
| Center Lift<br>Edge moisture variation distance, $e_m$<br>Center lift, $y_m$ | <br>9.0 feet<br>0.5 inch | <br>9.0 feet<br>0.6 inch |
| Edge Lift<br>Edge moisture variation distance, $e_m$<br>Edge lift, $y_m$ | <br>4.7 feet<br>1.1 inches | <br>4.7 feet<br>1.3 inches |
| Modulus of Subgrade Reaction, k (assuming presoaking as indicated below) | 150 pci | 150 pci |
| Minimum perimeter footing/thickened edge embedment below finish grade | 18 inches | 6 inches |
| Minimum Slab Thickness | 5 inches[5] | 8 inches[5] |
| Presoak | 120% of Opt.<br>18 inches | 120% of Opt.<br>18 inches |

4. Expansion index is for preliminary design purposes. Further evaluation is needed at the completion of grading.
5. Recommendations for foundation reinforcement and slab thickness are ultimately the purview of the foundation engineer/structural engineer based upon geotechnical criteria and structural engineering considerations.
6. Recommendations for vapor retarders below slabs are also the purview of the foundation engineer/structural engineer and should be provided in accordance with applicable code requirements.

### *4.2.2 Shallow Foundation Maintenance*

The geotechnical parameters provided herein assume that if the areas adjacent to the foundation are planted and irrigated, these areas will be designed with proper drainage and adequately maintained so that ponding, which causes significant moisture changes below the foundation, does not occur. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Plants should only be provided with sufficient irrigation for life and not overwatered to saturate subgrade soils. Sunken planters placed adjacent to the foundation should either be designed with an efficient drainage system or liners to prevent moisture infiltration below the foundation. Some

lifting of the perimeter foundation beam should be expected even with properly constructed planters.

In addition to the factors mentioned above, future owners/property management personnel should be made aware of the potential negative influences of trees and/or other large vegetation. Roots that extend near the vicinity of foundations can cause distress to foundations. Future owners (and the owner's landscape architect) should not plant trees/large shrubs closer to the foundations than a distance equal to half the mature height of the tree or 20 feet, whichever is more conservative unless specifically provided with root barriers to prevent root growth below the building foundation.

It is the owner's responsibility to perform periodic maintenance during hot and dry periods to ensure that adequate watering has been provided to keep soil from separating or pulling back from the foundation. Future owners and property management personnel should be informed and educated regarding the importance of maintaining a constant level of soil-moisture. The owners should be made aware of the potential negative consequences of both excessive watering, as well as allowing potentially expansive soils to become too dry. Expansive soils can undergo shrinkage during drying, and swelling during the rainy winter season, or when irrigation is resumed. This can result in distress to building structures and hardscape improvements. The builder should provide these recommendations to future owners and property management personnel.

### *4.2.3 Slab Underlayment Guidelines*

The following is for informational purposes only since slab underlayment (e.g., moisture retarder, sand or gravel layers for concrete curing and/or capillary break) is unrelated to the geotechnical performance of the foundation and thereby not the purview of the geotechnical consultant. Post-construction moisture migration should be expected below the foundation. The foundation engineer/architect should determine whether the use of a capillary break (sand or gravel layer), in conjunction with the vapor retarder, is necessary or required by code. Sand layer thickness and location (above and/or below vapor retarder) should also be determined by the foundation engineer/architect.

## *4.3 Soil Bearing and Lateral Resistance*

Provided our earthwork recommendations are implemented, an allowable soil bearing pressure of 2,000 pounds per square foot (psf) may be used for the design of footings having a minimum width of 12 inches and minimum embedment of 18 inches below lowest adjacent ground surface. This value may be increased by 300 psf for each additional foot of embedment and 150 psf for each additional foot of foundation width to a maximum value of 3,000 psf. A mat foundation a minimum of 6 inches below lowest adjacent grade may be designed for an allowable soil bearing pressure of 1,200 psf. These allowable bearing pressures are applicable for level (ground slope equal to or flatter than 5H:1V) conditions only. Bearing values indicated are for total dead loads and frequently applied live loads and may be increased by ⅓ for short duration loading (i.e., wind or seismic loads).

In utilizing the above-mentioned allowable bearing capacity and provided our earthwork recommendations are implemented, foundation settlement due to structural loads is anticipated to be 1-inch or less. Differential settlement may be taken as half of the total settlement (i.e., ½-inch over a horizontal span of 40 feet).

Resistance to lateral loads can be provided by friction acting at the base of foundations and by passive earth pressure. For concrete/soil frictional resistance, an allowable coefficient of friction of 0.3 may be assumed with dead-load forces. An allowable passive lateral earth pressure of 220 psf per foot of depth (or pcf) to a maximum of 2,200 psf may be used for the sides of footings poured against properly compacted fill. Allowable passive pressure may be increased to 300 pcf (maximum of 3,000 psf) for short duration seismic loading. This passive pressure is applicable for level (ground slope equal to or flatter than 5H:1V) conditions only. Frictional resistance and passive pressure may be used in combination without reduction. We recommend that the upper foot of passive resistance be neglected if finished grade will not be covered with concrete or asphalt. The provided allowable passive pressures are based on a factor of safety of 1.5 and 1.1 for static and seismic loading conditions, respectively. The structural designer should incorporate appropriate factors of safety and/or load factors in their design.

### *4.4 Lateral Earth Pressures and Retaining Wall Design Considerations*

The following may be used for design of site retaining walls. Lateral earth pressures are provided as equivalent fluid unit weights, in psf per foot of depth (or pcf). These values do not contain an appreciable factor of safety, so the retaining wall designer should apply the applicable factors of safety and/or load factors during design. A soil unit weight of 120 pcf may be assumed for calculating the actual weight of soil over the wall footing.

The following lateral earth pressures are presented in Table 8 on the following page, for approved imported free draining, clean granular (sandy) soils with a maximum of 35 percent fines (passing the No. 200 sieve per ASTM D-421/422) and a "Very Low" expansion potential (EI of 20 or less per ASTM D4829). The site soils are not suitable for retaining wall backfill due to their fines content and expansion index. Import of soils meeting the criteria outlined above will need to be used for retaining wall backfill soil. The wall designer should clearly indicate on the retaining wall plans the required imported sandy soil backfill criteria. These preliminary findings should be confirmed during grading.

***TABLE 8***

***Lateral Earth Pressures – Approved Imported Sandy Soils***

| Conditions | Equivalent Fluid Unit Weight (pcf) | Equivalent Fluid Unit Weight (pcf) |
|---|---|---|
| | Level Backfill | 2:1 Sloped Backfill |
| | Approved Sandy Soils | Approved Sandy Soils |
| Active | 35 | 55 |
| At-Rest | 55 | 70 |

If the wall can yield enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the earth pressure will be higher. This would include 90-degree corners of retaining walls. Such walls should be designed for "at-rest." The equivalent fluid pressure values assume free-draining conditions and a drainage system will be installed and maintained to prevent the build-up of hydrostatic pressures. If conditions other than those assumed above are anticipated, the equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical engineer.

Retaining wall structures should be provided with appropriate drainage and appropriately waterproofed. To reduce, but not eliminate, saturation of near-surface (upper approximate 1-foot) soils in front of the retaining walls, the perforated subdrain pipe should be located as low as possible behind the retaining wall. The outlet pipe should be sloped to drain to a suitable outlet. In general, we do not recommend retaining wall outlet pipes be connected to area drains. If subdrains are connected to area drains, special care should be taken to maintain these drains. Typical conventional retaining wall drainage is shown on Figure 2. It should be noted that the recommended subdrain does not provide protection against seepage through the face of the wall and/or efflorescence. Waterproofing and outlet systems are not the purview of the geotechnical consultant.

Surcharge loading effects from any adjacent structures should be evaluated by the retaining wall designer. In general, structural loads within a 1:1 (horizontal to vertical) upward projection from the bottom of the proposed retaining wall footing will surcharge the proposed retaining wall. In addition to the recommended earth pressure, retaining walls adjacent to streets should be designed to resist a uniform lateral pressure of 85 pounds per square foot (psf) due to normal street vehicle traffic, if applicable. Uniform lateral surcharges may be estimated using the applicable coefficient of lateral earth pressure using a rectangular distribution. A factor of 0.45 and 0.3 may be used for at-rest and active conditions, respectively. The retaining wall designer should contact the geotechnical consultant for any required geotechnical input in estimating surcharge loads.

If retaining walls greater than 6 feet in height are proposed, the retaining wall designer should contact the geotechnical engineer for specific seismic lateral earth pressure increments based on the configuration of the planned retaining wall structures.

Soil bearing and lateral resistance (friction coefficient and passive resistance) are provided in

Section 4.3. Earthwork considerations (temporary backcuts, backfill, compaction, etc.) for retaining walls are provided in Section 4.1 (Site Earthwork) and the subsequent earthwork related sub-sections.

## *4.5 Corrosivity to Concrete and Metal*

Although not corrosion engineers (LGC Geotechnical is not a corrosion consultant), several governing agencies in Southern California require the geotechnical consultant to determine the corrosion potential of soils to buried concrete and metal facilities. We therefore present the results of our testing with regard to corrosion for the use of the client and other consultants, as they determine necessary.

Corrosion testing of near-surface bulk samples at the subject and nearby sites indicate a soluble sulfate content value of approximately 500 ppm (less than 0.05 percent), a chloride content of 66 to 130 ppm, pH of 8.0 to 9.4, and a minimum resistivity of 1,000 to 1,900 ohm-centimeters. Based on Caltrans Corrosion Guidelines (2021), soils are considered corrosive if the pH is 5.5 or less, or the chloride concentration is 500 ppm or greater, or the sulfate concentration is 2,000 ppm (0.2 percent) or greater. Based on the test results, soils are not considered corrosive using Caltrans criteria. Note that based on minimum resistivity the soils are considered severely corrosive to metallic improvements. If improvements that may be susceptible to corrosion are proposed, it is recommended that further evaluation by a corrosion engineer be performed.

Based on previous laboratory test results of representative site soil samples and our experience, onsite soils are either designated class “S0” or “S1” per ACI 318, Table 19.3.1.1 with respect to sulfates. Concrete in direct contact with the onsite soils can be designed according to ACI 318, Table 19.3.2.1 using the “S0” or “S1” sulfate classification.

Laboratory testing needs to be performed at the completion of grading by the project corrosion engineer to further evaluate the as-graded soil corrosivity characteristics. Accordingly, revision of the corrosion potential may be needed, should future test results differ substantially from the conditions reported herein. The client and/or other members of the development team should consider this during the design and planning phase of the project and formulate an appropriate course of action.

## *4.6 Preliminary Asphalt Concrete Pavement Sections*

For the purposes of these preliminary recommendations, we have selected a preliminary design R-value of 15 and calculated pavement sections for Traffic Indices of 5.0, 5.5 and 6.5. R-value testing of the street subgrade will need to be performed to confirm our preliminary testing results/assumptions once the streets have been graded to finish subgrade elevations and the final Traffic Index is determined by the Civil Engineer or City Engineer. We are not responsible for selecting a design Traffic Index. It is our understanding that the City of Irvine requires a minimum pavement section of 4.2 inches of asphalt over 6 inches of base.

***TABLE 9***

***Preliminary Pavement Sections***

| **Assumed Traffic Index** | 5.0 | 5.5 | 6.5 |
|---|---|---|---|
| **R -Value Subgrade** | 15 | 15 | 15 |
| **AC Thickness** | 4.2 inches | 4.2 inches | 4.2 inches |
| **AB Thickness** | 6.0 inches | 8.0 inches | 12.0 inches |

Due to anticipated construction traffic prior to the completion of the project, we recommend that the total thickness (base course and capping course) of AC be placed at essentially the same time. Construction traffic loading on only the base course of the AC will increase the potential for pavement distress. It should be noted that construction traffic such as concrete trucks will likely exceed traffic loading after completion of construction.

Increasing the thickness of asphalt or adding additional base material will reduce the likelihood of the pavement experiencing distress during its service life. The above recommendations are based on the assumption that proper maintenance and irrigation of the areas adjacent to the roadway will occur through the design life of the pavement. Failure to maintain a proper maintenance and/or irrigation program may jeopardize the integrity of the pavement.

Earthwork recommendations regarding aggregate base and subgrade are provided in the previous Section "Site Earthwork" and the related sub-sections of this report.

## *4.7 Nonstructural Concrete Flatwork*

Nonstructural concrete flatwork (such as walkways, private drives, patio slabs, etc.) has a potential for cracking due to changes in soil volume related to soil-moisture fluctuations. To reduce the potential for excessive cracking and lifting, concrete may be designed in accordance with the minimum guidelines outlined in Table 10 on the following page. These guidelines will reduce the potential for irregular cracking and promote cracking along construction joints but will not eliminate all cracking or lifting. Thickening the concrete and/or adding additional reinforcement will further reduce cosmetic distress.

***TABLE 10***

***Nonstructural Concrete Flatwork Guidelines***

| | Community Sidewalks (≤6 feet wide) | Private Drives | Patios/Entryways / Walkways (adjacent to homes or flatwork >6 feet wide) | City Sidewalk Curb and Gutters |
|---|---|---|---|---|
| Minimum Thickness (in.) | 4 (nominal) | 5 (full) | 5 (full) | City/Agency Standard |
| Presaturation | Wet down | Presoak to 12 inches | Presoak to 12 inches | City/Agency Standard |
| Reinforcement | — | No. 3 at 24 inches on centers | No. 3 at 24 inches on centers | City/Agency Standard |
| Thickened Edge (in.) | — | 8 x 8 | — | City/Agency Standard |
| Crack Control Joints | Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness | Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness | Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness | City/Agency Standard |
| Maximum Joint Spacing | 5 feet | 10 feet or quarter cut whichever is closer | 6 feet | City/Agency Standard |

To reduce the potential for driveways to separate from the garage slab, the builder may elect to install dowels to tie these two elements together. Similarly, future homeowners should consider the use of dowels to connect flatwork to the foundation.

## *4.8 Subsurface Water Infiltration*

Recent regulatory changes have occurred that mandate that storm water be infiltrated below grade into subsurface soils rather than collected in a conventional storm drain system. Typically, a combination of methods are implemented to reduce surface water runoff and increase infiltration including; permeable pavements/pavers for roadways and walkways, directing surface water runoff to grass-lined swales, retention areas, and/or drywells, etc.

It should be noted that collecting and concentrating surface water for the purpose of intentionally infiltrating below grade, conflicts with the geotechnical engineering objective of directing surface water away from slopes, structures and other improvements. The geotechnical stability and integrity of a site is reliant upon appropriately handling surface water. In general, the vast majority of geotechnical distress issues are directly related to improper drainage. In general, distress in the form of movement of improvements could occur as a result of soil saturation and loss of soil support, expansion, internal soil erosion, collapse and/or settlement.

The results of our field infiltration testing indicate the observed 1-D infiltration rate for I-1 through I-10 (not including required factors of safety for design) ranged from 0.06 to 6.61 inches per hour. The design infiltration rate is thereby equal to the Observed Infiltration Rate provided in Table 1 (inches per hour) divided by the design factor of safety. The design factor of safety must be a minimum of 2.0 but may be increased at the discretion of the design engineer (County of Orange, 2013). Per the County of Orange infiltration guidelines (2013), infiltration of stormwater is not required when the factored infiltration rate (measured infiltration rate with safety factors applied) is less than 0.3 inches per hour in the vicinity of the BMPs.

Based on our experience in the area and results of field infiltration testing indicating highly variable infiltration rates and soils with fines content (silts and clays), CPT data indicating highly layered native soils, we recommend against the intentional infiltration of stormwater into the subsurface soils.

### *4.9 Control of Surface Water and Drainage Control*

From a geotechnical perspective, we recommend that compacted finished grade soils adjacent to proposed structures be sloped away from the proposed structures and towards an approved drainage device or unobstructed swale. Drainage swales, wherever feasible, should not be constructed within 5 feet of buildings. Where lot and building geometry necessitates that drainage swales be routed closer than 5 feet to structural foundations, we recommend the use of area drains together with drainage swales. Drainage swales used in conjunction with area drains should be designed by the project civil engineer so that a properly constructed and maintained system will prevent ponding within 5 feet of the foundation. Code compliance of grades is not the purview of the geotechnical consultant.

Planters with open bottoms adjacent to buildings should be avoided. Planters should not be designed adjacent to buildings unless provisions for drainage, such as catch basins, liners, and/or area drains, are made. Overwatering must be avoided.

### *4.10 Geotechnical Plan Review*

Project plans (grading, foundation, retaining wall, etc.) should be reviewed by this office prior to construction to verify that our geotechnical recommendations have been incorporated. Additional or modified geotechnical recommendations may be required based on the proposed layout.

### *4.11 Geotechnical Observation and Testing*

The recommendations provided in this report are based on limited subsurface observations and geotechnical analysis. The interpolated subsurface conditions should be checked in the field during construction by a representative of LGC Geotechnical. Geotechnical observation and testing is required per Section 1705 of the 2022 California Building Code (CBC).

Geotechnical observation and/or testing should be performed by LGC Geotechnical at the following stages:

- During grading (removal bottoms, fill placement, etc.);
- During retaining wall backfill and compaction;
- During utility trench backfill and compaction;
- After presoaking building pad and other concrete-flatwork subgrades, and prior to placement of aggregate base or concrete;
- Preparation of pavement subgrade and placement of aggregate base;
- After building and wall footing excavation and prior to placement of steel reinforcement and/or concrete; and
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

## *5.0 LIMITATIONS*

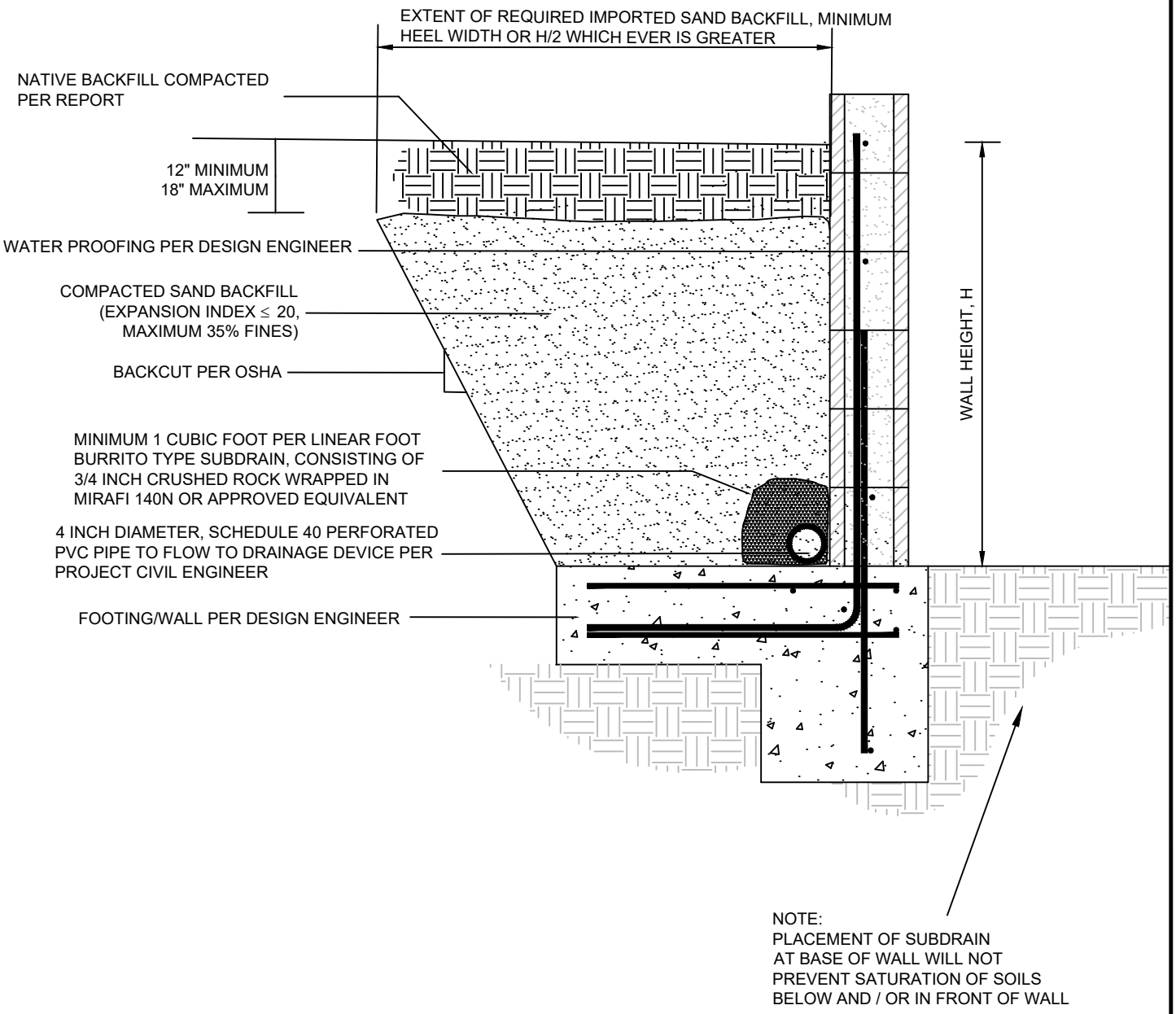
Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included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

This report is based on data obtained from limited observations of the site, which have been extrapolated to characterize the site. While the scope of services performed is considered suitable to adequately characterize the site geotechnical conditions relative to the proposed development, no practical evaluation can completely eliminate uncertainty regarding the anticipated geotechnical conditions in connection with a subject site. Variations may exist and conditions not observed or described in this report may be encountered during grading and construction.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of the other consultants (at a minimum the civil engineer, structural engineer, landscape architect) and incorporated into their plans. The contractor should properly implement the recommendations during construction and notify the owner if they consider any of the recommendations presented herein to be unsafe, or unsuitable.

The findings of this report are valid as of the present date. However, changes in the conditions of a site can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. The findings, conclusions, and recommendations presented in this report can be relied upon only if LGC Geotechnical has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site. This report is intended exclusively for use by the client, any use of or reliance on this report by a third party shall be at such party's sole risk.

In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and modification.




LGC Geotechnical, Inc.

**FIGURE 2**
***Retaining Wall Backfill Detail***

| | |
|---|---|
| *PROJECT NAME* | *Brookfield - Gateway Village* |
| *PROJECT NO.* | *23203-01* |
| *ENG. / GEOL.* | *DJB / KTM* |
| *SCALE* | *Not to Scale* |
| *DATE* | *November 2024* |

# *Appendix A*
# *References*

## *APPENDIX A*

## ***References***


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# *Appendix B*
# *Boring Logs*

# Geotechnical Boring Log Borehole HS-1

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~370' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map | 

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | B-1 | R-1 | 8<br>9<br>9 | 111.9 | 5.1 | ML | **Quaternary Alluvium (Qal):**<br>@ 0.5' - Sandy SILT: reddish brown, slightly moist, stiff; agricultural till | MD |
| | | | R-2 | 12<br>19<br>19 | 114.9 | 8.4 | CL / CL-ML | @ 2.5' - Sandy CLAY to Sandy Clayey SILT: dark brown, slightly moist, very stiff | |
| 365 | 5 | | R-3 | 8<br>10<br>11 | 107.0 | 4.2 | SM | @ 5' - Silty SAND: light brown, slightly moist, medium dense | |
| | | | R-4 | 5<br>7<br>7 | 116.8 | 4.8 | SC to CL | @ 7.5' - Clayey SAND to Sandy CLAY: brown, slightly moist, medium dense | CO |
| 360 | 10 | | R-5 | 5<br>5<br>8 | 107.4 | 8.6 | SM | @ 10' - Silty SAND: brown, moist, medium dense, lacks pores | |
| 355 | 15 | | SPT-1 | 2<br>3<br>3 | | 8.4 | | @ 15' - Silty SAND: brown, moist, loose | |
| 350 | 20 | | R-6 | 7<br>12<br>50/3" | 95.7 | 3.7 | | @ 20' - Silty SAND: light brown, slightly moist, dense | |
| 345 | 25 | | SPT-2 | 8<br>16<br>15 | | 3.7 | SW-SM | @ 25' - SAND with Silt: brown, slightly moist, dense | |
| 340 | 30 | | | | | | | Total Depth: 26.5'<br>Groundwater: N/A<br>Caving: Hole Measured Approximately 22' after Removal of the Augers<br>Backfilled with Cuttings on: 9/25/2024 | |

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole HS-2

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~424' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of 1 |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 420 | 0 | B-1 | R-1 | 13<br>20<br>20 | 115.2 | 5.0 | CL | **Quaternary Alluvium (Qal)**<br>@ 0.5' - Sandy CLAY: brown, slightly moist, hard; well indurated | |
| | | | R-2 | 10<br>16<br>17 | 111.3 | 7.4 | ML | @ 2.5' - Sandy SILT: grayish/light yellowish brown, slightly moist, very stiff; caliche stringers; well indurated | |
| 415 | 5 | | R-3 | 7<br>14<br>20 | 110.7 | 9.4 | CL/ML | @ 5' - SILT/CLAY with Sand: grayish/light yellowish brown, slightly moist, very stiff; abundant caliche stringers; few pinhole pores | |
| | | | R-4 | 9<br>12<br>17 | 105.7 | 6.9 | ML | @ 7.5' - Sandy SILT: brown, slightly moist, very stiff; caliche stringers; few scattered pores | |
| 410 | 10 | | R-5 | 12<br>20<br>24 | 107.6 | 8.5 | | @ 10' - SILT with Sand: grayish/light yellowish brown, slightly moist, hard; slightly indurated, lacks pores | |
| 405 | 15 | | SPT-1 | 5<br>6<br>8 | | 6.1 | SM | @ 15' - Silty SAND: light brown, slightly moist, medium dense | |
| 400 | 20 | | R-6 | 17<br>21<br>25 | 105.3 | 1.3 | SP | @ 20' - SAND with Gravel: light brown, dry, dense | |
| 395 | 25 | | SPT-2 | 7<br>14<br>14 | | 2.5 | SM | @ 25' - Silty SAND with Gravel: brown, dry, dense | |
| | 30 | | | | | | | Total Depth: 26.5'<br>Groundwater: N/A<br>Caving: Hole Measured Approximately 12' after Removal of the Augers<br>Backfilled with Cuttings on: 9/26/2024 | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole HS-3

**Date:** 09/26/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~372' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map | 

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 370 | 0 | | R-1 | 8<br>5<br>7 | 114.7 | 11.6 | CL | **Quaternary Alluvium (Qal)**<br>@ 0.5' - Sandy CLAY: dark brown mottled, slightly moist, stiff; agricultural till | |
| | | | R-2 | 8<br>10<br>11 | 116.5 | 8.1 | SM | @ 2.5' - Silty SAND: brown, moist, medium dense; indurated | |
| 365 | 5 | | R-3 | 11<br>10<br>11 | 112.4 | 15.7 | CL | @ 5' - Sandy CLAY: brown, moist, very stiff; caliche stringers; lacks pores | |
| | | | R-4 | 5<br>10<br>13 | 109.2 | 15.8 | | @ 7.5' - Sandy CLAY: brown, moist, very stiff | AL<br>CN |
| 360 | 10 | | R-5 | 6<br>11<br>14 | 112.9 | 16.7 | CL-ML | @ 10' - Sandy/Silty CLAY: brown, moist, very stiff | |
| 355 | 15 | | R-6 | 4<br>5<br>8 | 116.8 | 13.3 | CL | @ 15' - Sandy CLAY: reddish brown, moist, stiff | CO |
| 350 | 20 | | SPT-1 | 3<br>5<br>5 | | 11.7 | SC | @ 20' - Clayey SAND: reddish brown, moist, medium dense | |
| | 25 | | R-7 | 5<br>12<br>18 | 101.9 | 23.2 | CL | @ 25' - Sandy CLAY: brown, very moist, very stiff; caliche stringers | |
| 345 | 30 | | | | | | | Total Depth: 26.5'<br>Groundwater: N/A<br>Caving: Hole Measured Approximately 21' after Removal of the Augers<br>Backfilled with Cuttings on: 9/26/2024 | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole HS-4

**Date:** 09/26/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~353' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map | Page 1 of

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 350 | 0 | B-1 | R-1 | 8<br>8<br>10 | 115.1 | 9.9 | SC-CL | **Quaternary Alluvium (Qal)**<br>@ 0.5' - Clayey SAND to Sandy CLAY: dark brown mottled, moist, medium dense to stiff; agricultural till | MD |
| | | | R-2 | 7<br>11<br>14 | 114.0 | 10.1 | CL-CM | @ 2.5' - Sandy CLAY to Silty Sand: brown, moist, very stiff to medium dense; indurated | |
| 345 | 5 | | R-3 | 8<br>14<br>15 | 111.4 | 6.0 | SM | @ 5' - Silty SAND: grayish brown, slightly moist, medium dense; slightly indurated | |
| | | | R-4 | 5<br>5<br>9 | 96.2 | 13.1 | ML | @ 7.5' - Sandy SILT: light brown, moist, stiff | |
| 340 | 10 | | R-5 | 6<br>6<br>6 | 99.3 | 8.2 | SM | @ 10' - Silty SAND: pale brown, moist, loose | CO |
| 335 | 15 | | SPT-1 | 1<br>2<br>2 | | 11.4 | SM/ML | @ 15' - Silty SAND to Sandy SILT: brown, moist, medium stiff | |
| 330 | 20 | | R-6 | 6<br>6<br>7 | 109.2 | 6.3 | SM | @ 20' - Silty SAND: brown, slightly moist, medium dense | CO |
| 325 | 25 | | SPT-2 | 6<br>12<br>17 | | 12.0 | CL | @ 25' - Sandy CLAY: brown, moist, hard | |
| | 30 | | | | | | | Total Depth: 26.5'<br>Groundwater: N/A<br>Caving: Hole Measured Approximately 19.5' after Removal of the Augers<br>Backfilled with Cuttings on: 9/26/2024 | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole HS-5

| | |
|---|---|
| **Date:** 09/26/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~340 MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | B-1 | R-1 | 5 5 6 | 109.5 | 15.0 | CL | **Quaternary Alluvium (Qal)**<br>@ 0.5' - Sandy CLAY: moderate brown, moist, stiff, agricultural till | |
| | | | R-2 | 4 6 8 | 112.1 | 10.7 | SM | @ 2.5' - Silty SAND: brown, moist, medium dense; slightly indurated; very few pinhole pores | |
| 335 | 5 | | R-3 | 7 8 11 | 105.8 | 3.9 | SW-SM | @ 5' - SAND with Silt: light brown, slightly moist, medium dense | |
| | | | R-4 | 4 5 5 | 102.2 | 4.3 | SM-SC | @ 7.5' - Silty SAND to Clayey SAND: light brown, slightly moist, loose | CO |
| 330 | 10 | | R-5 | 7 8 8 | 109.4 | 3.2 | SM | @ 10' - Silty SAND: light brown, slightly moist, medium dense | CO |
| 325 | 15 | | R-6 | 17 16 20 | 108.1 | 8.0 | | @ 15' - Silty SAND with Gravel: brown, moist, medium dense | |
| 320 | 20 | | SPT-1 | 7 14 18 | | 12.4 | CL | @ 20' - Sandy CLAY: brown, moist, hard; indurated | |
| 315 | 25 | | R-7 | 10 21 25 | | 13.7 | | @ 25' - Sandy CLAY: reddish brown, moist, hard | |
| 310 | 30 | | | | | | | Total Depth: 26.5'<br>Groundwater: N/A<br>Caving: Hole Measured Approximately 11' after Removal of the Augers<br>Backfilled with Cuttings on: 9/26/2024 | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-1 (cont)

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~342' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 2 of 2 |

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | Logged By JMN<br>Sampled By JMN<br>Checked By BPP<br><br>DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 310 | 30 | | | | | | | Total Depth: 30'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 305 | 35 | | | | | | | | |
| 300 | 40 | | | | | | | | |
| 295 | 45 | | | | | | | | |
| 290 | 50 | | | | | | | | |
| 285 | 55 | | | | | | | | |
| | 60 | | | | | | | | |

LGC Geotechnical, Inc.

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-1

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~342' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 340 | 0 | | | | | | | @ 0' - Dry Vegetation/Topsoil<br>**Quaternary Alluvium (Qal)**<br>@ 2.5' - Silty SAND: brown, sightly moist` | |
| 335 | 5 | | | | | | | | |
| 330 | 10 | | | | | | | @ 10' - Sandy Clay: olive brown, slightly moist | |
| 325 | 15 | | | | | | | @ 15' - Silty SAND: brown, moist | |
| 320 | 20 | | | | | | | | |
| 315 | 25 | | | | | | | | |
| | 30 | | SPT-1 | 8<br>11<br>13 | | | | @ 28.5' - Silty SAND: orangish brown, moist, dense | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ⏚ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-2

| | |
|---|---|
| **Date:** 9/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 2.4" |
| **Elevation of Top of Hole:** ~342' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of 1 |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 340 | 0 | | | | | | | @ 0' - Dry Vegetation/Topsoil<br>**Quaternary Alluvium (Qal)** | |
| | 5 | | SPT-1 | 3<br>4<br>4 | | | SM | @ 3.5' - Silty Sand: olive brown, slightly moist, loose | |
| 335 | | | | | | | | Total Depth: 5'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 330 | 10 | | | | | | | | |
| 325 | 15 | | | | | | | | |
| 320 | 20 | | | | | | | | |
| 315 | 25 | | | | | | | | |
| | 30 | | | | | | | | |

LGC Geotechnical, Inc.

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-3 (cont)

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~339' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 2 of 2 |

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | Logged By JMN<br>Sampled By JMN<br>Checked By BPP<br><br>DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 305 | 30 | | | | | | | Total Depth: 30'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 300 | 35 | | | | | | | | |
| 295 | 40 | | | | | | | | |
| 290 | 45 | | | | | | | | |
| 285 | 50 | | | | | | | | |
| 280 | 55 | | | | | | | | |
| | 60 | | | | | | | | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-3

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~339' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | | @ 0' - Dry Vegetation/Topsoil<br>**Quaternary Alluvium (Qal)** | |
| 335 | 5 | | | | | | | @ 5' - Silty SAND: brown | |
| 330 | 10 | | | | | | | @ 10' - Silty SAND: light brown | |
| 325 | 15 | | | | | | | @ 15' - Silty SAND: light brown | |
| 320 | 20 | | | | | | | @ 20' - SAND: light brown | |
| 315 | 25 | | | | | | | @ 25' - Sandy CLAY with Gravel: brown, slightly moist | |
| 310 | 30 | | SPT-1 | 3<br>10<br>9 | | | SP-SM | @ 28.5' - SAND to Silty SAND: grayish brown, dry, medium dense | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-4

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~339' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of 1 |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 335 | 0 | | SPT-1 | 2<br>3<br>4 | | | ML-SM | **Quaternary Alluvium (Qal):**<br>@ 3.5' - Sandy SILT to Silty SAND: brown, slightly moist, stiff to loose | |
| 330 | 5 | | | | | | | Total Depth: 5'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 325 | 10 | | | | | | | | |
| 320 | 15 | | | | | | | | |
| 315 | 20 | | | | | | | | |
| 310 | 25 | | | | | | | | |
| | 30 | | | | | | | | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-5 (cont)

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~371' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | Logged By JMN<br>Sampled By JMN<br>Checked By BPP<br><br>DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 340 | 30 | | | | | | | Total Depth: 30'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 335 | 35 | | | | | | | | |
| 330 | 40 | | | | | | | | |
| 325 | 45 | | | | | | | | |
| 320 | 50 | | | | | | | | |
| 315 | 55 | | | | | | | | |
| | 60 | | | | | | | | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-5

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~371' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of 2 |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 370 | 0 | | | | | | | @ 0' - Dry Vegetation/Topsoil<br>**Quaternary Alluvium (Qal)** | |
| 365 | 5 | | | | | | | @ 5' - Silty SAND: brown, slightly moist | |
| 360 | 10 | | | | | | | @ 10' - Sandy Silt: light brown, slightly moist | |
| 355 | 15 | | | | | | | @ 15' - Sandy Clay with Gravel: brown, slightly moist | |
| 350 | 20 | | | | | | | @ 20' - Sand with Silt and Gravel: dry | |
| 345 | 25 | | | | | | | @ 25' - Sandy CLAY with Gravel: brown, slightly moist | |
| | 30 | | SPT-1 | 4<br>3<br>7 | | | SM | @ 28.5' - Silty SAND: light orangish brown, slightly moist, medium dense | -#200 |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-6

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~371' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 370 | 0 | | | | | | | @ 0' - Dry Vegetation/Topsoil<br>**Quaternary Alluvium (Qal)** | |
| | 5 | | SPT-1 | 3<br>4<br>7 | | | | @ 3.5' - Silty SAND: brown, slightly moist, medium dense | |
| 365 | | | | | | | | Total Depth: 5'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 360 | 10 | | | | | | | | |
| 355 | 15 | | | | | | | | |
| 350 | 20 | | | | | | | | |
| 345 | 25 | | | | | | | | |
| | 30 | | | | | | | | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-7 (cont)

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~416' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | Logged By JMN<br>Sampled By JMN<br>Checked By BPP<br><br>DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 385 | 30 | | | | | | | Total Depth: 30'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/27/2024 | |
| 380 | 35 | | | | | | | | |
| 375 | 40 | | | | | | | | |
| 370 | 45 | | | | | | | | |
| 365 | 50 | | | | | | | | |
| 360 | 55 | | | | | | | | |
| | 60 | | | | | | | | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-7

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~416' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of 2 |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 415 | 0 | | | | | | | @ 0' - Dry Vegetation/Topsoil<br>**Quaternary Alluvium (Qal)** | |
| 410 | 5 | | | | | | | @ 5' - Silty Sand: orangish brown | |
| 405 | 10 | | | | | | | @ 10' - Silty Sand: brown, slightly moist | |
| 400 | 15 | | | | | | | @ 15' - Silty Sand: brown, slightly moist | |
| 395 | 20 | | | | | | | | |
| 390 | 25 | | | | | | | @ 25' - Silty Sand with Clay: brown, slightly moist | |
| | 30 | | SPT-1 | 36<br>50/1" | | | ML | @ 28.5' - Clayey Silt: light gray, moist, hard | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-8

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~416' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 415 | 0 | | | | | | | @ 0' - Gravel over Topsoil<br>**Quaternary Alluvium (Qal)** | |
| | | | SPT-1 | 2<br>3<br>2 | | | SM | @ 3.5' - Silty Sand: brown, slightly moist, loose | -#200 |
| | 5 | | | | | | | | |
| 410 | | | | | | | | Total Depth: 5'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/30/2024 | |
| | 10 | | | | | | | | |
| 405 | | | | | | | | | |
| | 15 | | | | | | | | |
| 400 | | | | | | | | | |
| | 20 | | | | | | | | |
| 395 | | | | | | | | | |
| | 25 | | | | | | | | |
| 390 | | | | | | | | | |
| | 30 | | | | | | | | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-9

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~417' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 415 | 0 | | | | | | | **Quaternary Alluvium (Qal)** | |
| 410 | 5 | | | | | | | @ 5' - SAND with Silt: light brown, dry | |
| 405 | 10 | | | | | | | | |
| 400 | 15 | | | | | | | | |
| 395 | 20 | | | | | | | | |
| 390 | 25 | | | | | | | @ 25' - Sandy SILT to SAND with Silt: light brown, dry | |
| | 30 | | SPT-1 | 6<br>8<br>8 | | | ML | @ 28.5' - Sandy SILT: light brown, slightly moist, very stiff | -#200 |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-9 (cont)

**Date:** 09/25/2024 | **Drilling Company:** 2R Drilling

**Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75

**Project Number:** 23203-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~417' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | Logged By JMN<br>Sampled By JMN<br>Checked By BPP<br><br>DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 385 | 30 | | | | | | | Total Depth: 30'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/30/2024 | |
| 380 | 35 | | | | | | | | |
| 375 | 40 | | | | | | | | |
| 370 | 45 | | | | | | | | |
| 365 | 50 | | | | | | | | |
| 360 | 55 | | | | | | | | |
| | 60 | | | | | | | | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ⏚ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 5/3/2024

# Geotechnical Boring Log Borehole I-10

| | |
|---|---|
| **Date:** 09/25/2024 | **Drilling Company:** 2R Drilling |
| **Project Name:** Brookfield - Gateway Village | **Type of Rig:** CME 75 |
| **Project Number:** 23203-01 | **Drop:** 30" **Hole Diameter:** 8" |
| **Elevation of Top of Hole:** ~417' MSL | **Drive Weight:** 140 pounds |
| **Hole Location:** See Geotechnical Map | Page 1 of 1 |

Logged By JMN
Sampled By JMN
Checked By BPP

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 415 | 0 | | | | | | | **Quaternary Alluvium (Qal)** | |
| | | | SPT-1 | 4<br>4<br>5 | | | SM | @ 3.5' - Silty SAND: brown, dry, medium dense | -#200 |
| 410 | 5 | | | | | | | Total Depth: 5'<br>Groundwater: N/A<br>3" of Perforated Pipe with Filter Sock Installed Surrounded by Gravel and Presoaked on 9/25/2024<br>Pipe Removed and Backfilled with Cuttings on 9/30/2024 | |
| 405 | 10 | | | | | | | | |
| 400 | 15 | | | | | | | | |
| 395 | 20 | | | | | | | | |
| 390 | 25 | | | | | | | | |
| | 30 | | | | | | | | |

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**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

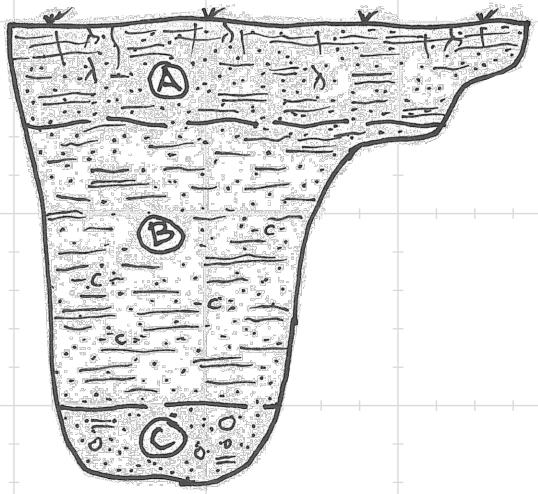
Last Edited: 5/3/2024

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-1** |
| **Project Number: 23203-01** | **Date: 9/12/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

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| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>**@ 0' to 2.5' - Moderate brown, clayey sand with silt, moist, loose to medium dense, roots and rootlets, scattered gravels, agricultural till. Grades to mottled light brown & brown** | **afu** | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>**@ 2.5' - Grades to moderate reddish brown, sandy silt with some clay, slightly dense, moist, porous, few rootlets. Increase clay, caliche stringers.**<br>**@ 7' - Increase density, decrease porosity** | **Qal** | | **B-1 @ 4' to 5'** | | |
| | C | **@ 10' to TD - Lt. reddish brown, sand with clay, very moist, medium dense, few cobbles** | | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 362'** **Surface Slope: Flat** **Trend: EW**



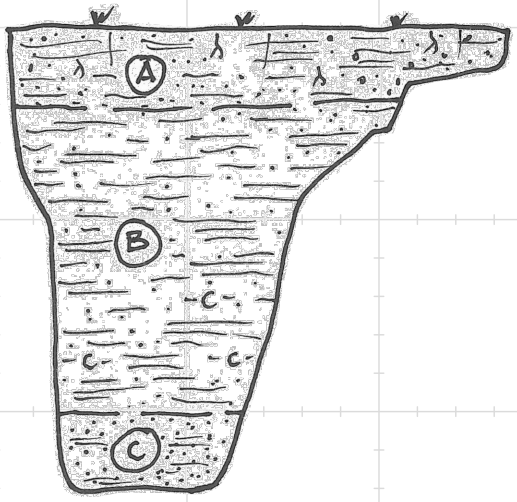

Total Depth: 12'
Groundwater: No
Backfilled: Yes

SCALE: 1" = 5'

| Project Name: Gateway | Logged By: KTM | Trench No: TP-2 | |
|---|---|---|---|
| Project Number: 23203-01 | Date: 9/12/24 | Engineering Properties: | |
| Equipment: Cat (WT8C99) Backhoe | Location: See Geotechnical Map | | |

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>@ 0' to 2' - Moderate brown, clayey silt with sand, moist, loose to sl. dense, roots & rootlets, agricultural till, few gravels. | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>@ 2' - Moderate reddish brown, silty clay with trace sand, moist, medium stiff (indents w/ finger pressure), scattered pores to $\frac{1}{8}$".<br><br>@7' - Caliche stringers & few pores to $\frac{1}{16}$", slightly indurated, gradually lightens | Qal | | B-1<br>@ 3' to 5' | | |
| | C | @ 10' to TD - Lt. reddish brown, sand with clay, moist to very moist, medium dense | | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 347'** **Surface Slope: Flat** **Trend: EW**



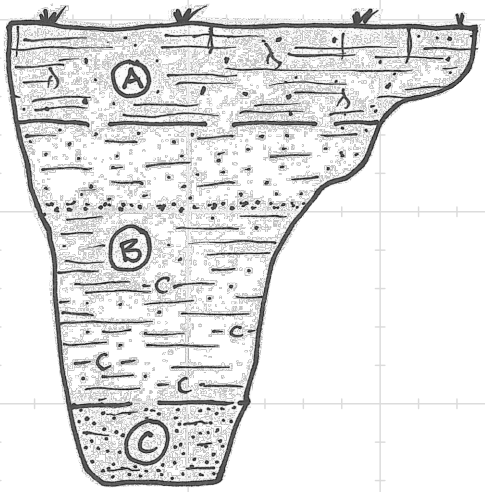

Total Depth: 12'
Groundwater: No
Backfilled: Yes

SCALE: 1" = 5'

| Project Name: Gateway | Logged By: KTM | Trench No: TP-3 | |
|---|---|---|---|
| Project Number: 23203-01 | Date: 9/12/24 | Engineering Properties: | |
| Equipment: Cat (WT8C99) Backhoe | Location: See Geotechnical Map | | |

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>@ 0' to 2.5' - Moderate brown to mottled, & mod. brown, Sandy clay with silt, moist, soft to medium stiff, roots & few gravels, agricultural till | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>@ 2.5' - Reddish brown, fine sandy silt, moist, slightly stiff, lens of silty sand<br><br>@ 5' - Moderate reddish brown, silty clay, moist, slightly stiff & porous to 1/16". Increase moisture and caliche stringers with depth. | Qal | | | | |
| | C | @ 10' to TD - Lt. reddish brown, silty sand, very moist, medium dense, varies, lacks pores | | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 338'** **Surface Slope: Flat** **Trend: EW**




Total Depth: 12'
Groundwater: No
Backfilled: Yes

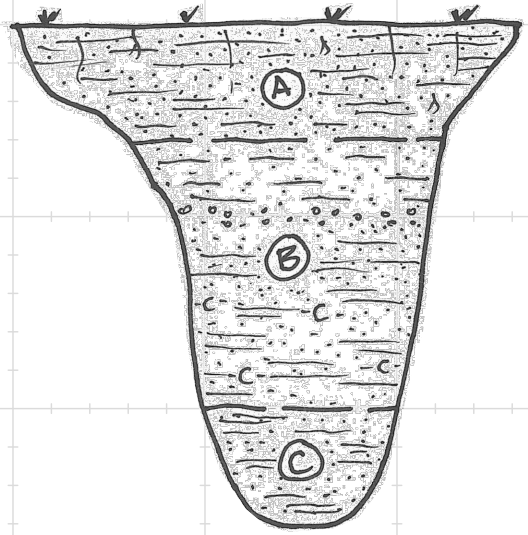
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-4** |
| **Project Number: 23203-01** | **Date: 9/12/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>**@ 0' to 3' - Moderate brown grades to mottled lt. brown & dk. brown , upper 1' dry to moist, silty to clayey sand, medium dense.** | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>**@ 3' - Lt. reddish brown, sandy silt, moist, sl. stiff.**<br>**@ 5' - Lt. brown gravelly sand, moist , dense grades to moderate reddish brown, clayey sand to sandy clay, very moist, pores to 1/8", caliche stringers.** | Qal | | | | |
| | C | **@ 10' to TD - Lt. reddish brown, sandy silt w/ clay moist, medium dense, lacks porosity.** | | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 345'** **Surface Slope: Flat** **Trend: EW**




Total Depth: 14'
Groundwater: No
Backfilled: Yes

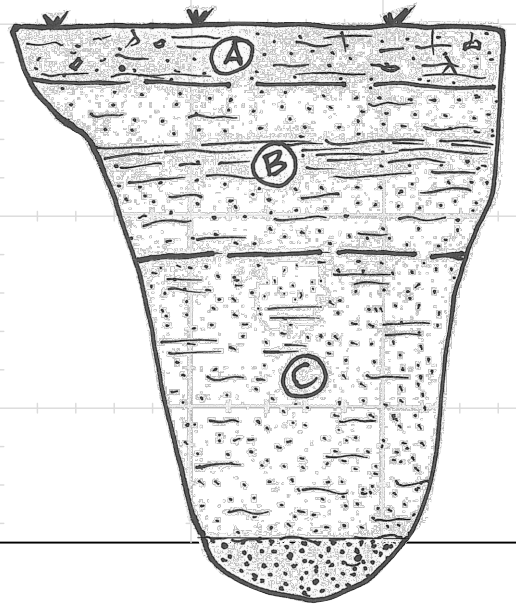
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-5** |
| **Project Number: 23203-01** | **Date: 9/12/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>@ 0' - 1.5' - Brown, silty sand moist, medium dense, trash bits (agricultural till) | afu | | | | |
| | B | @ 1.5' - Lt. yellowish brown, sand w/ silt, very moist, sl. dense (excavates easily)<br><br>@ 3' - Horizontal lenses of silty clay and clayey sand, very moist, slightly dense / slightly stiff. | | | B-1 @ 2' to 4' | | |
| | C | **Quaternary Alluvium (Qal)**<br>@ 6' - Clayey Sand light brown, very moist, slightly dense, few pores<br>@ 7' - Light yellowish brown sand w/ some silt, very moist, slightly dense<br>@ 14' to TD - gravely sand, wet, dense (no visible water) | Qal | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 351'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 15'
Groundwater: No
Backfilled: Yes

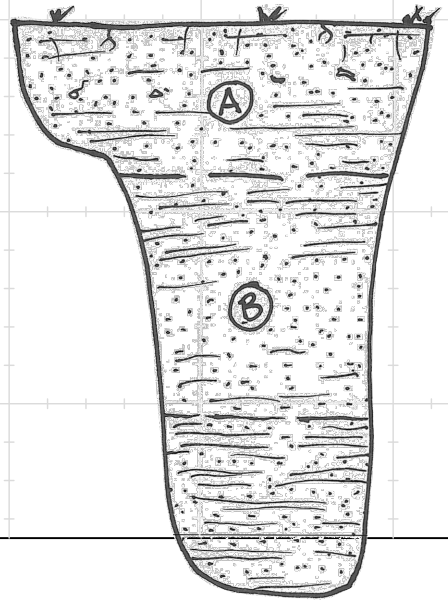
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-6** |
| **Project Number: 23203-01** | **Date: 9/12/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill Undocumented (afu)**<br>@ 0' - Moderate brown & mottled light brown, silty sand to sandy silt, dry to moist, agricultural till & some trash<br>@ 2', stiff gradual decrease in sand with depth, increase moisture | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>@ 4' - Silty clay w/ sand, moist to very moist, stiff, gradually lightens to moderate reddish brown<br><br>@ 6' - Brown sand with silt, moist to very moist, medium dense, lenses of clayey sand (grades to finer soils)<br><br>@ 10' to TD - Clayey silt lenses | Qal | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 356'** **Surface Slope: Flat** **Trend: EW**




Total Depth: 15'
Groundwater: No
Backfilled: Yes

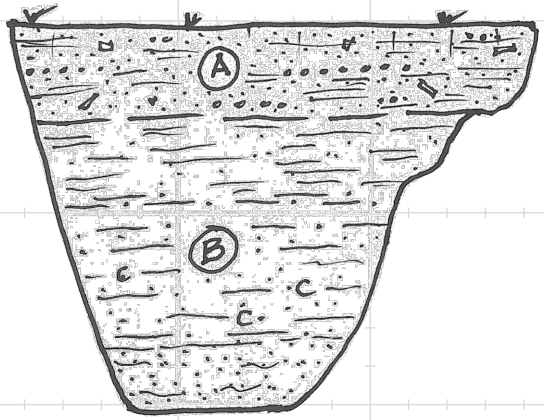
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-7** |
| **Project Number: 23203-01** | **Date: 9/12/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>**@ 0' to 2.5' - Lt. brown & moderate brown layered, silty sand and clayey sand, dry (upper 1.5') to slightly moist, dense, scattered gravels and plastic pieces** | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>**@ 2.5' - Moderate brown, sandy clay, moist, dense**<br>**@ 4.5' - Brown, silt with some sand, moist, medium stiff, grades to**<br>**@ 6' to 7' - Moderate reddish brown mottled, few pinhole pores & caliche**<br>**@ 8' to TD - Increase sand, lacks pores, moist** | Qal | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 364'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 10'
Groundwater: No
Backfilled: Yes

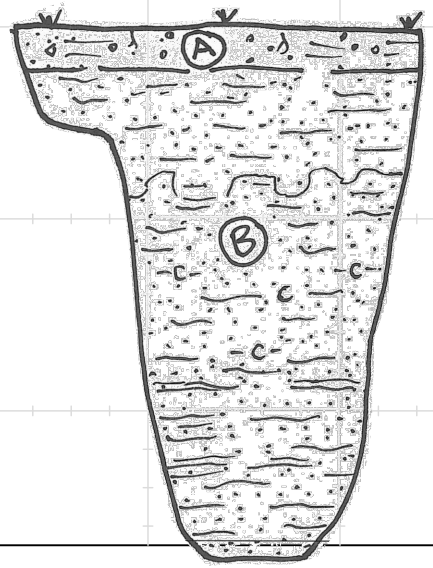
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-8** |
| **Project Number: 23203-01** | **Date: 9/12/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>@ 0' to 1' - Moderate brown, sandy silt with clay & gravel, sl. moist, stiff, (plastic, agricultural till) | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>@ 1' to 4' - Moderate brown grades to mottled brown sandy silt, moist, sl. stiff to stiff (lacks porosity)<br><br>@ 4' - Color lightens to lt. yellowish brown, very moist<br><br>@ 6' - Increase/variable clay content, few caliche stringers & minor pinhole porosity<br><br>@ 9' to TD - Silty sand with clay lenses, very moist, sl. dense to medium dense | Qal | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 378'** **Surface Slope: Flat** **Trend: NS**



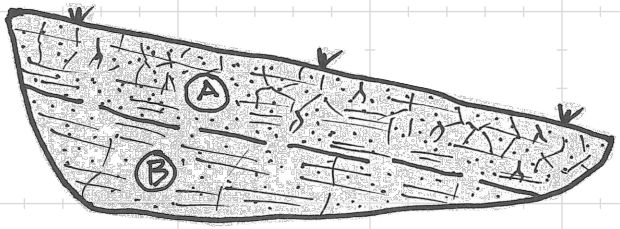

Total Depth: 14'
Groundwater: No
Backfilled: Yes

SCALE: 1" = 5'

| Project Name: Gateway | Logged By: KTM | Trench No: TP-9 | |
|---|---|---|---|
| Project Number: 23203-01 | Date: 9/12/24 | Engineering Properties: | |
| Equipment: Backhoe | Location: See Geotechnical Map | | |

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | Tertiary Vaqueros and Sespe formation, Undifferentiated (Tvs)<br>@ 0' to 2' - Moderate brown, clayey sand to sandy clay, dry to slightly moist, very stiff (well indurated), pedosols, porous | Topsoil | | | | |
| | B | @ 2' to TD - Moderate reddish brown, sandy clay, moist, stiff, extremely weathered | Tvs | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 397'** **Surface Slope: 10°±** **Trend: N30W**




Total Depth: 5'
Groundwater: No
Backfilled: Yes

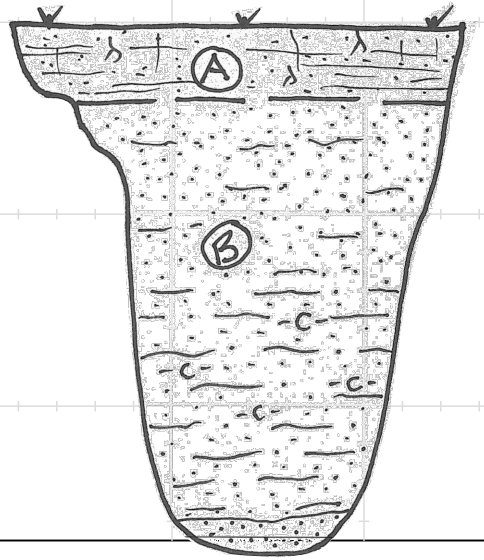
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-10** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>@ 0' to 2' - Dark brown & light brown layers, sand & silty sand, dry, stiff / dense (compacted ±) | afu | | | | |
| | B | **Quaternary Alluvium (Qal)**<br>@ 2' - Moderate brown, silty sand, slightly moist, medium dense, gradual lightens @ 5'<br><br>@ 7' - Light reddish brown, sandy silt, slightly moist, medium dense, pores to 1/16", caliche stringers, few root hairs<br><br>@ 13' to TD - Light yellowish brown, sand, moist, medium dense | Qal | | B-1<br>@ 2' to 4' | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 433'** **Surface Slope: Flat** **Trend: NW**




Total Depth: 14'
Groundwater: No
Backfilled: Yes

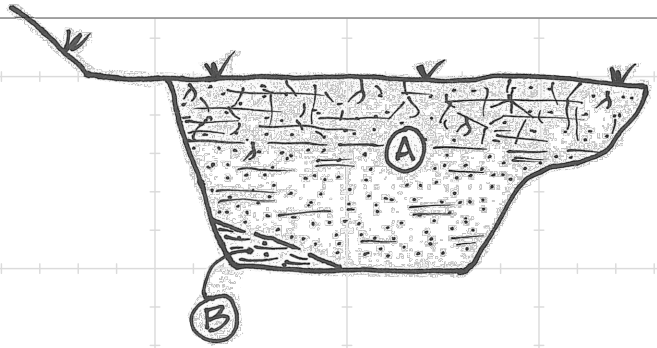
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-11** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Quaternary Alluvium (Qal)**<br>**@ 0' to 2' - Dark brown , clayey sand to sandy clay, dry, very stiff, rectilinear weathering (paleosol) , rootlets**<br><br>**@ 2' - Moderate brown, silty to clayey sand, moist, dense** | Qal | | Small Bulk B-1 @ 1' to 2' | | |
| | B | **Tertiary Vaqueros and Sespe formation, Undifferentiated (Tvs)**<br>**@ 4' to TD - Light greenish gray and off white mottled, sandy clay stone, moist, very stiff, extremely weathered. Possibly diatomaceous** | Tvs | | Small Bulk B-2 @ 4' to 5' | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 443'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 5'
Groundwater: No
Backfilled: Yes

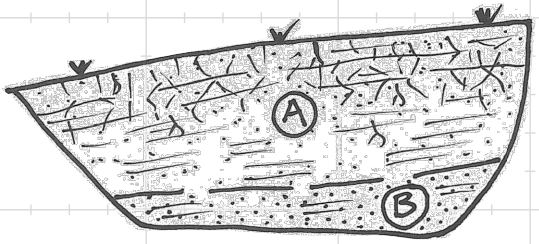
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-12** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Quaternary Alluvium (Qal)**<br>**@ 0' to 2' - Dark brown , sandy clay, moist, stiff roots, rootlets, rectilinear weathered (pedosols)**<br><br>**@2' - Increase density to very stiff, gradual change to bedrock bellow** | Qal | | | | |
| | B | **Tertiary Vaqueros and Sespe formation, Undifferentiated (Tvs)**<br>**@ 4' to TD - Intense orange, clayey sandstone, very moist, dense** | Tvs | | **Small B-1 @ 4' to 5'** | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 422'** **Surface Slope: 10°±** **Trend: NS**



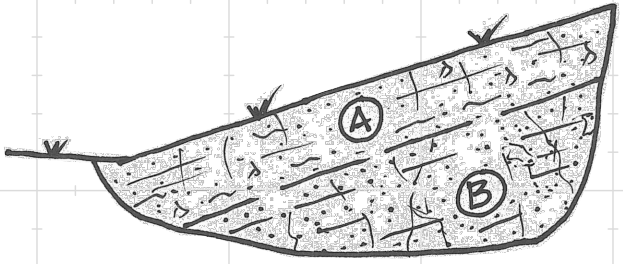

Total Depth: 5'
Groundwater: No
Backfilled: Yes

SCALE: 1" = 5'

| Project Name: Gateway | Logged By: KTM | Trench No: TP-13 | LGC Geotechnical, Inc. |
|---|---|---|---|
| Project Number: 23203-01 | Date: 9/13/24 | Engineering Properties: | |
| Equipment: Backhoe | Location: See Geotechnical Map | | |

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| General Bedding N35E, 37N | A | Tertiary Vaqueros and Sespe formation, Undifferentiated (Tvs)<br>@ 0' to 2' - Moderate brown, sandy silt with clay, dry, stiff (indurated), abundant pores, rootlets | Topsoil | | | | |
| | B | @ 2' to TD - Light greenish gray and off white (layered faintly), sandy siltstone & silty sandstone, slightly moist, hard/dense, soft sediment deformation | Tvs | | B-1 @ 2' to 5' | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 417'** **Surface Slope: 10°±** **Trend: NS**




Total Depth: 6'
Groundwater: No
Backfilled: Yes

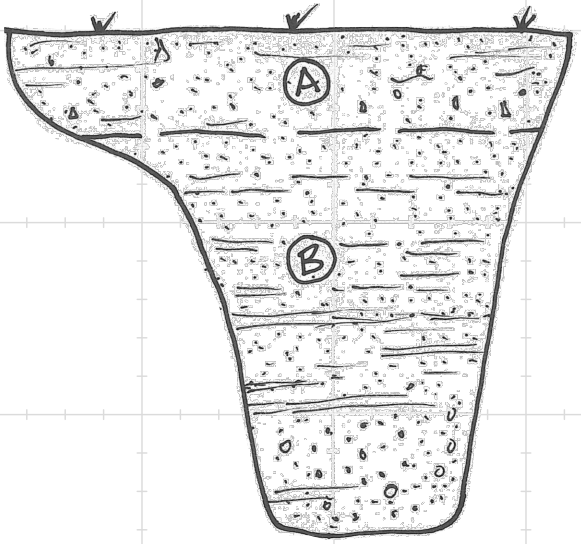
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-14** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented**<br>**@ 0' to 2.5' - Brown & light brown layered / mottled sand and sity sand, moist, medium deuse, trash bits & gravel** | afu | | | | |
| | B | **Quaternary Alluvium**<br>**@ 2.5' - Light brown & brown layered sand and silty sand, moist, medium deuse, friable, iron oxidee along lenses**<br>**@ 7' to TD - Increase moisture to very moist, increase in fines with lenses of clayey sand, few scattered cobbles, "beach sand"** | Qal | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 390'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 13'
Groundwater: N
Backfilled: Y

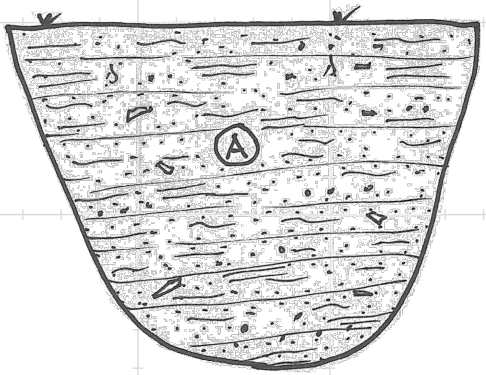
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-15** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Maps** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented (afu)**<br>**@ 0' to TD - Light reddish brown, light orange, greenish gray & dark brown layers, sandy silt, clay, silty sand with scattered gravels, dry to moist, loose. Debris including metal rebar, some scattered construction debris and asphalt** | afu | | @ 2' to 10' B-1 | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 423'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 9'
Groundwater: No
Backfilled: Yes

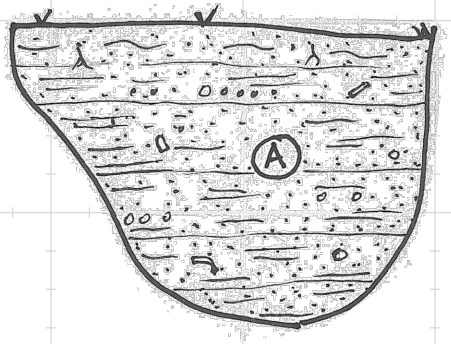
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-16** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented**<br>**@ 0' to TD - Light reddish brown, light yellowish brown & brown layered, silty sand, sandy silt, clayey sand, dry to moist, loose, scattered gravels & cobbles and minor small construction debris** | afu | | B-1 @ 2' to 8' | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 418'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 8'
Groundwater: No
Backfilled: Yes

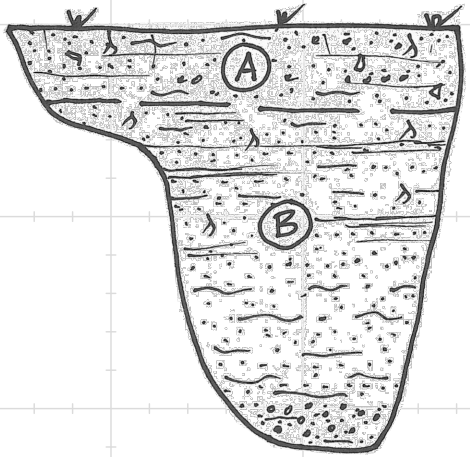
SCALE: 1" = 5'

| | | |
|---|---|---|
| **Project Name: Gateway** | **Logged By: KTM** | **Trench No: TP-17** |
| **Project Number: 23203-01** | **Date: 9/13/24** | **Engineering Properties:** |
| **Equipment: Backhoe** | **Location: See Geotechnical Map** | |

LGC Geotechnical, Inc.

| Geologic Attitudes | Unit | SOIL DESCRIPTION: | GEOLOGIC UNIT | USCS | SAMPLE No | MOISTURE (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|
| | A | **Artificial Fill, Undocumented**<br>**@ 0' to 2' - Grayish brown, silty sand and sand faintly layered, loose to slightly dense, dry, trash, gravels** | afu | | | | |
| | B | **Quanternary Alluvium**<br>**@ 2' - Light yellowish brown and brown interbedded, sand and silty sand with few very thin clay layers, slightly moist, slightly to medium dense, few rootlets, friable**<br>**@ 6' - Grades to sandy silt, very moist**<br>**@ 10' to TD - Sand with gravels & silt** | Qal | | | | |

**GRAPHICAL REPRESENTATION BELOW:** **Elevation: 410'** **Surface Slope: Flat** **Trend: NS**




Total Depth: 11'
Groundwater: No
Backfilled: Yes

SCALE: 1" = 5'

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/3/23 | Logged By | BF |
| Drilling Company | 2R Drilling, Inc. | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 75 Hollow-Stem | Hammer Data | 140 lbs @ 30 Inch Drop |
| Sampling Method(s) | Modified California, Bulk | | |
| Approximate Groundwater Depth: | Groundwater at 99 Feet. | | |
| Comments | | | |

# H- 1

**Sheet 1 of 4**

| | |
|---|---|
| Total Depth Drilled (ft) | 100.8 |
| Approximate Ground Surface Elevation (ft) | 340.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 340 | 0 | | | | | SM | Surface: Gravel Road.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Dark yellowish brown silty fine SAND with some gravel, moist. | | | B-1 @ 0-5' |
| | | | B-1 | | | | | | | |
| | 5 | | D-1 | 11 | | | @ 5': Dark yellowish brown clayey silty fine SAND, moist, loose, micaceous, sandy silty CLAY with trace caliche stringers in tip. | 13.1 | 106.1 | |
| | | | | | | CL | **Alluvium (Qal)**<br>Tip: Dark yellowish brown sandy silty CLAY, damp to moist, medium stiff, trace caliche stringers. | | | |
| 330 | 10 | | D-2 | 9 | | SC-CL | @ 10': Dark yellowish brown silty clayey fine SAND to sandy CLAY, moist, loose/medium stiff, micaceous, trace caliche stringers, few pinhole pores, trace pencil-tip pores, slightly plastic. | 16.1 | 106.0 | |
| | 15 | | D-3 | 7 | | SM/ML | @ 15': Yellowish brown silty fine SAND/sandy SILT, damp to moist, loose/medium stiff, micaceous, few pinhole pores, friable. | 10.4 | 95.5 | CN, GS |
| 320 | 20 | | D-4 | 10 | | CL | @ 20': Dark yellowish brown sandy silty CLAY, moist to wet, medium stiff, micaceous, few to little pinhole pores, trace pencil-tip pores, moderately plastic. | 14.3 | 113.6 | DS, CN, AL |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-5 | 28 | | CL | @ 25': Brown sandy silty CLAY, moist to wet, very stiff, micaceous, few pinhole pores, trace pencil-tip pores, moderately plastic. | 14.0 | 117.8 | |
| 310 | 30 | | D-6 | 42 | | SC-CL | @ 30': Strong brown clayey fine SAND to sandy CLAY, wet, medium dense/very stiff, micaceous, trace pinhole pores, slightly plastic. | 14.8 | 118.5 | |
| | 35 | | D-7 | 30 | | CL | @ 35': Brown silty CLAY, wet, very stiff, trace pinhole pores, trace FeO stained flecks, moderately plastic. | 14.7 | 117.1 | |
| 300 | 40 | | D-8 | 21 | | SM-ML | @ 40': Yellowish brown silty fine SAND to sandy SILT, damp to moist, medium dense/stiff, micaceous, slightly friable where sandy. | 9.6 | 112.0 | |
| | 45 | | D-9 | 32 | | SM | @ 45': Dark yellowish brown silty fine SAND, moist, medium dense, micaceous, trace FeO stained flecks, friable. | 18.0 | 104.4 | |
| 290 | 50 | | D-10 | 32 | | SP | @ 50': Very pale brown coarse SAND with gravel, damp, medium dense, friable. | 2.2 | 108.8 | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 55 | | D-11 | 62 | | SP-SM | @ 55': Yellowish brown silty fine to coarse SAND with gravel, damp, very dense, slightly friable. | 2.1 | 123.9 | |
| -280 | 60 | | D-12 | 51 | | | @ 60': Yellowish brown silty fine to coarse SAND with gravel, damp, dense, slightly friable. | 4.6 | | |
| | 65 | | D-13 | 50/5" | | | @ 65': Yellowish brown silty fine to coarse SAND with gravel, damp, very dense, slightly friable. | 1.8 | 120.4 | |
| -270 | 70 | | D-14 | 35 | | | @ 70': Light yellowish brown silty fine SAND, damp, medium dense, micaceous, friable. | 6.3 | 105.6 | |
| | 75 | | D-15 | 31 | | SM | @ 75': Dark yellowish brown silty fine SAND, damp, medium dense, slightly friable. | 7.2 | 111.4 | |
| -260 | 80 | | D-16 | 39 | | | @ 80': Brown silty fine SAND, damp, medium dense, micaceous, slightly friable. | 5.9 | 110.3 | |
| | 85 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 85 | D | D-17 | 67 | | SP | @ 85': Pale brown fine to medium SAND, damp, dense, micaceous, friable. | 3.9 | 113.8 | |
| 250 | 90 | D | D-18 | 78 | | ML | **Vaqueros/Sespe Formation (Tvs)**<br>@ 90': Yellowish brown sandy SILTSTONE, moist, hard, micaceous, highly cemented in upper rings. | 15.4 | 108.3 | |
| | 95 | D | D-19 | 50/1.5" | | SP | @ 95': Brownish yellow fine to coarse SANDSTONE with gravel, damp to moist, very dense, friable. ▽ | 11.4 | | Sample Disturbed. |
| 240 | 100 | SPT | SPT-1 | 60/9" | | SP-SM | @ 100': Yellowish brown silty fine to medium SANDSTONE, saturated, very dense. | | | |
| | | | | | | | Notes:<br>Total Depth: 100.8 Feet.<br>Groundwater at 99 Feet.<br>Backfilled with Cement Grout. | | | |
| | 105 | | | | | | | | | |
| 230 | 110 | | | | | | | | | |
| | 115 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

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| | | | |
|---|---|---|---|
| Date(s) Drilled | **4/4/23** | Logged By | **BF** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, Bulk** | | |
| Approximate Groundwater Depth: | **Groundwater at 68.5 Feet.** | | |
| Comments | | | |

# H- 2

**Sheet 1 of 3**

| | |
|---|---|
| Total Depth Drilled (ft) | **75.6** |
| Approximate Ground Surface Elevation (ft) | **369.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Gravel road.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Dark yellowish brown silty gravelly SAND, damp, pieces of concrete and debris. | | | |
| | 5 | D-1 | 17 | | | SC | **Alluvium (Qal)**<br>@ 5': Yellowish brown clayey fine SAND, damp to moist, medium dense, micaceous, piece of concrete in top ring. | 8.4 | 111.5 | B-1 @ 5-9' MD, AL, EI, CC, DS, GS |
| 360 | | B-1 | | | | | | | | |
| | 10 | D-2 | 8 | | | ML | @ 10': Light yellowish brown sandy SILT, damp to moist, medium stiff, micaceous, highly friable. | 9.5 | 100.8 | DS, GS |
| | 15 | D-3 | 10 | | | | @ 15': Upper: Light yellowish brown silty fine SAND, damp to moist, loose, micaceous, highly friable. | 8.3 | 98.4 | |
| 350 | | | | | | SM-ML | Lower: brown silty fine SAND to sandy SILT, damp to moist, loose/medium stiff, micaceous. | | | |
| | 20 | D-4 | 9 | | | SM | @ 20': Upper: Brown silty fine SAND, damp to moist, loose, micaceous, slightly friable. | 12.3 | 98.7 | |
| | | | | | | SP | Lower: Light yellowish brown fine SAND, damp to moist, loose, micaceous, friable. | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-5 | 45 | | SC-CL | @ 25': Strong brown clayey fine SAND to sandy CLAY, moist, medium dense/very stiff, micaceous, trace pinhole pores, slightly plastic. | 10.5 | 123.2 | |
| 340 | | | | | | | | | | |
| | 30 | | D-6 | 13 | | SM-SC | @ 30': Strong brown clayey silty fine SAND, moist, loose to medium dense, micaceous, FeO flecks. | 9.3 | 113.3 | |
| | 35 | | D-7 | 32 | | SM-ML | @ 35': Yellowish brown silty fine SAND to sandy SILT, moist, medium dense/very stiff, micaceous, trace pinhole pores, trace caliche stringers. | 11.0 | 111.0 | |
| 330 | | | | | | | | | | |
| | 40 | | D-8 | 37 | | SM | @ 40': Light yellowish brown to yellowish brown silty medium SAND, damp to moist, medium dense, micaceous, trace pinhole pores, trace to few subrounded to subangular gravel approximately 1"-diameter. | 8.8 | 106.2 | |
| | 45 | | D-9 | 41 | | SC-CL | @ 45': Brown silty clayey fine SAND to sandy CLAY, damp to moist, medium dense/very stiff, micaceous, trace pinhole pores, trace subrounded gravel approximately 1/2"-diameter. | 10.8 | 120.7 | |
| 320 | | | | | | | | | | |
| | 50 | | D-10 | 53 | | SM | @ 50': Upper: Brown silty fine SAND, damp to moist, dense, micaceous, slightly friable. | 8.2 | 117.8 | |
| | | | | | | SP | Lower: Light brown fine to medium SAND with trace silt, damp to moist, dense, micaceous, slightly friable. | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

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| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 55 | | D-11 | 49 | | CL | @ 55': Yellowish brown sandy silty CLAY, moist, hard, trace pinhole pores, little caliche nodules, trace subrounded gravel approximately 1/4"-diameter, slightly plastic. | 15.3 | 112.9 | |
| 310 | 60 | | | | | | | | | |
| | 65 | | D-12 | 82/9" | | SP | @ 65': Upper: Strong brown gravelly medium to coarse SAND, wet, very dense, micaceous, subrounded gravel approximately 1/2"-1"-diameter. | 7.2 | 132.0 | |
| | | | SB-1 | | | CL | **Vaqueros/Sespe Formation (Tvs)** Lower: Light gray to pale brown CLAYSTONE, moist, hard, MnO flecks. ▽ | | | SB-1 @ 66.5' |
| 300 | 70 | | | | | | | | | |
| | 75 | | SB-2 | | | SP | @ 75': Yellowish brown gravelly medium SANDSTONE, saturated, very dense, friable, yellow SILTSTONE in bottom ring and shoe. | 14.8 | 116.5 | SB-2 @ 75' |
| | | | D-13 | 85/7" | | | Notes: Total Depth: 75.6 Feet. Groundwater at 68.5 Feet. Backfilled with Cement Grout. | | | |
| 290 | 80 | | | | | | | | | |
| | 85 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **4/4/23** | Logged By | **BF** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, Bulk** | | |
| Approximate Groundwater Depth: | **Groundwater at 63.9 Feet.** | | |
| Comments | | | |

# H- 3

**Sheet 1 of 4**

| | |
|---|---|
| Total Depth Drilled (ft) | **86.3** |
| Approximate Ground Surface Elevation (ft) | **388.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Gravel road.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Dark yellowish brown silty fine SAND, damp, some gravel. | | | |
| | | | | | | SM | **Alluvium (Qal)** | | | B-1 @ 3-6' |
| | 5 | | B-1 | | | | | | | |
| | | | D-1 | 11 | | | @ 5': Brown silty fine SAND, damp to moist, loose, micaceous, trace pinhole pores. | 6.4 | 114.1 | |
| 380 | | | | | | | | | | |
| | 10 | | D-2 | 14 | | SP | @ 10': Upper: Light yellowish brown fine to coarse SAND, damp, loose, micaceous, friable. | 3.1 | 108.1 | |
| | | | | | | SM | Lower: Brown silty fine SAND, damp, loose, micaceous, slightly friable. | | | |
| | 15 | | D-3 | 9 | | | @ 15': Brown silty fine SAND, damp to moist, loose, micaceous, slightly friable. | 5.4 | 98.0 | GS, CN |
| 370 | | | | | | | | | | |
| | 20 | | D-4 | 15 | | SP | @ 20': Brown medium to coarse SAND, damp to moist, loose to medium dense, trace mica, friable. | 5.0 | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-5 | 60 | | SP | @ 25': Brown medium to coarse SAND, damp to moist, dense, micaceous, highly friable. | 2.3 | 124.7 | |
| 360 | | | | | | | | | | |
| | 30 | | D-6 | 10 | | CL | @ 30': Brown sandy silty CLAY, moist, medium stiff, micaceous, trace pinhole pores, moderately plastic. | 8.9 | 106.1 | |
| | 35 | | D-7 | 28 | | | @ 35': Brown sandy silty CLAY, moist, very stiff, micaceous, trace pinhole pores, trace pencil-tip pores, trace caliche nodules, moderately plastic. | 12.1 | 114.8 | |
| 350 | | | | | | | | | | |
| | 40 | | D-8 | 36 | | SM-ML | @ 40': Light gray to very pale brown silty fine SAND to sandy SILT, damp to moist, medium dense/very stiff, micaceous, slightly friable. | 17.1 | 106.3 | |
| | 45 | | D-9 | 41 | | CL | @ 45': Dark yellowish brown sandy silty CLAY, moist, very stiff, micaceous, trace pinhole pores, moderately plastic. | 11.2 | 123.8 | |
| 340 | | | | | | | | | | |
| | 50 | | D-10 | 55 | | SP | @ 50': Upper: Very pale brown gravelly coarse SAND, damp, dense, slightly friable. | 2.6 | 122.0 | |
| | | | | | | SM | Lower: Light yellowish brown silty fine SAND, moist, dense, micaceous, slightly friable. | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

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NMG

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| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 55 | | D-11 | 36 | | SP | @ 55': Yellowish brown to brown fine to coarse SAND, moist, medium dense, micaceous, slightly friable. | 5.8 | 113.0 | |
| 330 | | | | | | | ▽ | | | |
| | 60 | | | | | | | | | |
| | 65 | | D-12 | 70/10" | | SM-ML | @ 65': Upper: Light yellowish brown to brown silty fine SAND to sandy SILT, wet to saturated, very dense/hard, micaceous. | 19.0 | 110.4 | |
| | | | | | | SP | Lower: Brown fine SAND, saturated, very dense, micaceous, subrounded gravel approximately 2"-diameter in tip. | | | |
| 320 | | | | | | | | | | |
| | 70 | | | | | | | | | |
| | 75 | | D-13 | 30 | | SM | @ 75': Brown gravelly silty fine SAND, saturated, medium dense, red CLAYSTONE in tip. | 15.6 | 114.7 | |
| | | | | | | CL | **Vaqueros/Sespe Formation (Tvs)** @ 76.5': Red CLAYSTONE, damp to moist, hard. | | | |
| 310 | | | | | | | | | | |
| | 80 | | | | | | | | | |
| | 85 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

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| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 85 | | D-14 | 85/9" | | CL | @ 85': Red CLAYSTONE, damp to moist, hard, trace mica. | 15.3 | 117.7 | |
| 300 | | | | | | | Notes:<br>Total Depth: 86.3 Feet.<br>Groundwater at 63.9 Feet.<br>Backfilled with Cement Grout. | | | |
| | 90 | | | | | | | | | |
| | 95 | | | | | | | | | |
| 290 | | | | | | | | | | |
| | 100 | | | | | | | | | |
| | 105 | | | | | | | | | |
| 280 | | | | | | | | | | |
| | 110 | | | | | | | | | |
| | 115 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

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Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **4/4/23** | Logged By | **BF** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, Bulk** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H- 4

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **40.8** |
| Approximate Ground Surface Elevation (ft) | **422.5 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Gravel road.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Yellowish brown silty fine SAND, damp. | | | |
| 420 | | | | | | | | | | B-1 @ 3-6' MD, GS, EI, CC |
| | | | B-1 | | | SM | **Alluvium (Qal)** | | | |
| | 5 | | D-1 | 11 | | | @ 5': Light yellowish brown silty fine SAND, damp, loose, micaceous, friable. | 3.9 | 101.6 | |
| | 10 | | D-2 | 12 | | SP | @ 10': Light yellowish brown fine SAND, damp, loose, micaceous, highly friable. | 1.3 | | |
| 410 | | | | | | | | | | |
| | 15 | | D-3 | 11 | | | @ 15': Light yellowish brown fine to coarse SAND, damp, loose, micaceous, highly friable. | 1.8 | | |
| | 20 | | D-4 | 26 | | | @ 20': Upper: Light yellowish brown fine to coarse SAND, damp, medium dense, micaceous, highly friable. | 1.5 | 124.2 | |
| 400 | | | | | | CL | Lower: Brown silty CLAY, damp, very stiff, trace caliche stringers, trace pinhole pores, moderately plastic. | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-5 | 33 | | CL | @ 25': Brownish yellow silty CLAY, damp to moist, very stiff, trace mica, few to little pinhole pores, little to some caliche stringers, moderately plastic. | 10.8 | 110.5 | CN, AL |
| | 30 | | D-6 | 56 | | | @ 30': Brownish yellow silty CLAY with trace sand, damp to moist, hard, trace mica, few to little pinhole pores, little to some caliche stringers, weathered bedrock in tip. | 13.0 | 111.2 | |
| 390 | | | | | | SM | **Vaqueros/Sespe Formation (Tvs)** | | | |
| | 35 | | D-7 | 64 | | | @ 35': Pale brown to yellow silty SANDSTONE, damp, very dense, micaceous. | 8.8 | 112.9 | |
| | 40 | | D-8 | 85/9" | | | @ 40': Light yellowish brown to olive yellow silty SANDSTONE, damp to moist, very dense, micaceous, poorly bedding. | 8.2 | 109.5 | |
| 380 | | | | | | | Notes:<br>Total Depth: 40.75 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cement Grout. | | | |
| | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| 370 | | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

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Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/3/23 | Logged By | BF |
| Drilling Company | 2R Drilling, Inc. | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 75 Hollow-Stem | Hammer Data | 140 lbs @ 30 Inch Drop |
| Sampling Method(s) | Modified California, Bulk | | |
| Approximate Groundwater Depth: | No Groundwater Encountered. | | |
| Comments | | | |

# H- 5

**Sheet 1 of 3**

| | |
|---|---|
| Total Depth Drilled (ft) | 61.4 |
| Approximate Ground Surface Elevation (ft) | 353.5 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Open field, barley, dirt, weeds.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Dark yellowish brown silty fine SAND, damp, micaceous. | | | |
| 350 | | | | | | SM | **Alluvium (Qal)** | | | B-1 @ 4-9' |
| | 5 | | D-1<br>B-1 | 11 | | | @ 5': Brown silty fine SAND, damp to moist, loose, micaceous, trace pinhole pores, trace subrounded gravel approximately 1/4"-diameter. | 15.5 | 105.6 | |
| | 10 | | D-2 | 8 | | | @ 10': Brown silty fine SAND, damp to moist, loose, micaceous, trace pinhole pores, trace subrounded gravel approximately 1/4"-diameter. | 11.0 | 107.4 | CN, AL |
| 340 | | | | | | | | | | |
| | 15 | | D-3 | 9 | | | @ 15': Upper: Brown silty fine SAND, damp to moist, loose, micaceous, trace pinhole pores. | 13.2 | 96.9 | |
| | | | | | | SP | Lower: Light yellowish brown fine SAND, damp to moist, loose, micaceous, friable. | | | |
| | 20 | | D-4 | 25 | | CL | @ 20': Brown sandy silty CLAY, moist, very stiff, few pinhole pores, trace caliche stringers, moderately plastic. | 16.1 | 111.9 | |
| 330 | | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-5 | 41 | | CL | @ 25': Strong brown sandy silty CLAY, damp to moist, very stiff, trace pinhole pores, moderately plastic. | 15.2 | 117.5 | |
| | 30 | | D-6 | 28 | | | @ 30': Strong brown sandy silty CLAY, damp to moist, very stiff, trace pinhole pores, moderately plastic. | 16.6 | 114.7 | |
| 320 | | | | | | | | | | |
| | 35 | | D-7 | 19 | | SM | @ 35': Dark yellowish brown silty fine SAND, moist, medium dense, micaceous, trace pinhole pores, slightly friable. | 7.1 | 114.8 | |
| | 40 | | D-8 | 29 | | SP-SM | @ 40': Yellowish brown silty fine SAND, moist, medium dense, micaceous, slightly friable, clay lenses in upper rings. | 4.7 | 110.9 | |
| 310 | | | | | | | | | | |
| | 45 | | D-9 | 31 | | SM-ML | @ 45': Pale brown to brown silty fine SAND to sandy SILT, moist, medium dense/very stiff, micaceous, trace pinhole pores. | 18.5 | 105.1 | |
| | 50 | | D-10 | 38 | | SM | **Vaqueros/Sespe Formation (Tvs)**<br>@ 50': Yellowish brown silty SANDSTONE, damp to moist, medium dense, trace mica, clay beds in upper rings, slightly friable. | 8.5 | 116.0 | |
| 300 | | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 55 | | | | | SP | @ 55': Yellow clean SANDSTONE, damp, very dense, micaceous, slightly friable. | | | |
| | 60 | SPT | -1 | 90/11" | | | @ 60': Yellow clean SANDSTONE, damp to moist, very dense, micaceous, slightly friable. | 7.6 | | |
| 290 | | | | | | | Notes:<br>Total Depth: 61.4 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cement Grout. | | | |
| | 65 | | | | | | | | | |
| | 70 | | | | | | | | | |
| 280 | | | | | | | | | | |
| | 75 | | | | | | | | | |
| | 80 | | | | | | | | | |
| 270 | | | | | | | | | | |
| | 85 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/21/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H- 6

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **31.5** |
| Approximate Ground Surface Elevation (ft) | **345.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Dirt agricultural road.<br>Hand-augered to 4'.<br>**Aritficial Fill, Undocumented (Afu)** | | | |
| | | | | | | | **Alluvium (Qal)** | | | |
| 340 | 5 | | D-1 | 20 | | SM | @ 5': Brown silty fine SAND, moist, medium dense, pinhole pores. | 8.8 | 114.4 | |
| | 10 | | D-2 | 9 | | | @ 10': Light brown silty SAND, moist, medium stiff, mica. | 9.4 | 95.0 | AL, GS |
| 330 | 15 | | D-3 | 9 | | | @ 15': Light brown silty fine SAND, damp to moist, medium dense, brown silt in tip. | 9.9 | 101.2 | |
| | 20 | | D-4 | 13 | | SC/CL | @ 20': Dark brown clayey fine SAND/ sandy CLAY, moist, stiff. | 14.3 | 114.6 | AL, GS |
| 320 | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 320 | 25 | | D-5 | 50/6" | | SC-CL | @ 25': Reddish brown clayey SAND/sandy CLAY, very dense/hard, moist, caliche. | 12.3 | 123.5 | |
| | 30 | | D-6 | 50 | | SC | @ 30': Reddish brown to pale brown clayey medium SAND, moist, dense, reddish brown sandy clay in tip, pale brown clayey sand in upper rings. | 15.0 | 114.8 | |
| | | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| 310 | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |
| 300 | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| 290 | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/21/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H- 7

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **45.0** |
| Approximate Ground Surface Elevation (ft) | **351.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SC | Surface: Stockpile.<br>**Artificial Fill, Undocumented (Afu)**<br>Mottled olive gray clayey SAND, moist. | | | |
| 350 | | | | | | | | | | |
| | 5 | | D-1 | 11 | | SM | **Alluvium (Qal)**<br>@ 5': Pale brown silty fine SAND, damp, medium dense, friable, brown silt in tip. | 3.4 | 79.0 | |
| | 10 | | D-2 | 20 | | SM | @ 10': Light brown silty medium SAND, moist, medium dense, friable, coarser in tip. | 6.0 | 104.1 | GS, CN |
| 340 | | | | | | | | | | |
| | 15 | | D-3 | 37 | | SM | @ 15': Pale brown silty coarse SAND with gravel, damp, dense, friable. | 2.9 | 114.7 | |
| | 20 | | D-4 | 46 | | | @ 20': Pale brown silty coarse SAND with gravel, damp, dense, friable. | 3.6 | | |
| 330 | | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | D | D-5 | 76 | | SM | @ 25': Pale brown medium to coarse silty SAND, damp, dense, friable. | 2.6 | 114.8 | |
| 320 | 30 | D | D-6 | 84 | | SM | @ 30': Pale brown silty coarse SAND with gravel, damp, very dense, friable. | 3.4 | | |
| | 35 | D | D-7 | 50/6" | | | @ 35': No sample recovery. | | | Rig chatter @ 36' |
| 310 | 40 | D | D-8 | 50/2" | | | @ 40': No sample recovery. | | | Rig chatter @ 40' |
| | 45 | | | | | | @ 45': Sampler bouncing. | | | |
| | | | | | | | Notes:<br>Total Depth: 45'.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| 300 | 50 | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/20/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H- 8

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **31.5** |
| Approximate Ground Surface Elevation (ft) | **362.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Dirt agriculture road.<br>**Artificial Fill, Undocumented (Afu)** | | | |
| | | | | | | | **Alluvium (Qal)** | | | |
| 360 | | | | | | | | | | |
| | 5 | | D-1 | 27 | | SM | @ 5': Light brown silty medium SAND, trace gravel, damp, medium dense. | 4.1 | 118.5 | |
| | 10 | | D-2 | 19 | | | @ 10': Light brown silty medium SAND, trace gravel, moist, medium dense. | 8.9 | 107.4 | GS, CN |
| 350 | | | | | | | | | | |
| | 15 | | D-3 | 44 | | | @ 15': Pale brown medium SAND, damp, dense, friable. | 2.8 | 120.1 | |
| | 20 | | D-4 | 80 | | SM | @ 20': Pale brown silty medium to coarse SAND with gravel, damp, dense, silty sand in upper rings. | 2.5 | 117.1 | |
| 340 | | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-5 | 35 | | SM | @ 25': Pale brown silty medium to coarse SAND with gravel, damp, dense, friable. | 2.4 | 103.9 | |
| | 30 | | D-6 | 34 | | SM | @ 30': Pale brown silty medium to coarse SAND with gravel, damp, dense, friable. | 4.9 | 109.6 | |
| 330 | | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |
| 320 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| 310 | | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/20/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H- 9

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **31.5** |
| Approximate Ground Surface Elevation (ft) | **376.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface : Dirt agriculture road.<br>**Artificial Fill, Undocumented (Afu)** | | | |
| | | | | | | | **Alluvium (Qal)** | | | |
| | 5 | | D-1 | 33 | | ML | @ 5': Brown sandy SILT, damp to moist, medium stiff. | 8.4 | 118.8 | |
| 370 | | | | | | | | | | |
| | 10 | | D-2 | 12 | | | @ 10': Brown to dark brown SILT, moist, medium stiff, silty sand in upper rings. | 33.7 | 84.1 | AL |
| | 15 | | D-3 | 21 | | SM | @ 15': Pale brown silty medium SAND, damp, medium dense, friable. | 4.2 | 113.6 | |
| 360 | | | | | | | | | | |
| | 20 | | D-4 | 20 | | | @ 20': Pale brown silty fine to medium SAND, moist, medium dense, friable. | 9.4 | 100.6 | GS, CN |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 350 | 25 | | D-5 | 61 | | SM | @ 25': Pale brown silty medium to coarse SAND, trace gravel, damp, dense, friable. | 4.5 | 121.4 | |
| | 30 | | D-6 | 38 | | | @ 30': No sample recovery. (Sandy according to driller and cuttings) | | | |
| 340 | 35 | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| | 40 | | | | | | | | | |
| 330 | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/20/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, SPT** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H-10

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **46.5** |
| Approximate Ground Surface Elevation (ft) | **410.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 410 | 0 | | | | | SM | Surface: Stockpile.<br>**Artificial Fill, Undocumented (Afu)** | | | |
| | 5 | D | 1 | 35 | | | @ 5': Olive yellow silty SAND with gravel, moist, dense. | 8.4 | 108.4 | Rig chatter @ 6' |
| 400 | 10 | D | 2 | 13 | | ML | @ 10': Very dark brown sandy SILT with gravel, moist, stiff, some trash. | 7.8 | 111.7 | |
| | | | | | | ML | **Alluvium (Qal)**<br>@ 14': Cuttings change to dark brown and contain roots. | | | |
| | 15 | D | 3 | 66 | | | @ 15': Dark brown sandy SILT, damp, hard, rootlets, pinhole pores. | 5.0 | 105.6 | |
| 390 | 20 | D | 4 | 38 | | CL | @ 20': Dark brown sandy CLAY, damp, very stiff, caliche, pinhole pores. | 11.2 | 108.7 | AL |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | D | 5 | 25 | | SM | @ 25': Pale brown silty medium SAND, moist, medium dense, friable. | 12.3 | 94.3 | |
| 380 | 30 | SPT | 1 | 9 | | | @ 30': Brown silty SAND, damp, loose/stiff, siltier lenses, pale brown SAND in tip. | 8.8 | | |
| | 35 | D | 6 | 39 | | | @ 35': Pale brown silty fine SAND, moist, medium dense. | 7.0 | 119.1 | |
| | | SPT | 2 | 14 | | | @ 37.5': Pale brown silty fine to medium SAND, damp, medium dense. | 5.5 | | |
| 370 | 40 | D | 7 | 40 | | ML | @ 40': Light brown sandy SILT, moist, stiff. | 15.6 | 108.1 | |
| | | SPT | 3 | 18 | | | @ 42.5': Brown sandy SILT, moist, stiff. | 9.0 | | |
| | 45 | D | 8 | 60 | | | @ 45': Brown sandy SILT, damp, stiff. | 5.2 | 114.9 | |
| | | | | | | | Notes:<br>Total Depth: 46.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| 360 | 50 | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | 11/21/23 | Logged By | DDK |
| Drilling Company | 2R Drilling, Inc. | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 75 Hollow-Stem | Hammer Data | 140 lbs @ 30 Inch Drop |
| Sampling Method(s) | Modified California, SPT | | |
| Approximate Groundwater Depth: | No Groundwater Encountered. | | |
| Comments | | | |

# H-11

## Sheet 1 of 2

| | |
|---|---|
| Total Depth Drilled (ft) | 31.5 |
| Approximate Ground Surface Elevation (ft) | 417.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | Surface: Gravel yard.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Silty Gravel | | | |
| | | | | | | SM | **Alluvium (Qal)**<br>@ 1': Brown silty fine SAND, damp. | | | |
| | 5 | | D-1 | 21 | | | @ 5': Brown silty fine SAND, damp, medium dense, pinhole pores. | 9.6 | 109.0 | |
| 410 | | | SPT-1 | 8 | | | @ 7.5': Light brown fine to medium SAND with silt, damp to moist, medium dense. | 7.1 | | |
| | 10 | | D-2 | 34 | | | @ 10': Pale brown medium SAND, damp, medium dense, friable. | 4.3 | 111.6 | GS, CN |
| | | | SPT-2 | 5 | | | @ 12.5': Pale brown medium to coarse SAND, damp, medium dense, friable. | 3.7 | | |
| | 15 | | D-3 | 14 | | | @ 15': No sample recovery. (Driller felt sandy soils) | | | |
| 400 | | | SPT-3 | 14 | | SM | @ 17.5': Pale brown silty medium to coarse SAND with gravel, damp, medium dense, friable. | 4.2 | | |
| | 20 | | D-4 | 30 | | | @ 20': Pale brown silty coarse SAND with gravel, moist, dense, friable, brown sandy clay in tip. | 13.9 | 110.8 | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | SPT | -4 | 31 | | SM | @ 25': Pale brown silty coarse SAND with gravel, damp, dense, friable. | 5.6 | | |
| 390 | | | | | | | | | | |
| | 30 | D | -5 | 43 | | SM | @ 30': Pale brown medium to coarse SAND, damp, trace gravel, dense, friable. | 4.3 | 108.6 | |
| | | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| | 35 | | | | | | | | | |
| 380 | | | | | | | | | | |
| | 40 | | | | | | | | | |
| | 45 | | | | | | | | | |
| 370 | | | | | | | | | | |
| | 50 | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | 11/20/23 | Logged By | DDK |
| Drilling Company | 2R Drilling, Inc. | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 75 Hollow-Stem | Hammer Data | 140 lbs @ 30 Inch Drop |
| Sampling Method(s) | Modified California, SPT | | |
| Approximate Groundwater Depth: | No Groundwater Encountered. | | |
| Comments | | | |

# H-12

## Sheet 1 of 2

| | |
|---|---|
| Total Depth Drilled (ft) | 31.5 |
| Approximate Ground Surface Elevation (ft) | 423.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | Surface: Gravel parking lot. **Artificial Fill, Undocumented (Afu)** | | | |
| | | | | | | SP-SM | @ 0': Silty GRAVEL. | | | |
| | | | | | | | **Alluvium (Qal)** @ 1': Brown fine to medium SAND with silt, moist. | | | |
| 420 | | | | | | | | | | |
| | 5 | SPT | SPT-1 | 7 | | | @ 5': Brown fine to medium SAND with silt, moist, loose, friable. | 7.8 | | |
| | | D | D-1 | 35 | | SP-SM | @ 7.5': Pale brown medium to coarse SAND with silt and gravel, damp, medium dense, friable. | 1.8 | 107.6 | GS, CN |
| | 10 | SPT | SPT-2 | 10 | | SM | @ 10': Brown silty fine SAND, damp to moist, coarse sand in tip. | 11.9 | | |
| 410 | | D | D-2 | 66 | | SM | @ 12.5': Pale brown silty coarse SAND with gravel, damp, dense, friable. | 2.7 | 110.5 | |
| | 15 | SPT | SPT-3 | 15 | | | @ 15': Pale brown gravelly medium to coarse SAND, moist, dense, friable, brown clay in tip. | 7.3 | | |
| | | D | D-3 | 20 | | CL | @ 17.5': Dark brown sandy CLAY, moist, stiff. | 11.8 | 113.0 | |
| | 20 | SPT | SPT-4 | 19 | | | @ 20': Reddish brown sandy CLAY, moist, stiff. | 14.4 | | |
| 400 | | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-4 | 43 | | CL/CH | @ 25': Reddish brown sandy CLAY, and brown silty CLAY, wet, stiff, trace caliche. | 31.7 | 88.8 | AL, GS |
| | 30 | | SPT-5 | 30 | | SM | @ 30': Light brown silty fine to medium SAND, damp to moist, medium dense, friable. | 6.5 | | |
| 390 | | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |
| 380 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| 370 | | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/20/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, SPT** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# H-13

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | **31.5** |
| Approximate Ground Surface Elevation (ft) | **436.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Uncultivated field, weeds.<br>**Alluvium (Qal)**<br>@ 0': Light brown silty SAND, damp, roots. | | | |
| | 5 | | D-1 | 32 | | | @ 5': Light brown silty SAND, damp, medium dense, roots, pores. | 2.8 | 120.1 | |
| 430 | | | SPT-1 | 13 | | | @ 7.5': Light brown silty SAND, damp, medium dense, roots, pores. | 7.7 | | |
| | 10 | | D-2 | 43 | | | @ 10': Light brown silty SAND, damp, medium dense, roots, pores, coarse sand in tip. | 5.3 | 106.9 | |
| | | | | | | SP | | | | |
| | | | SPT-2 | 7 | | | @ 12.5': Upper: Pale brown medium to coarse SAND, damp, medium dense, friable. | 6.5 | | |
| | | | | | | SM | Lower: Brown silty fine to medium SAND, damp, medium dense. | | | |
| | 15 | | D-3 | 15 | | | @ 15': Brown silty fine SAND, moist, medium dense. | 9.4 | 112.3 | AL, GS, CN |
| 420 | | | SPT-3 | 8 | | ML | @ 17.5': Brown SILT with fine sand, moist, medium stiff. | 10.6 | | |
| | 20 | | D-4 | 41 | | SM | @ 20': Brown to light brown silty medium SAND, damp, dense. | 3.5 | 113.6 | AL, GS |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 410 | 25 | SPT-4 | | 10 | | SM | @ 25': Pale brown silty medium SAND, damp, dense, friable. | 3.6 | | |
| | 30 | D-5 | | 28 | | | @ 30': Brown silty fine to medium SAND, moist, dense. | 13.4 | 107.3 | |
| | | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| 400 | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |
| 390 | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

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Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | 11/20/23 | Logged By | DDK |
| Drilling Company | 2R Drilling, Inc. | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 75 Hollow-Stem | Hammer Data | 140 lbs @ 30 Inch Drop |
| Sampling Method(s) | Modified California, SPT | | |
| Approximate Groundwater Depth: | No Groundwater Encountered. | | |
| Comments | | | |

# H-14

## Sheet 1 of 2

| | |
|---|---|
| Total Depth Drilled (ft) | 31.5 |
| Approximate Ground Surface Elevation (ft) | 392.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Dirt yard. **Artificial Fill, Undocumented** | | | |
| | | | | | | SM | @ 0': Very dark brown gravelly silty medium SAND, damp, medium dense, trash. | | | |
| 390 | | | | | | | **Alluvium (Qal)** @ 1': Pale brown fine to medium SAND, damp. | | | |
| | 5 | SPT | SPT-1 | 3 | | | @ 5': Pale brown fine to medium SAND, damp, loose, friable. | 5.7 | | |
| | | D | D-1 | 14 | | | @ 7.5': Pale brown fine to medium SAND, damp, loose, friable. | 4.6 | 102.9 | |
| | 10 | SPT | SPT-2 | 13 | | | @ 10': Pale brown silty medium to coarse SAND with gravel, damp, loose, friable, gravel in tip. | 4.9 | | |
| 380 | | D | D-2 | | | | @ 12.5': No sample recovery. (Very gravelly) | | | |
| | 15 | SPT | SPT-3 | 32 | | GP | @ 15': Minimal recovery, crushed GRAVEL, and brown medium to coarse SAND, damp to moist. | 6.7 | | |
| | | D | D-3 | 62 | | SM | @ 17.5': Pale brown silty coarse SAND with gravel, damp, medium dense, friable. | 2.7 | | |
| | 20 | SPT | SPT-4 | 10 | | SM | @ 20': Brown silty fine to medium SAND, moist, medium dense, friable. | 8.9 | | |
| 370 | | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | | D-4 | 52 | | SM | @ 25': Brown silty fine to medium SAND, damp, medium dense, friable. | 3.2 | 111.9 | |
| | 30 | | SPT-5 | 28 | | SM | @ 30': Pale brown silty medium to coarse SAND with gravel, damp, dense, friable. | 2.9 | | |
| 360 | | | | | | | Notes:<br>Total Depth: 31.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | |
| | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |
| 350 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |
| 340 | | | | | | | | | | |
| | 55 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**

**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **4/3/23** | Logged By | **BF** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, Bulk** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# P-1

**Sheet 1 of 1**

| | |
|---|---|
| Total Depth Drilled (ft) | **13.0** |
| Approximate Ground Surface Elevation (ft) | **340.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 340 | 0 | | | | | SM | Surface: Gravel road.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Brown silty gravelly fine SAND, moist. | | | |
| | 5 | D | D-1 | 13 | | | @ 5': Yellowish brown silty fine SAND, damp to moist, loose, micaceous, slightly friable, trace caliche stringers in tip. | 7.1 | 113.5 | |
| | | | | | | SM | **Alluvium (Qal)** | | | |
| 330 | 10 | D | D-2 | 7 | | | @ 11': Yellowish brown silty fine SAND, damp to moist, loose, micaceous, trace pinhole pores, slightly friable. | 12.3 | 103.1 | CN, GS |
| | 15 | | | | | | Notes:<br>Total Depth: 13 Feet.<br>No Groundwater Encountered.<br>Installed 13 Feet of 2-Inch-Diameter Slotted Well Casing.<br>Backfilled Annular Space with #3 Sand.<br>Pre-Soaked on 4/4/2023.<br>Percolation Test Performed on 4/5/2023.<br>Backfilled with Cuttings and Tamped. | | | |
| 320 | 20 | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/3/23 | Logged By | BF |
| Drilling Company | 2R Drilling, Inc. | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 75 Hollow-Stem | Hammer Data | 140 lbs @ 30 Inch Drop |
| Sampling Method(s) | Modified California, Bulk | | |
| Approximate Groundwater Depth: | No Groundwater Encountered. | | |
| Comments | | | |

# P-2

**Sheet 1 of 1**

| | |
|---|---|
| Total Depth Drilled (ft) | 13.0 |
| Approximate Ground Surface Elevation (ft) | 350.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 350 | 0 | | | | | SM | Surface: Open field, barley, dirt, weeds.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Dark yellowish brown silty SAND, moist. | | | B-1 @ 0-5' |
| | | | B-1 | | | | | | | |
| | 5 | | D-1 | 19 | | | @ 5': Brown clayey silty fine SAND, moist, medium dense, micaceous, some rootlets, piece of concrete in tip. | 11.9 | | |
| | | | | | | SM-ML | **Alluvium (Qal)**<br>@ 7': Cuttings changed to lighter brown color. | | | |
| | | | D-2 | 7 | | | @ 8': Brown to yellowish brown silty fine SAND to sandy SILT, moist, medium stiff, micaceous, trace pinhole pores. | 16.6 | 94.8 | |
| 340 | 10 | | | | | | | | | |
| | | | D-3 | 11 | | SP | @ 11': Pale brown to light yellowish brown fine SAND, damp to moist, loose, micaceous, friable. | 3.2 | 98.1 | |
| | 15 | | | | | | Notes:<br>Total Depth: 13 Feet.<br>No Groundwater Encountered.<br>Installed 13 Feet of 2-Inch-Diameter Slotted Well Casing.<br>Backfilled Annular Space with #3 Sand.<br>Pre-Soaked on 4/4/2023.<br>Percolation Test Performed on 4/5/2023.<br>Backfilled with Cuttings and Tamped. | | | |
| 330 | 20 | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/21/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, SPT** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# P-3

**Sheet 1 of 1**

| | |
|---|---|
| Total Depth Drilled (ft) | **10.0** |
| Approximate Ground Surface Elevation (ft) | **336.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Dirt agriculture road between bean field and basin.<br>**Artificial Fill, Undocumented (Afu)**<br>@ 0': Brown silty fine SAND, damp to moist. | | | |
| | | | | | | SM | **Alluvium (Qal)**<br>@ 3': Cuttings change color to light brown. | | | |
| | 5 | | D-1 | 17 | | | @ 5': Light brown silty medium SAND, moist, medium dense, trace gravel, brown sandy clay with caliche in tip. | 8.1 | 106.9 | |
| 330 | | | | | | | | | | |
| | | | D-2 | 14 | | | @ 8.5': Light brown silty medium SAND, moist, medium dense, trace gravel. | 10.1 | 112.0 | |
| | 10 | | | | | | Notes:<br>Total Depth: 10 Feet.<br>No Groundwater Encountered.<br>Installed 4.5 Feet of 2-Inch-Diameter Slotted and 6 Feet of 2-Inch-Diameter Blank Well Casing.<br>Backfilled Annular Space with #3 Sand.<br>Pre-Soaked on 11/21/2023.<br>Percolation Test Performed on 11/22/2023.<br>Backfilled with Cuttings and Tamped. | | | |
| | 15 | | | | | | | | | |
| 320 | | | | | | | | | | |
| | 20 | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

Report: HOLLOW STEM; Project: 23007-01.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 11/7/24

| | | | |
|---|---|---|---|
| Date(s) Drilled | **11/21/23** | Logged By | **DDK** |
| Drilling Company | **2R Drilling, Inc.** | Drill Bit Size/Type | **8"** |
| Drill Rig Type | **CME 75 Hollow-Stem** | Hammer Data | **140 lbs @ 30 Inch Drop** |
| Sampling Method(s) | **Modified California, SPT** | | |
| Approximate Groundwater Depth: | **No Groundwater Encountered.** | | |
| Comments | | | |

# P-4

**Sheet 1 of 1**

| | |
|---|---|
| Total Depth Drilled (ft) | **15.0** |
| Approximate Ground Surface Elevation (ft) | **334.0 msl** |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | CL | Surface: Dirt road adjacent to basin.<br>**Artificial Fill, Undocumented**<br>@ 0': Dark brown sandy CLAY, moist. | | | |
| 330 | | | | | | | | | | |
| | 5 | | D-1 | 23 | | | @ 5': Dark brown sandy CLAY, moist, very stiff. | 11.8 | 118.8 | |
| | | | D-2 | 26 | | | @ 7.5': Dark brown sandy CLAY with gravel, moist, very stiff. | 10.4 | 117.7 | Rig chatter @ 9' |
| | 10 | | D-3 | 21 | | SM | **Alluvium (Qal)**<br>@ 10': Light brown silty medium SAND, moist, medium dense. | 8.1 | 118.2 | |
| 320 | | | | | | | | | | |
| | 15 | | | | | | @ 15': Cuttings become sandier. | | | |
| | | | | | | | Notes:<br>Total Depth: 15 Feet.<br>No Groundwater Encountered.<br>Installed 10 Feet of 2-Inch-Diameter Slotted and 5 Feet of 2-Inch-Diameter Blank Well Casing.<br>Backfilled Annular Space with #3 Sand.<br>Pre-Soaked on 11/21/2023.<br>Percolation Test Performed on 11/22/2023.<br>Backfilled with Cuttings and Tamped. | | | |
| | 20 | | | | | | | | | |
| 310 | | | | | | | | | | |
| | 25 | | | | | | | | | |

## LOG OF BORING

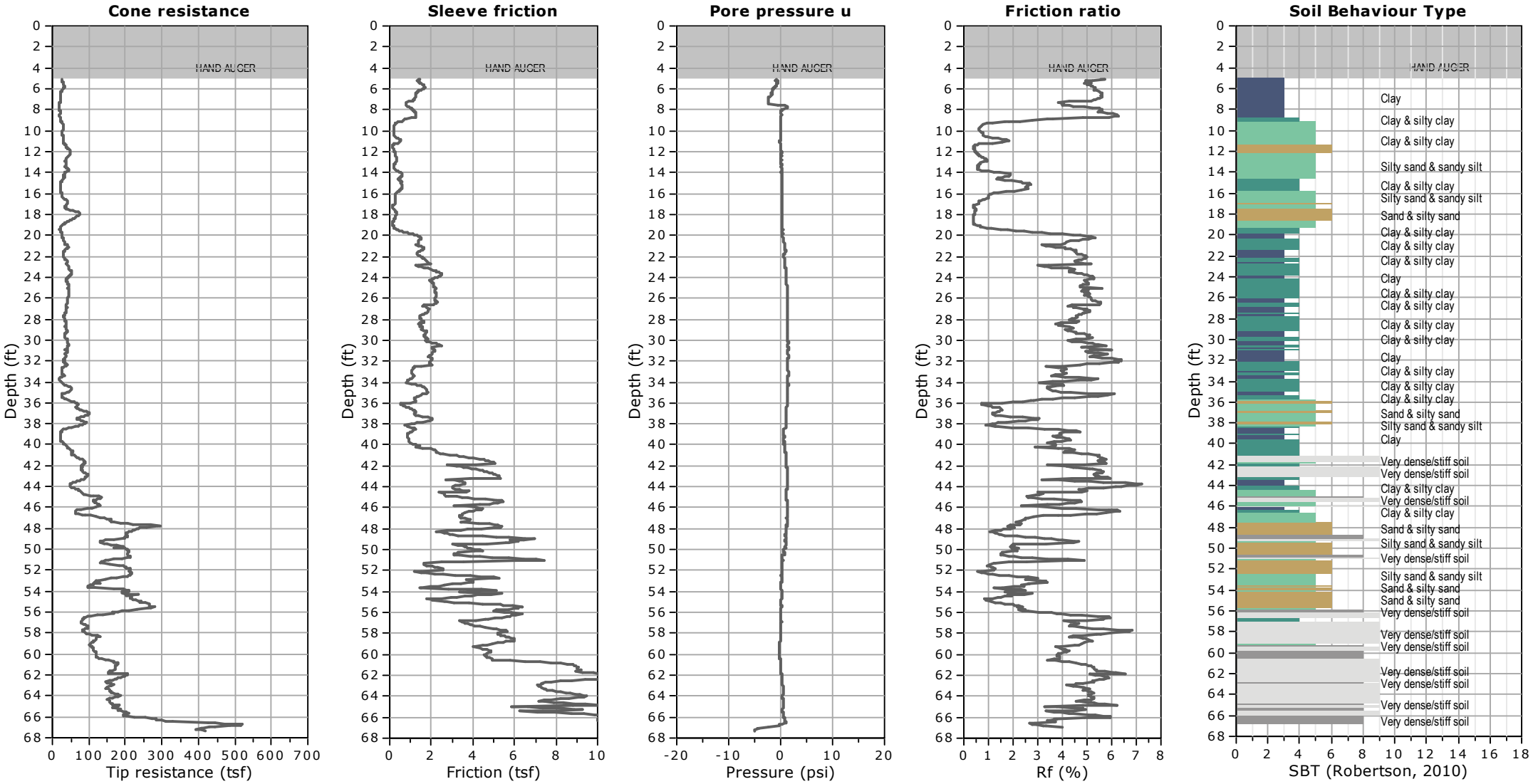
**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG

**Kehoe Testing and Engineering**
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steve@kehoetesting.com
www.kehoetesting.com

**Project:** **NMG Geotechnical / IOC- Gateway Park**
**Location:** **11911 Jeffrey Rd, Irvine, CA**

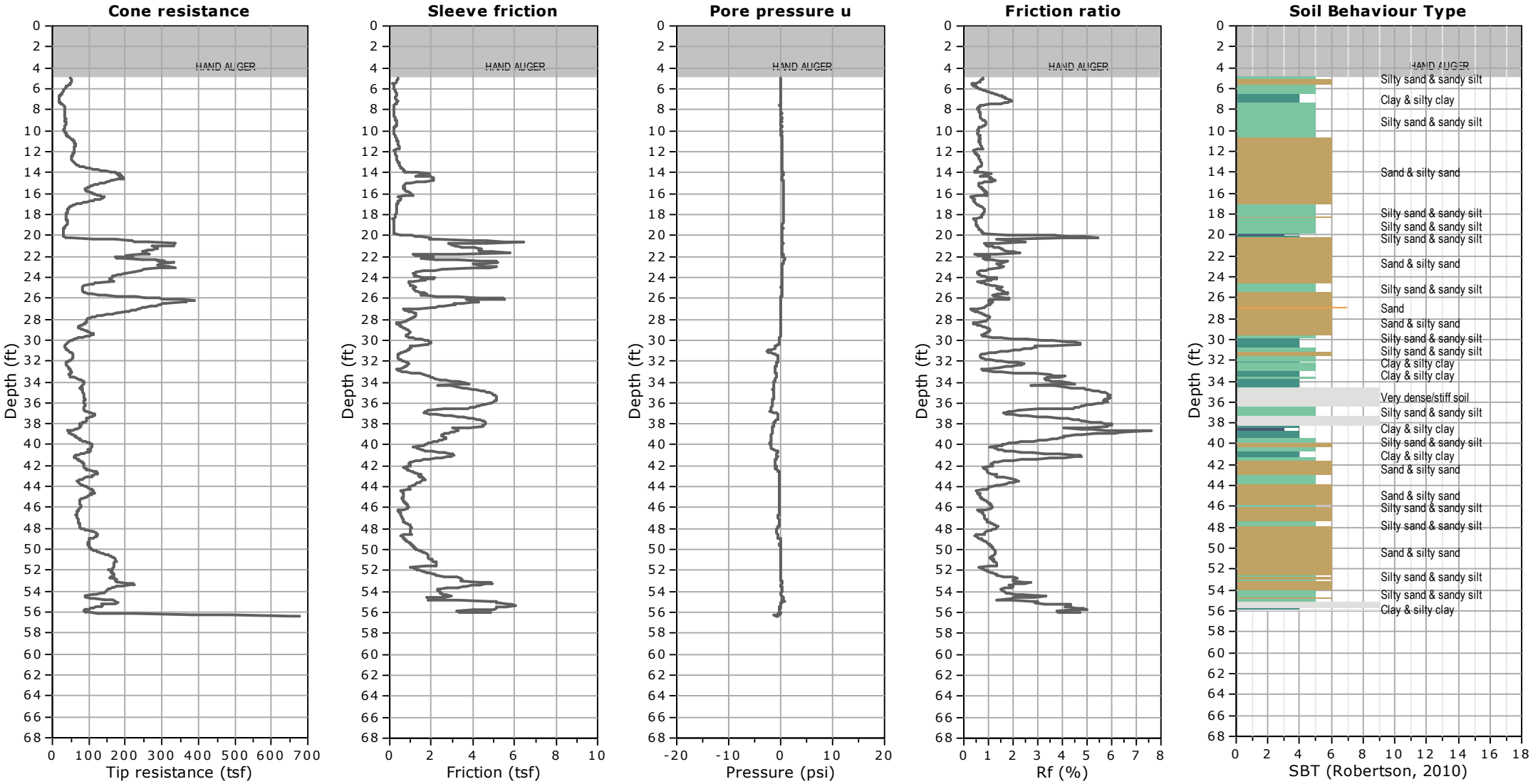
**CPT-1**
Total depth: 67.33 ft, Date: 3/27/2023



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**Location:** **11911 Jeffrey Rd, Irvine, CA**

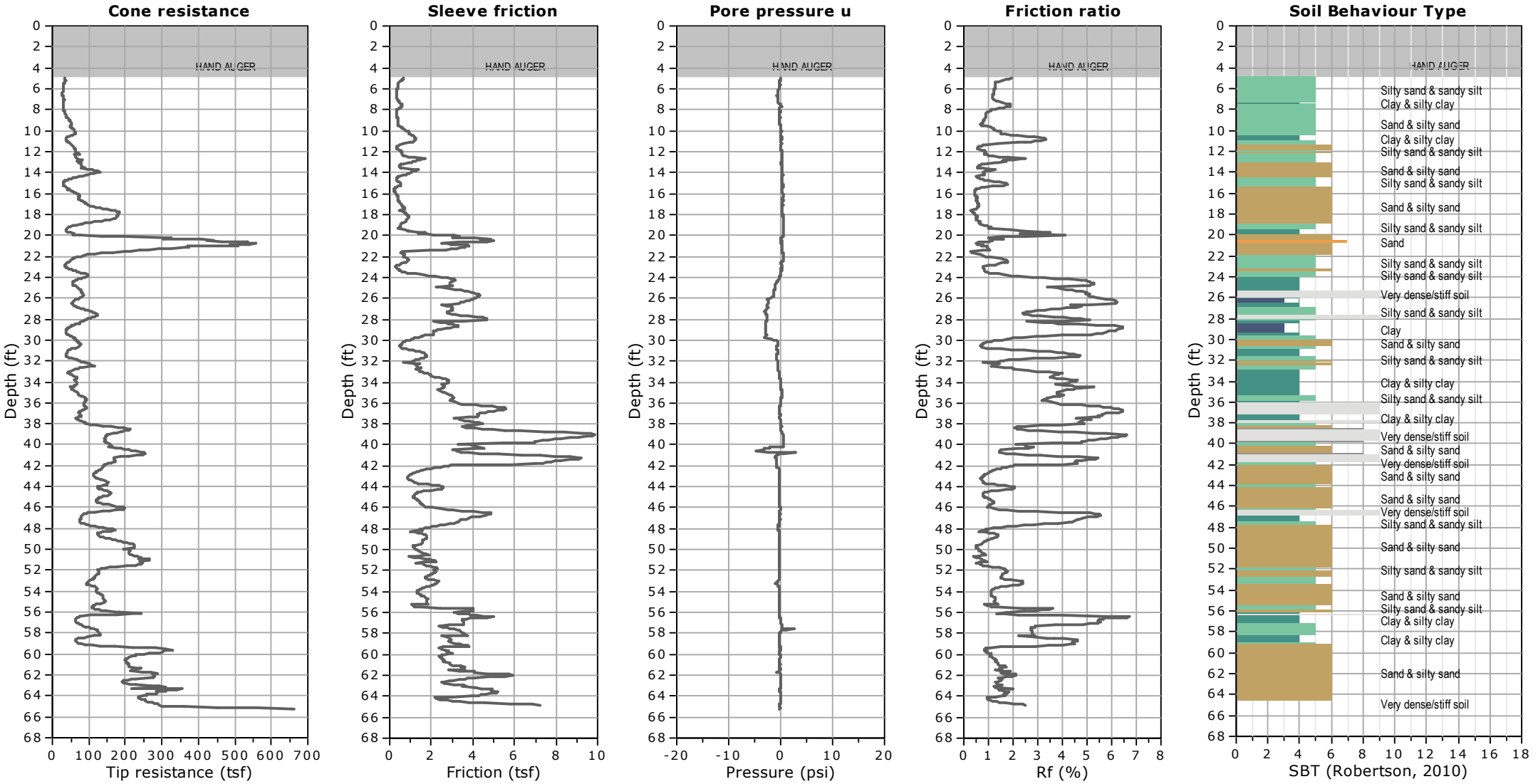
**CPT-2**
Total depth: 56.44 ft, Date: 3/27/2023



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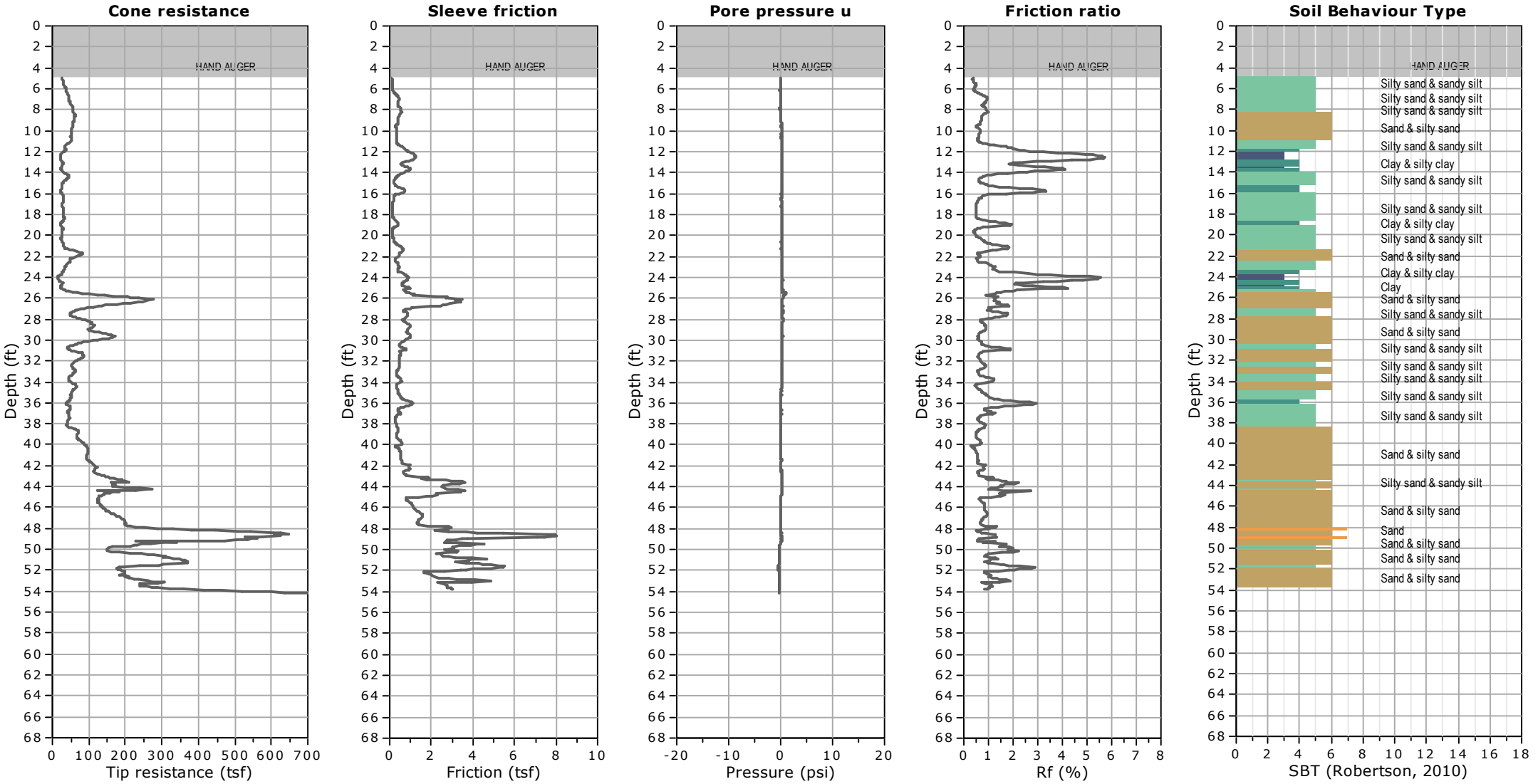
**CPT-3**
Total depth: 65.22 ft, Date: 3/27/2023



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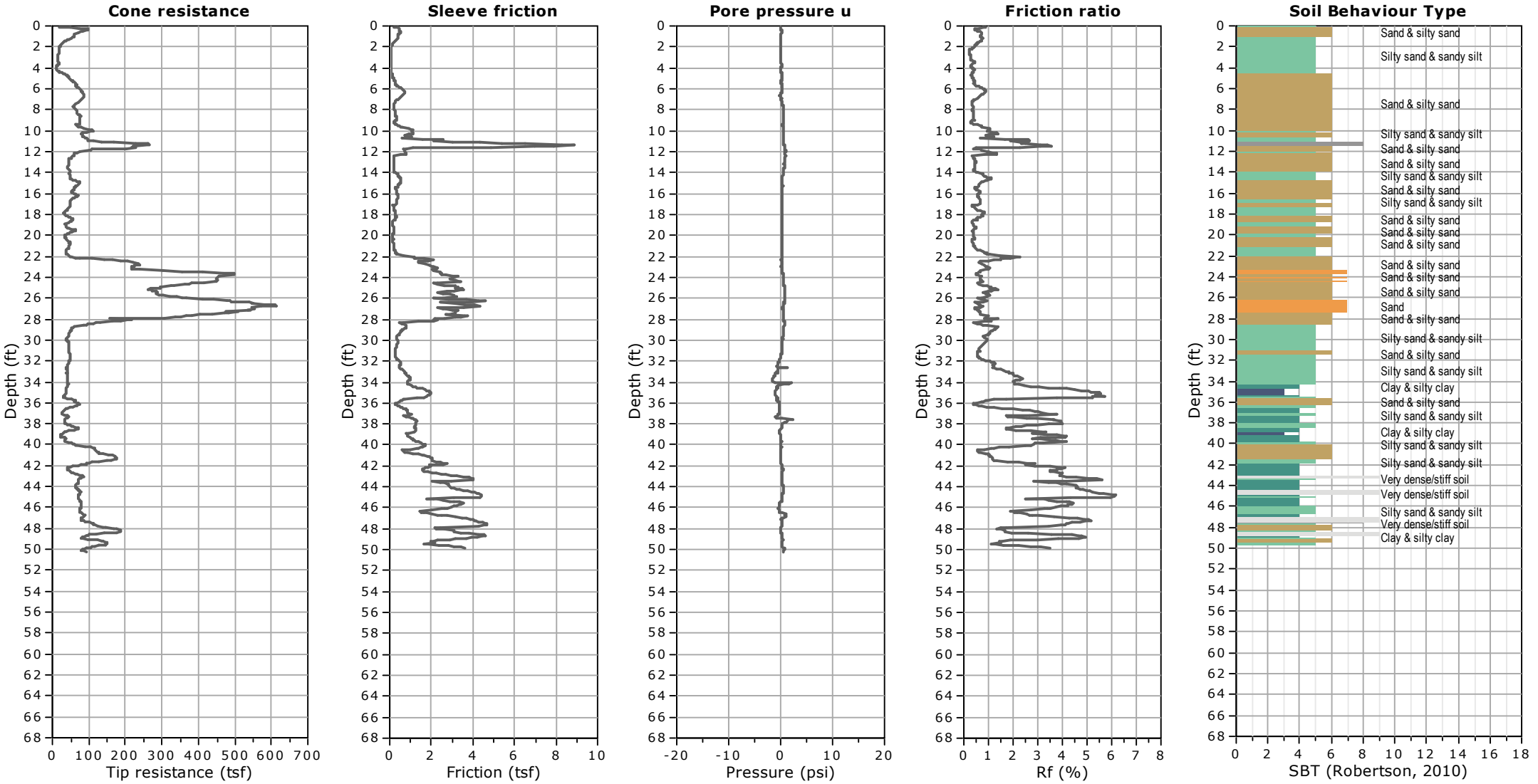
**CPT-4**
Total depth: 54.21 ft, Date: 3/27/2023



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**Project:** **NMG Geotechnical / IOC- Gateway Park**
**Location:** **11911 Jeffrey Rd, Irvine, CA**

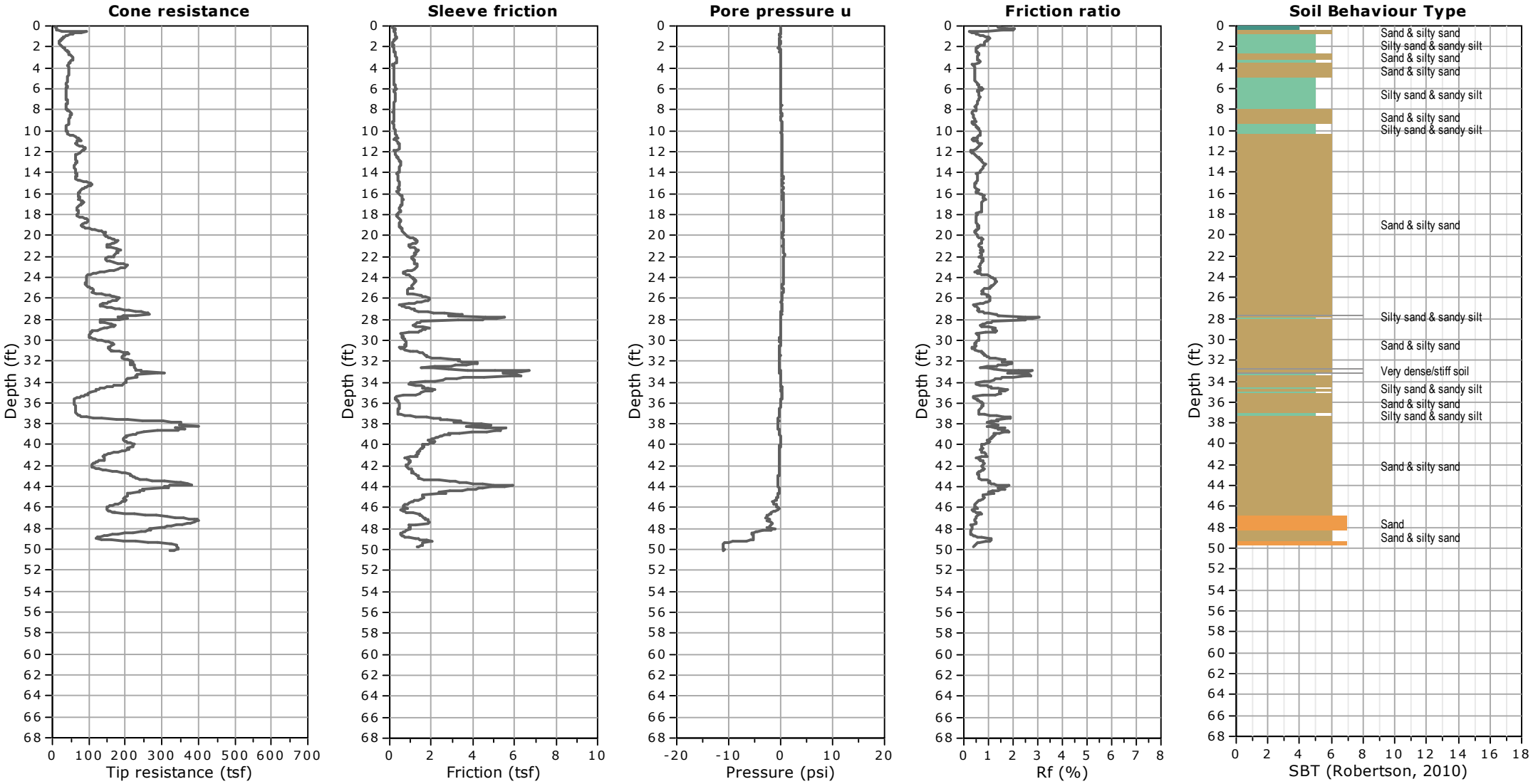
**CPT-5**
Total depth: 50.21 ft, Date: 3/27/2023



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**Project:** **NMG Geotechnical / IOC- Gateway Park**
**Location:** **11911 Jeffrey Rd, Irvine, CA**

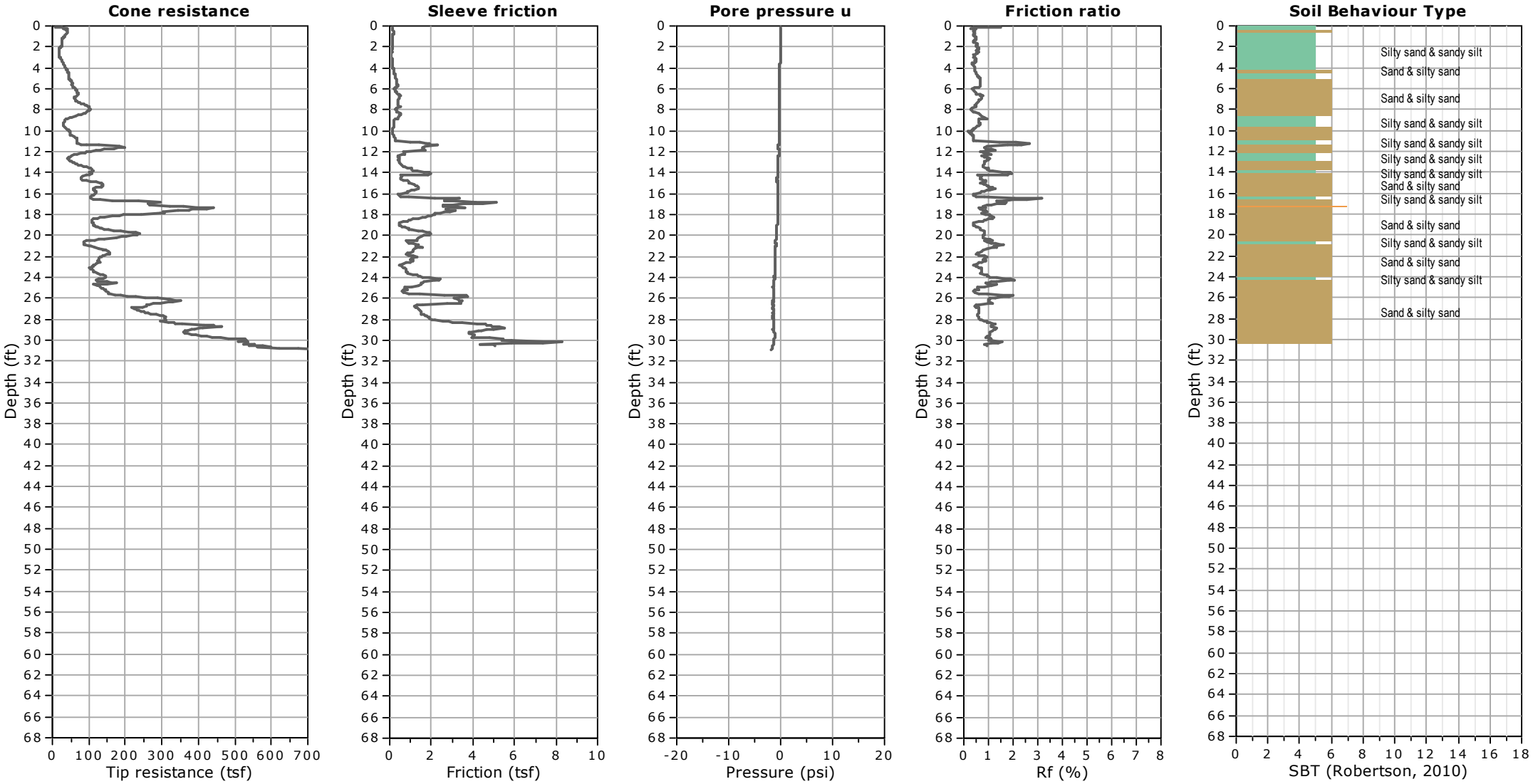
**CPT-6**
Total depth: 50.15 ft, Date: 3/27/2023



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**Project:** **NMG Geotechnical / IOC- Gateway Park**
**Location:** **11911 Jeffrey Rd, Irvine, CA**

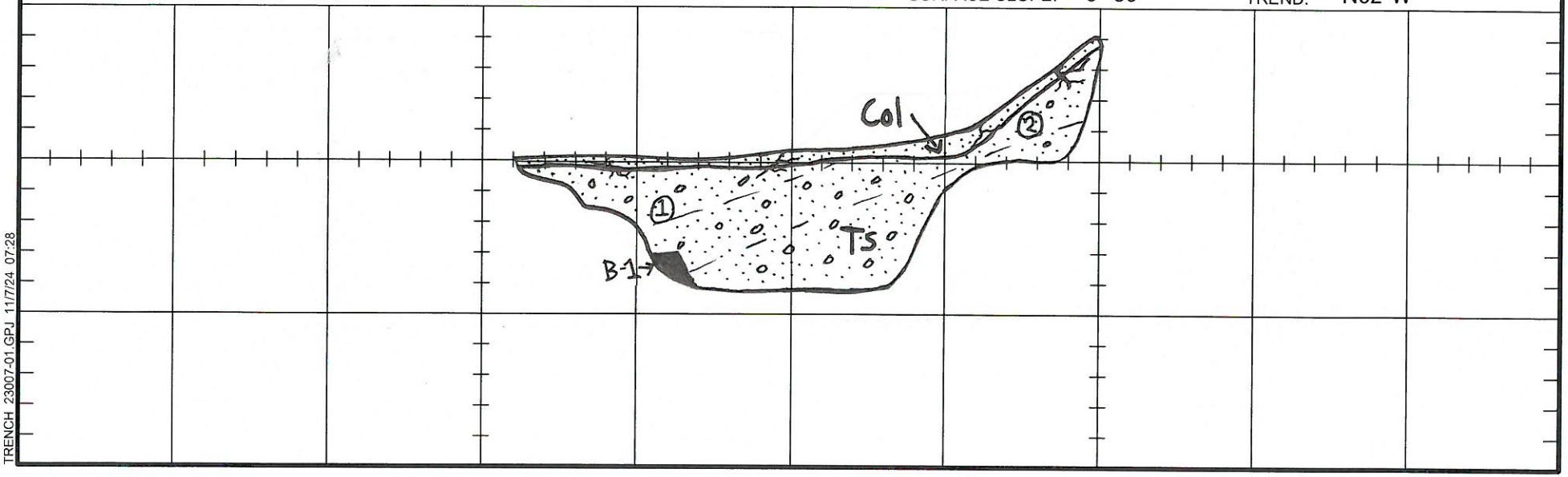
**CPT-7**
Total depth: 30.91 ft, Date: 3/27/2023



| | | | | | |
|---|---|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK | TRENCH NO.: | T- 1 |
| Project Number: | 23007-01 | Elevation: | 338' | | |
| Equipment: | J.D. 310SL HL | Location: | Irvine, CA | | |

| GEOLOGIC ATTITUDES | DESCRIPTION: | DATE: 11/9/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|---|
| 1. B: N30E, 21W | **Colluvium (Col)**<br>@ 0'-0.5': Grayish brown silty gravelly SAND, dry, loose, some roots. | | Col | SM | | | |
| 2. B: N4W, 13W | **Sespe Formation (Ts)**<br>@ 0.5': Light red silty clayey SANDSTONE, damp, dense, weathered more in upper 2', trace cobbles, rounded to subrounded, metavolcanic and weathered granite, perpendicular weathering joints, local faint bedding. | | Ts | SM/SC | B-1 @ 3' | | |
| | Notes:<br>Total Depth: 4 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | | |

GRAPHIC REPRESENTATION: N Wall SCALE: 1" = 5' SURFACE SLOPE: 0°-30° TREND: N62°W




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LOG OF TRENCH NO: T-1

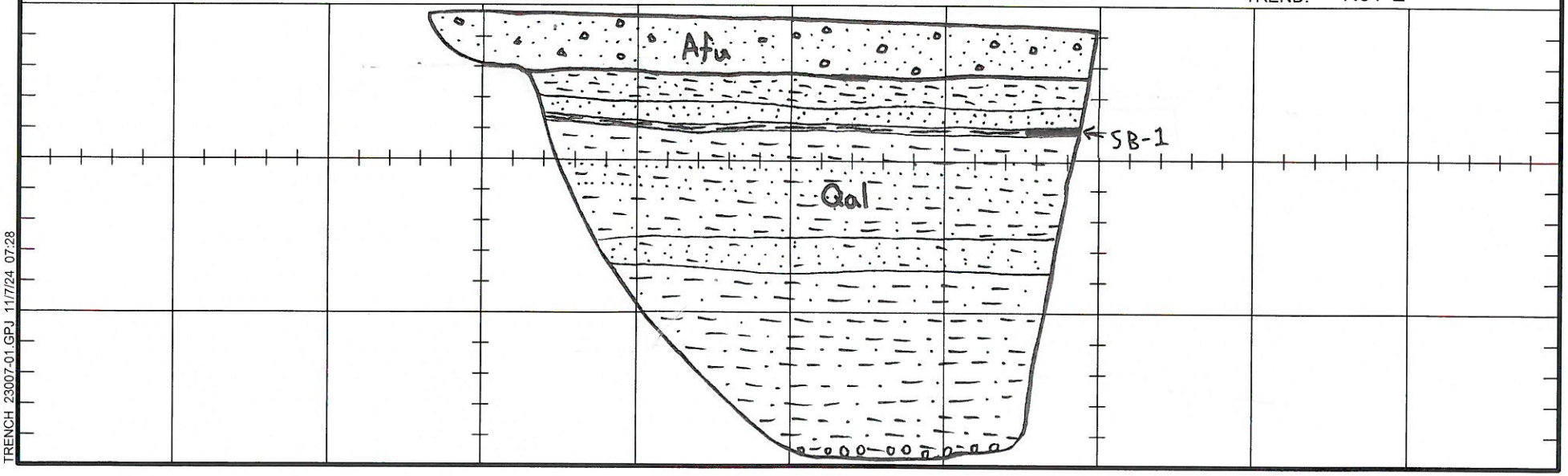
TRENCH 23007-01.GPJ 11/7/24 07:28

| | | | |
|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK |
| Project Number: | 23007-01 | Elevation: | 337' |
| Equipment: | J.D. 310SL HL | Location: | |

TRENCH NO.: **T- 2**

| GEOLOGIC ATTITUDES | DESCRIPTION: | DATE: 11/9/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-1.7': Brown silty fine SAND with abundant angular to subangular gravel, damp to moist, medium dense, locally friable, scattered trash. | | Afu | ML | | | |
| | **Alluvium (Qal)**<br>@ 1.7'-2.5': Dark brown clayey sandy SILT, moist, medium stiff. | | Qal | ML | | | |
| | @ 2.5'-3': Pale brown medium SAND, trace gravel, friable, damp to dry, medium dense. | | | SP | | | |
| | @ 3': Very dark brown CLAY, 2"-3" thick, abundant decaying plant matter, pores, moderately plastic. | | | CL | SB-1 @ 3' | | |
| | @ 3.3'-7': Brown SILT with interbedded fine sand laminations, damp to moist, medium stiff, trace pores. | | | ML | | | |
| | @ 7'-8': Grayish brown silty SAND, friable, caved 6" into trench wall, trace cobbles. | | | SM | | | |
| | @ 8'-14': Strong brown clayey SILT, moist. | | | ML | | | |
| | @ 14': Hard digging, cobbles, strong brown silty SAND, possible basal conglomerate overlying basal conglomerate overlying bedrock. | | | SM | | | |
| | Notes:<br>Total Depth: 14.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | | |

GRAPHIC REPRESENTATION: S Wall SCALE: 1" = 5' SURFACE SLOPE: 1° TREND: N61°E




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LOG OF TRENCH NO: T-2

TRENCH 23007-01.GPJ 11/7/24 07:28

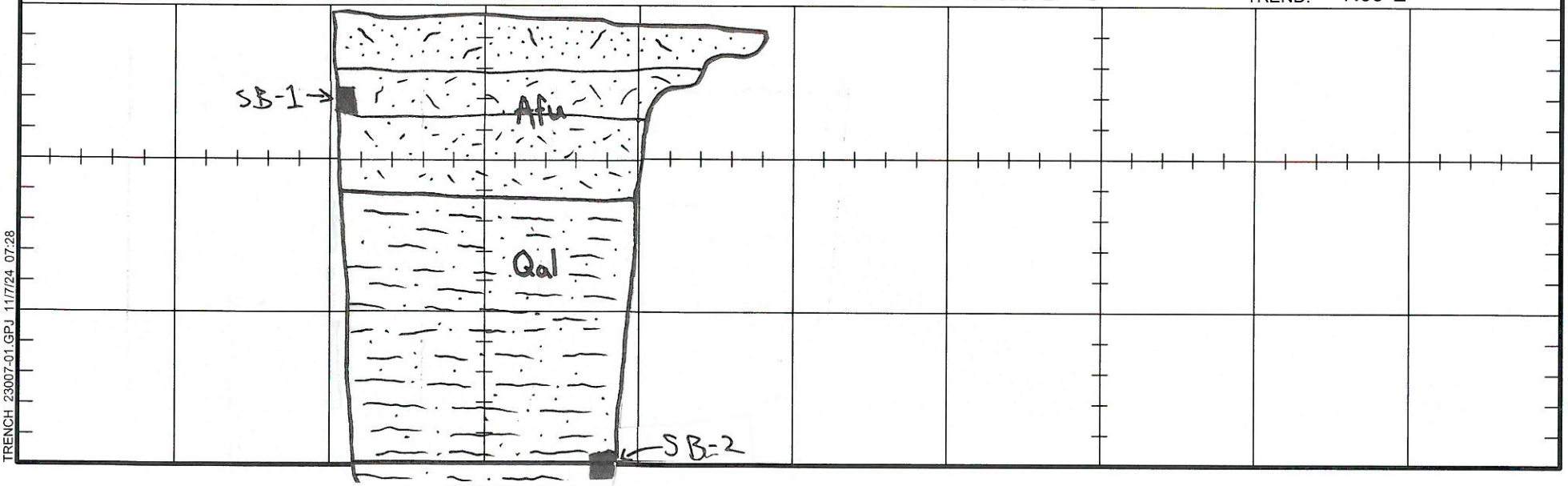
NMG Geotechnical, Inc.

| | | | |
|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK |
| Project Number: | 23007-01 | Elevation: | 353' |
| Equipment: | J.D. 310SL HL | Location: | |

TRENCH NO.: **T- 3**

| GEOLOGIC ATTITUDES | DESCRIPTION: DATE: 11/13/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-2': Mottled olive gray clayey SAND, moist, upper 0.5' dry, medium dense. | Afu | SC | | | |
| | @ 2'-3.5': Dark brown sandy CLAY, moist, medium stiff, trace trash. | | CL | SB-1 @ 2.5' | 15.9 | |
| | @ 3.5'-6': Mottled olive gray and light brown sandy SILT, moist, medium stiff, mica. | | ML | | | |
| | **Alluvium (Qal)**<br>@ 6': Dark brown sandy CLAY, moist, medium stiff, pores. | Qal | CL | | | |
| | @ 17': Pores. | | | SB-2 @ 17 | 13.1 | |
| | Notes:<br>Total Depth: 17.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: SE Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: N53°E




LOG OF TRENCH NO: T- 3

TRENCH 23007-01.GPJ 11/7/24 07:28

NMG

Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL

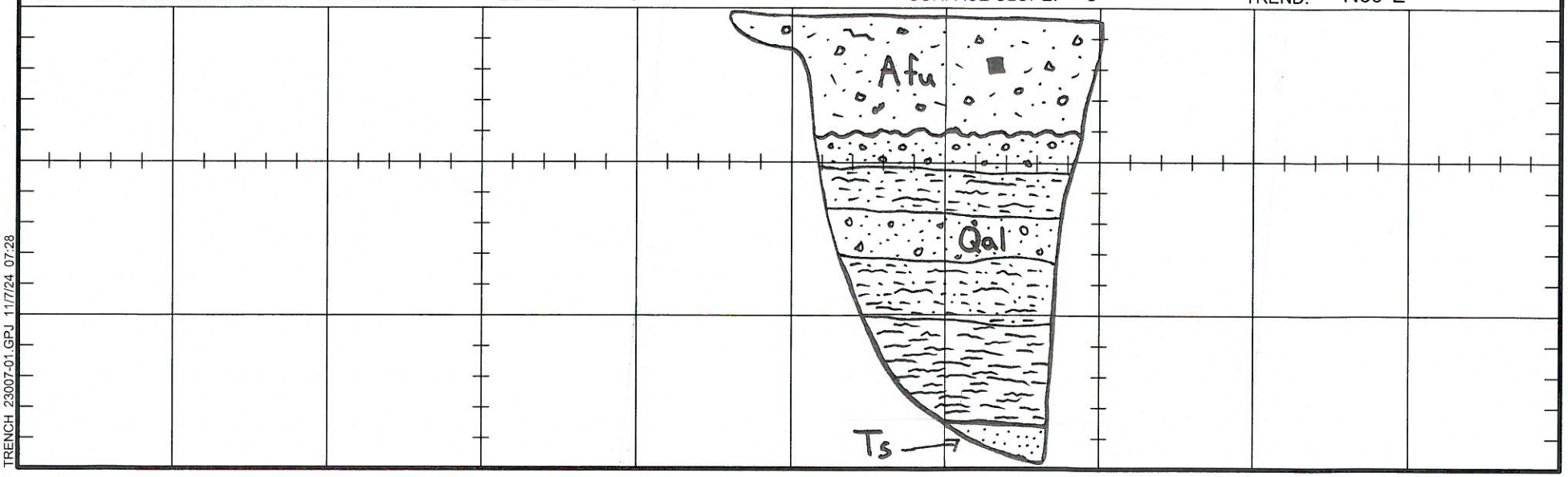
Logged By: DDK
Elevation: 363'
Location:

TRENCH NO.: **T- 4**

DATE: 11/9/23

| GEOLOGIC ATTITUDES | DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-3.6': Brown silty SAND with subangular gravel, damp to moist, medium denseplastic, brick and asphalt debris. | Afu | SM | | | |
| | **Alluvium (Qal)**<br>@ 3.6'-5': Pale brown fine to coarse SAND with rounded to subrounded gravel, damp, medium dense, friable. | Qal | SP | | | |
| | @ 5'-6.5': Brown clayey SILT. | | ML | | | |
| | @ 6.5'-8': Pale brown SAND with rounded gravel, friable. | | SP | | | |
| | @ 8'-10': Brown to light brown clayey SILT, moist, medium dense, caliche. | | ML | | | |
| | @ 10'-13': Light brown to brown CLAY, moist, plastic. | | CL | | | |
| | **Sespe Formation (Ts)**<br>@ 13': Yellow and red SANDSTONE, weathered at 13', less weathered by 14.5'. | Ts | SP | | | |
| | Notes:<br>Total Depth: 14.5 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: SE Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: N35°E




NMG Geotechnical, Inc.

LOG OF TRENCH NO: T- 4

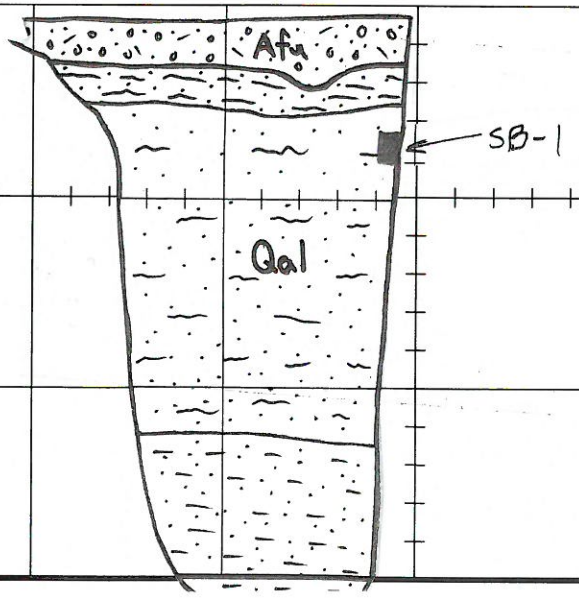
TRENCH 23007-01.GPJ 11/7/24 07:28

NMG Geotechnical, Inc.

Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL
Logged By: DDK
Elevation: 383'
Location:
TRENCH NO.: T- 5

| GEOLOGIC ATTITUDES | DESCRIPTION: DATE: 11/13/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-1.5': Dark grayish brown silty medium sandy GRAVEL, damp, medium dense. | Afu | GP | | | |
| | **Alluvium (Qal)**<br>@ 1.5': Very dark brown sandy CLAY, damp, medium dense, pores. | Qal | CL | SB-1 @ 3.5' | 7.0 | |
| | @ 3': Olive brown fine to medium SAND with clay, moist, medium dense, trace gravel, pores. | | SP | | | |
| | @ 11': Very light brown sandy SILT, moist, medium stiff, no pores. | | ML | | | |
| | Notes:<br>Total Depth: 16.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: W Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: North




LOG OF TRENCH NO: T-5

TRENCH 23007-01.GPJ 11/7/24 07:28

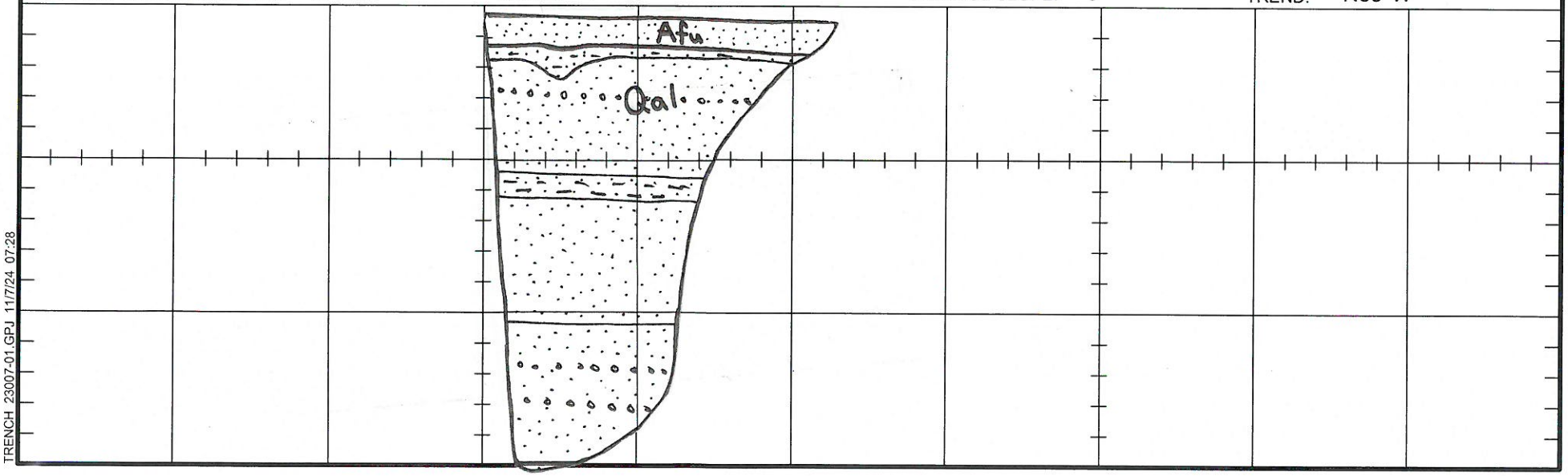
| | | | |
|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK |
| Project Number: | 23007-01 | Elevation: | 381' |
| Equipment: | J.D. 310SL HL | Location: | |

TRENCH NO.: **T- 6**

DATE: 11/9/23

| GEOLOGIC ATTITUDES | DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-1': Mottled light gray and orange brown fine SAND, damp, medium dense. | Afu | SP | | | |
| | **Alluvium (Qal)**<br>@ 1'-2': Brown silty fine SAND, damp to moist, medium dense, trace charcoal, channelized locally. | Qal | SM | | | |
| | @ 2'-3.4': Pale brown medium SAND, damp, medium dense, friable, laminated.<br>@ 2.5': 2" thick coarse SAND layer with gravel. | | SP | | | |
| | @ 3.5'-3.8': Light brown silty medium SAND, damp, medium dense. | | SM | | | |
| | @ 3.8'-5': Pale brown medium SAND, damp, medium dense. | | SP | | | |
| | @ 5'-6': Dark grayish brown SILT, moist, stiff. | | ML | | | |
| | @ 6'-10': Light brown medium SAND, moist, medium dense, laminated, friable. | | SP | | | |
| | @ 10': Light brown medium to coarse SAND with gravel, moist, medium dense, friable. | | | | | |
| | Notes:<br>Total Depth: 15.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: S Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: N83°W




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LOG OF TRENCH NO: T- 6

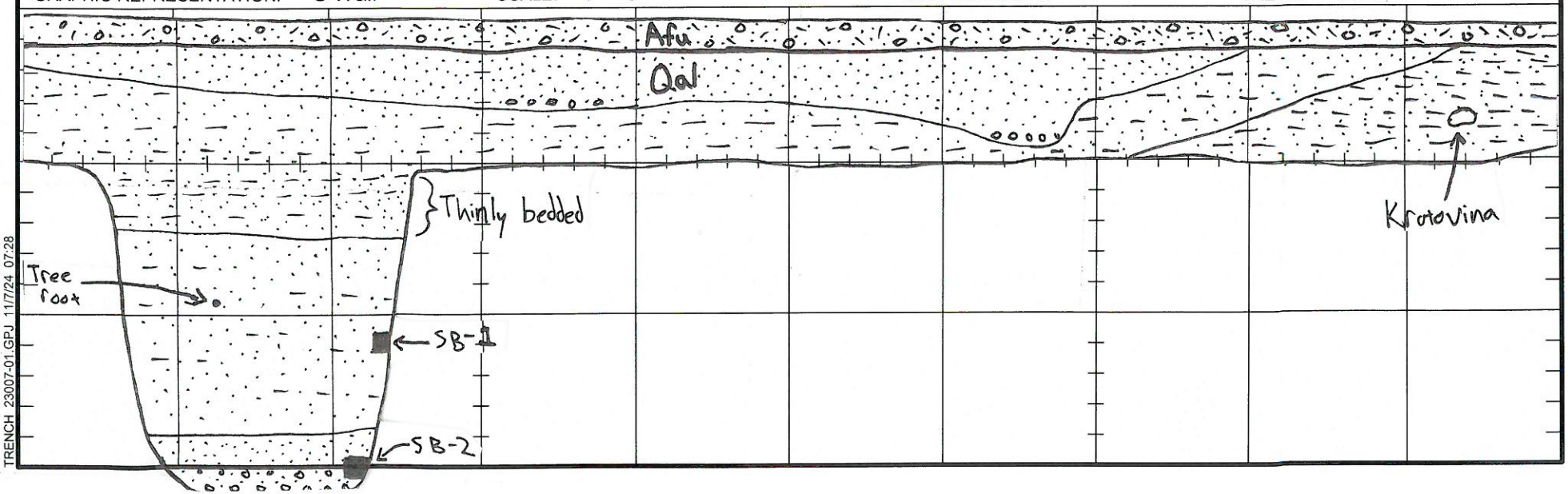
TRENCH 23007-01.GPJ 11/7/24 07:28

NMG

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK | TRENCH NO.: | T- 7 |
| Project Number: | 23007-01 | Elevation: | 392' | | |
| Equipment: | J.D. 310SL HL | Location: | | | |

| GEOLOGIC ATTITUDES | DESCRIPTION: | DATE: 11/10/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-1': Very dark brown gravelly silty medium SAND, damp, medium dense, trash. | | Afu | SP | | | |
| | **Alluvium (Qal)**<br>@ 1'-4': Strong brown medium to coarse SAND, damp, medium dense, friable, rounded gravel at bottom. | | Qal | SP | | | |
| | @ 2'-7': Interbedded pale brown to brown SILT, silty fine SAND, and sandy SILT, lenses of coarse SAND, damp, medium stiff/medium dense, 1'-2' layers. | | | ML/SP | | | |
| | @ 1'-5': Dark brown sandy SILT, damp, krotovina. | | | ML | | | |
| | @ 7'-14': Fine silty SAND, moist, medium dense. | | | SP | | | |
| | @ 14': Cobbly medium to coarse SAND. | | | | SB-1 @ 11' | 3.8 | |
| | @ 16': Larger cobbles. | | | | SB-2 @ 15' | 3.1 | |
| | Notes:<br>Total Depth: 16.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | | |

GRAPHIC REPRESENTATION: S Wall SCALE: 1" = 5' SURFACE SLOPE: 2° TREND: N80°E




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LOG OF TRENCH NO: T-7

TRENCH 23007-01.GPJ 11/7/24 07:28

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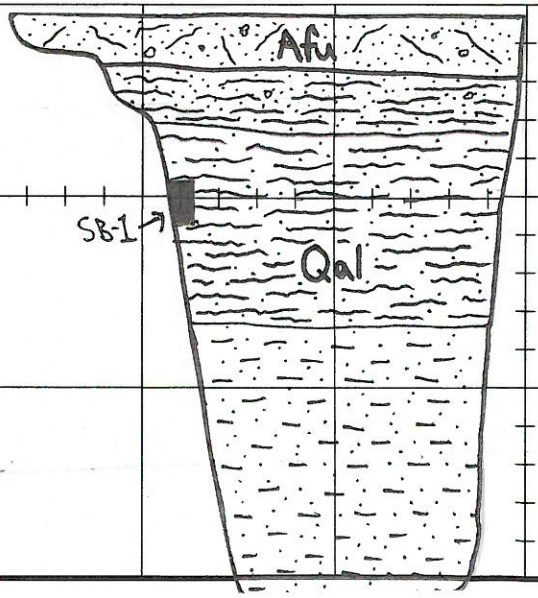
Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL

Logged By: DDK
Elevation: 395'
Location:

TRENCH NO.: **T- 8**

| GEOLOGIC ATTITUDES | DESCRIPTION: DATE: 11/9/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-1.7': Brown sandy CLAY, dry, stiff, pores, scattered black plastic, platy texture, pedogenic surfaces, scattered rounded gravels. | Afu | CL | | | |
| | **Alluvium (Qal)**<br>@ 1.7'-3': Dark brown sandy CLAY, damp, stiff, moderately plastic, pores, trace gravel. | Qal | CL | | | |
| | @ 3'-8': Dark brown CLAY with sand, slightly damp, stiff, pores, abundant caliche, pedogenic surfaces. | | | SB-1 @ 4.5' | | |
| | @ 8': Light brown sandy SILT, damp, medium stiff, no pores. | | ML | | | |
| | Notes:<br>Total Depth: 16.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: SE Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: N61°E




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LOG OF TRENCH NO: T- 8

TRENCH 23007-01.GPJ 11/7/24 07:28

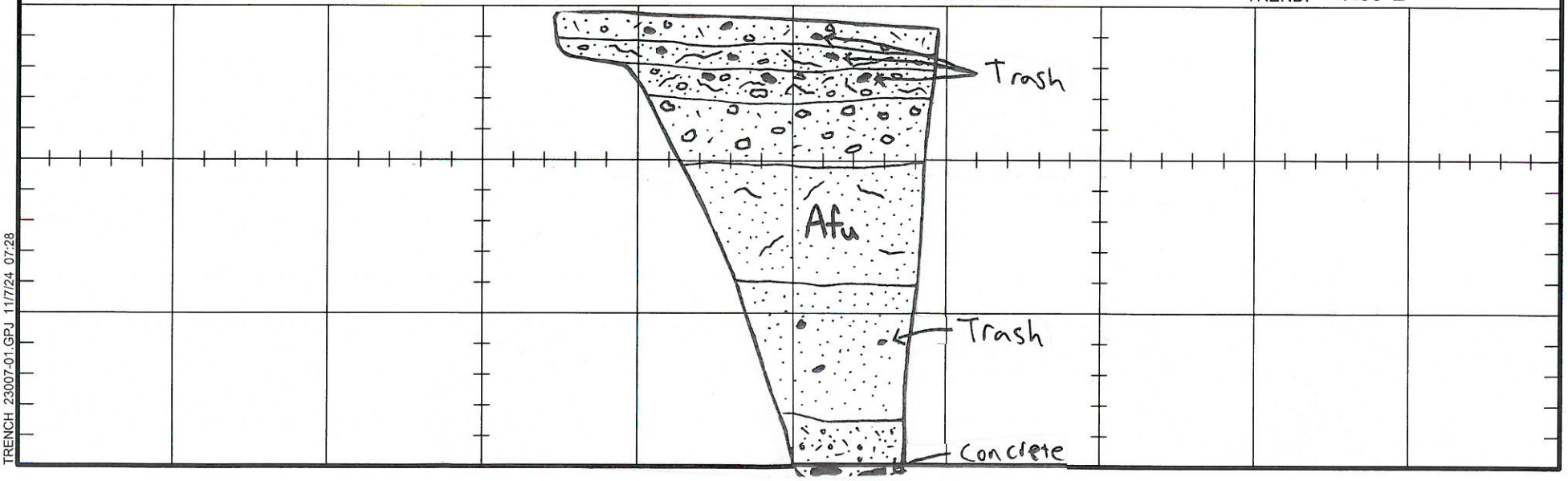
NMG Geotechnical, Inc.

| | | | |
|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK |
| Project Number: | 23007-01 | Elevation: | 403' |
| Equipment: | J.D. 310SL HL | Location: | |

TRENCH NO.: **T- 9**

| GEOLOGIC ATTITUDES | DESCRIPTION: DATE: 11/13/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)** | Afu | SP | | | |
| | @ 0'-1': Mottled brown silty fine to medium SAND with gravel, damp, medium dense, trash. | | SC | | | |
| | @ 1'-1.5': Mottled dark brown clayey fine to medium SAND, trace gravel, damp, medium dense, trash. | | SP | | | |
| | @ 1.5'-2.5': Mottled grayish brown and brown gravelly clayey SAND, damp, medium dense, trash. | | | | | |
| | @ 2.5'-4.5': Mottled yellowish brown and light brown gravelly medium SAND with silt, damp, medium dense, trace dark brown clay clumps. | | | | | |
| | @ 4.5'-8': Mottled dark brown and light brown clayey SAND, damp, medium dense. | | SC | | | |
| | @ 8'-13': Light gray and yellowish brown SAND, some trash. | | SP | | | |
| | @ 13': Brown sandy SILT with gravel, some trash. | | ML | | | |
| | @15': Chunks of concrete up to 1' in diameter. | | | | | |
| | Notes:<br>Total Depth: 14.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: S Wall SCALE: 1" = 5' SURFACE SLOPE: 4° TREND: N80°E




LOG OF TRENCH NO: T- 9

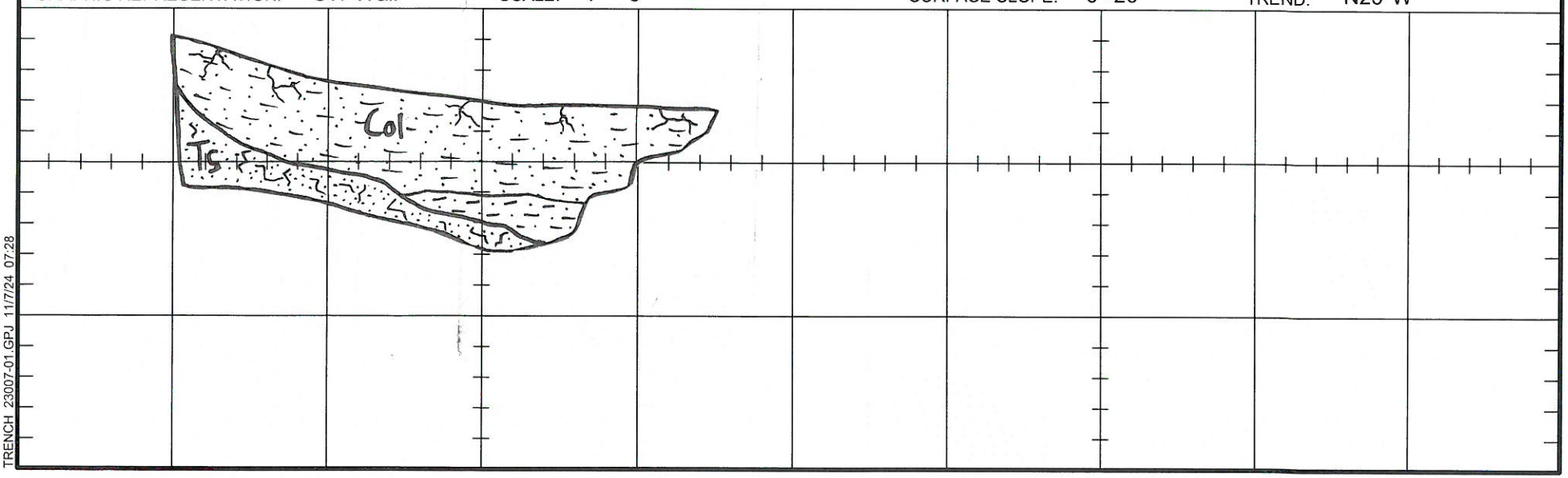
TRENCH 23007-01.GPJ 11/7/24 07:28

| | | | |
|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK |
| Project Number: | 23007-01 | Elevation: | 406' |
| Equipment: | J.D. 310SL HL | Location: | |

TRENCH NO.: **T-10**

| GEOLOGIC ATTITUDES | DESCRIPTION: | DATE: 11/10/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|---|
| | **Colluvium (Col)**<br>@ 0'-1.5': Dark brown sandy SILT, damp, medium stiff, roots, pores, caliche.<br><br>@ 3': Light brown SILT, damp, stiff, pores. | | Col | ML | | | |
| | **Sespe Formation (Ts)**<br>@ 1.5'-4': Pale yellow silty SANDSTONE, damp, dense, highly weathered, abundant caliche, fractured, 1'-diameter krotovina in south wall, little to no visible bedding. | | Ts | SM | | | |
| | Notes:<br>Total Depth: 5.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | | |

GRAPHIC REPRESENTATION: SW Wall SCALE: 1" = 5' SURFACE SLOPE: 0°-20° TREND: N25°W




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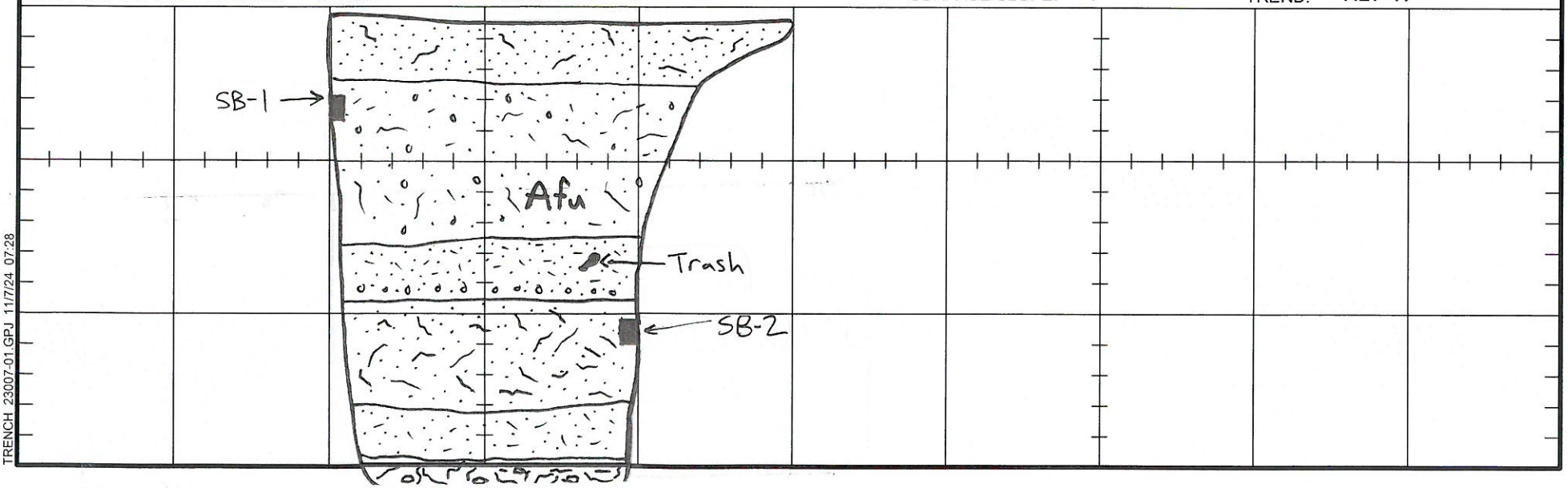
LOG OF TRENCH NO: T-10

TRENCH 23007-01.GPJ 11/7/24 07:28

| | | | | |
|---|---|---|---|---|
| Project Name: | COI/Gateway | Logged By: | DDK | TRENCH NO.: |
| Project Number: | 23007-01 | Elevation: | 428' | T-11 |
| Equipment: | J.D. 310SL HL | Location: | | |

| GEOLOGIC ATTITUDES | DESCRIPTION: | DATE: 11/13/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'-2': Mottled yellowish brown SAND with clay and very dark brown sandy CLAY, damp, medium dense/medium stiff, no trash. | | Afu | SC/CL | | | |
| | @ 2': Mottled light brown, yellowish brown, light gray, and dark brown silty clayey gravelly SAND, damp, medium dense, no trash. | | | SM/SC | SB-1 @ 3' | 8.1 | |
| | @ 7': Brown silty SAND, damp, trace gravel, some trash. | | | SM | | | |
| | @ 9': Brown sandy CLAY, damp. | | | CL | SB-2 @ 10 | 13.7 | |
| | @ 12.5': Grayish brown silty SAND, damp. | | | SM | | | |
| | @ 14': Grayish brown CLAY with gravel, damp. | | | CL | | | |
| | Notes:<br>Total Depth: 16.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | | |

GRAPHIC REPRESENTATION: E Wall SCALE: 1" = 5' SURFACE SLOPE: 1° TREND: N27°W




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LOG OF TRENCH NO: T-11

TRENCH 23007-01.GPJ 11/7/24 07:28

NMG

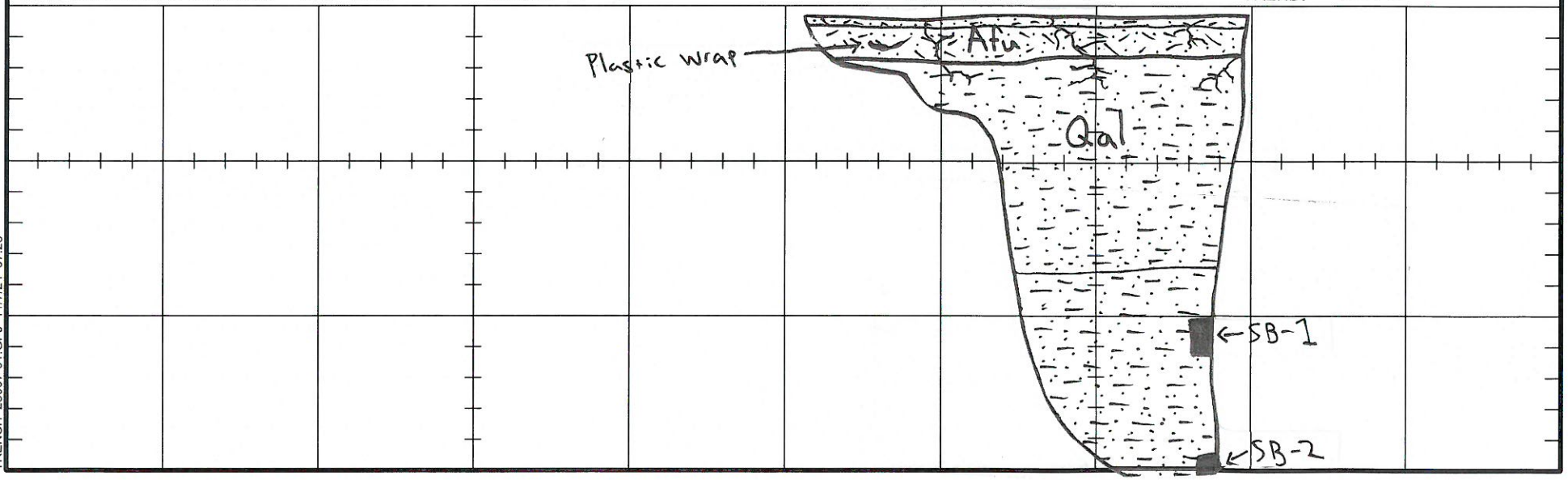
Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL

Logged By: DDK
Elevation: 414'
Location:

TRENCH NO.: **T-12**

| GEOLOGIC ATTITUDES | DESCRIPTION: DATE: 11/10/23 | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Artificial Fill, Undocumented (Afu)**<br>@ 0'- 0.3': Light brown sandy SILT, dry, medium stiff, roots, pores.<br>@ 0.3'-1.3': Dark brown sandy SILT, moist, medium stiff, roots, pores, plastic debris. | Afu | ML | | | |
| | **Alluvium (Qal)**<br>@ 1.3'-8': Very dark brown sandy SILT, moist, medium stiff, pores, roots.<br>@ 8': Light brown sandy SILT, medium dense, pores, moist. | Qal | ML | SB-1 @ 10<br>SB-2 @ 14 | 7.7<br>10.2 | |
| | Notes:<br>Total Depth: 15.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: NW Wall SCALE: 1" = 5' SURFACE SLOPE: 0° TREND: N24°E




NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-12

TRENCH 23007-01.GPJ 11/7/24 07:28

NMG

Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL

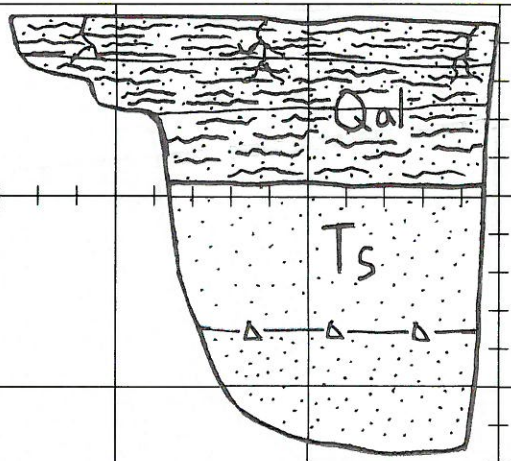
Logged By: DDK
Elevation: 429'
Location:

TRENCH NO.: **T-13**

DATE: 11/13/23

| GEOLOGIC ATTITUDES | DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Alluvium (Qal)**<br>@ 0'-1': Dark brown sandy CLAY, dry, medium stiff, pores, roots. | Qal | CL | | | |
| | @ 1'-2': Very dark brown sandy CLAY, damp, medium stiff, pores, roots, caliche. | | | | | |
| | @ 2'-4': Dark brown sandy CLAY, damp, medium stiff, pores, roots, abundant caliche. | | | | | |
| | **Sespe Formation (Ts)**<br>@ 4': Yellow SANDSTONE, heavily weathered, damp, dense. | Ts | SP | | | |
| | @ 8': Gray silty SANDSTONE with gray clay. | | SM | | | |
| | Notes:<br>Total Depth: 11.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: W Wall SCALE: 1" = 5' SURFACE SLOPE: 3° TREND: N20°W




NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-13

TRENCH 23007-01.GPJ 11/7/24 07:28

NMG

Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL

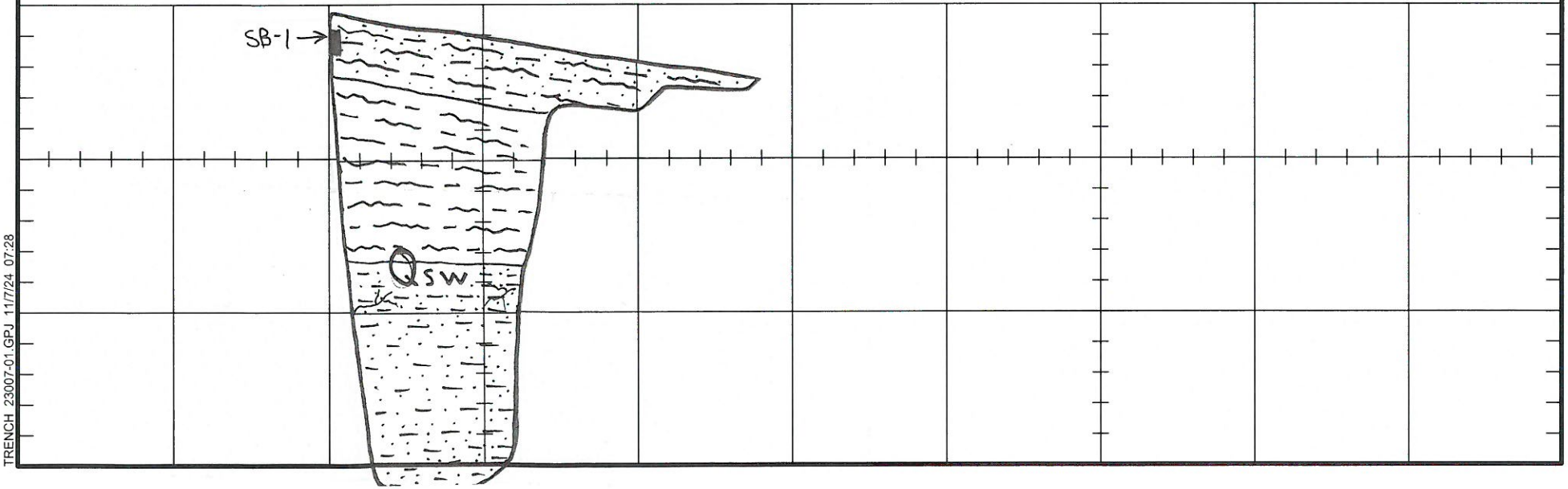
Logged By: DDK
Elevation: 434'
Location:

TRENCH NO.: **T-14**

DATE: 11/13/23

| GEOLOGIC ATTITUDES | DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES: U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Slopewash (Qsw)**<br>@ 0'-3': Very dark brown silty CLAY with sand, dry, medium stiff, pores.<br><br>@ 3'-8': Dark brown silty CLAY with sand, dry, medium stiff, pores, abundant caliche. | Qsw | CL | SB-1 @ 1' | 4.2 | |
| | @ 8': Light brown sandy SILT, dry, pores, roots.<br><br>@ 16': Hard, possible bedrock. | | SM | | | |
| | Notes:<br>Total Depth: 16.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: E Wall SCALE: 1" = 5' SURFACE SLOPE: 8° TREND: N20°E




NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-14

TRENCH 23007-01.GPJ 11/7/24 07:28

NMG

Project Name: COI/Gateway
Project Number: 23007-01
Equipment: J.D. 310SL HL

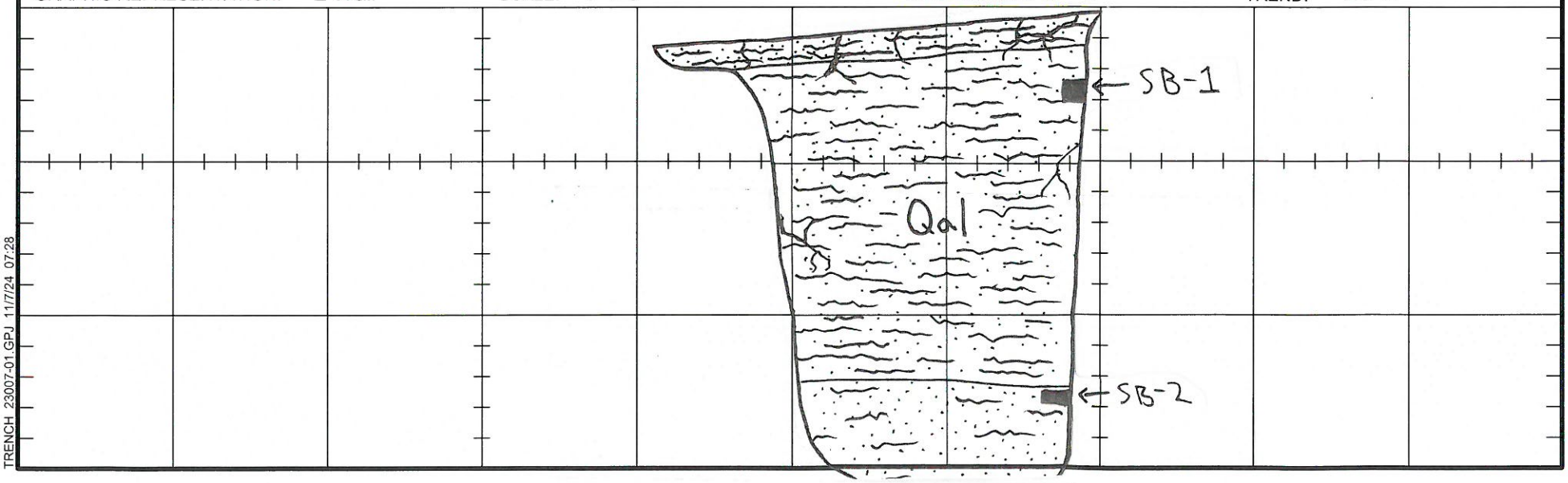
Logged By: DDK
Elevation: 438'
Location:

TRENCH NO.: **T-15**

DATE: 11/13/23

| GEOLOGIC ATTITUDES | DESCRIPTION: | GEOLOGIC UNIT | ENGINEERING PROPERTIES U.S.C.S. | SAMPLE NO. | MOISTURE CONTENT (%) | DRY DENSITY (pcf) |
|---|---|---|---|---|---|---|
| | **Alluvium (Qal)**<br>@ 0-1': Dark brown sandy CLAY, dry, medium stiff, roots, pores. | Qal | CL | SB-1 @ 2.5' | 9.6 | |
| | @ 1'-12': Very dark brown sandy CLAY, damp, medium stiff, roots, pores, trace caliche. | | | | | |
| | @ 12': Light brown clayey SAND, damp, medium dense, pores. | | SC | SB-2 @ 12.5' | 7.5 | |
| | Notes:<br>Total Depth: 16.0 Feet.<br>No Groundwater Encountered.<br>Backfilled with Cuttings and Tamped. | | | | | |

GRAPHIC REPRESENTATION: E Wall SCALE: 1" = 5' SURFACE SLOPE: 5° TREND: N5°W




NMG Geotechnical, Inc.

LOG OF TRENCH NO: T-15

TRENCH 23007-01.GPJ 11/7/24 07:28

DATE OF BORING 1 May 1989 WATER DEPTH N/E DATE MEASURED –
TYPE OF DRILL RIG Simco 2800 HOLE DIAMETER 8 inch HSA
WEIGHT OF HAMMER 140 lbs FALLING 30 inches SAMPLES Modified California

ELEVATION: Approx 340 ft LOGGED BY: EHS
LOCATION: Portola Sta. 18+00

| DEPTH, FT. | SAMPLES | BLOWS/FOOT | DESCRIPTION | UNC. COMP. STRENGTH, ksf | MOISTURE CONTENT, % | DRY DENSITY pcf | OTHER TESTS |
|---|---|---|---|---|---|---|---|
| | mc 1 | 10 | Loose to med. dense, damp, brown silty sand (SM) to sandy silt (ML) | – | 10.5 | 103 | SA (47) |
| 5 | mc 2 | 11 | Stiff, damp, dark brown sandy clay (CL) | – | 13.0<br>14.5 | 105 | WA (54)<br>LL=28<br>PL=21 |
| 10 | mc 3 | 8 | Loose, damp, light brown silty sand (SM), trace of clay | 6.0 | 104 | | – |
| 15 | mc 4 | 8 | | – | – | – | – |
| | | | Total depth 15 feet | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |

Project: Portola Parkway
Project No. 8840378A

LOG OF BORING WB-1

Fig. B-2

WOODWARD-CLYDE CONSULTANTS

S81031

PLATE A-1.4

GTC

# LOG OF DRILL HOLE

DRILLED June 24, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI

DH-4

SURFACE ELEVATION IN FEET 405 DATUM SEE PLATE 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL | SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA M — D — 0 (RC) |
|---|---|---|---|---|---|---|
| TOPSOIL | | | | | GRAVELLY SAND (SP), brown, moderately dense | 11-111 |
| SESPE FORMATION (Ts) | 400 | 5 | | | SILTY SAND (SM), red to tan, moderately dense | 9-113 |
| Conglomerate | | | | | SANDY GRAVEL (GP), orange brown, dense, boulders abundant. | |
| | 395 | 10 | | | | |
| B N10W 20NE | | | | | | |
| B NS 5NW | 390 | 15 | | | | 4-132 |
| | | 20 | | | Refusal @ 16 ft due to boulders<br>Bottom of drill hole @ 16 ft.<br>No water or caving<br>Drill hole backfilled and tamped | |
| | | 25 | | | | |
| | | 30 | | | | |
| | | 35 | | | | |

SHEET 1 OF 1

LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

S81031

PLATE A-1.5

GTC

# LOG OF DRILL HOLE

DRILLED June 2, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI

DH- 5

SURFACE ELEVATION IN FEET 413 DATUM SEE PLATE 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL | SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA D M — — 0 (RC) |
|---|---|---|---|---|---|---|
| TOPSOIL | | | | | SANDY CLAY (ML),brown dry, firm, cobbles | |
| SESPE FORMATION (Ts) Sandstone poorly cemented; friable | 410 | 5 | | 6 | SILTY SAND (SM),tan to buff, dense | 8-99 |
| | 405 | | | 8 | | 10-119 |
| | | 10 | | | red zone 1/8 inch thick silt | |
| B N10W 16NE | | | | 10 | CLAYEY SILT (ML),red to red brown, firm | 8-124-DS |
| | 400 | | | 5 | SANDY SILT (ML), red-brown, firm small amount clay, tan to buff, | 17-112-DS |
| | | 15 | | | SILTY SAND (SM), dense, slightly | |
| friable, massive | | | | 19 | silty, cobbles | 8-135 |
| | 395 | | | | | |
| | | 20 | | | SILTY SAND (SM), tan, dense, medium | |
| | | | | 10 | to coarse grained; cobbles | 9-125-DS GS,CP,DS |
| Conglomerate C N10E 13SE @ 25½' | 390 | | | | | |
| | | 25 | | | Gray to tan, cobbles in sandy silt, matrix, friable | |
| | | | | (50) | color change to yellow brown | 7-131 |
| | 385 | | | | fewer cobbles @ 28 ft, | |
| | | 30 | | | Seepage @ 30 ft. | |
| | | | | (26) | | 10-129 |
| | 380 | | | | | |
| | | 35 | | | Random cobbles | |

SHEET 1 OF 2

LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

S81031

PLATE A-1.5

GTC

# LOG OF DRILL HOLE

DRILLED June 2, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI / TPL

DH- 5

SURFACE ELEVATION IN FEET 413 DATUM See Plate 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA M — D — 0 (RC) |
|---|---|---|---|---|---|
| SESPE FORMATION(Ts) | 375 | 40 | (25) (50) | SILTY SAND (SM), yellow-brown, dense random cobbles.<br><br>iron oxide staining present | 10-127 |
| | | | | Bottom of Drill Hole @ 41 ft. No caving. Drill Hole backfilled and tamped. | 11-124 |

SHEET 2 OF 2

LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

S81031

PLATE A-1.6

GTC

# LOG OF DRILL HOLE

DRILLED June 2, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI / TPL

DH- 6

SURFACE ELEVATION IN FEET 498 DATUM SEE PLATE 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA D M — — 0 (RC) |
|---|---|---|---|---|---|
| TOPSOIL | | | 4 | SANDY SILT (ML), gray brown, medium firm | 9-101 |
| VAQUEROS FORMATION (Tv) | 495 | 5 | 7 | SILTY SAND (SM), tan to buff medium fine, caliche and cobbles gravel | 10-106-DS |
| | | | 6 | | |
| Siltstone | 490 | 10 | 7 | gray to yellow grey, very firm, | |
| Iron oxide staining massive | | | | fewer gravel | |
| S N52E 39NW | 485 | | 10 | shells small amount of sand | 14-116 |
| | | 15 | | | |
| | 480 | | | greenish grey | |
| BS EW 23N | | 20 | 16 | | 16-114 |
| | 475 | | (32) | | 16-116 |
| Fossiliferous zone (turitella inezana) C 3N10W 35 NE B N20W 21NE | | 25 | | | |
| | 470 | | (25) | | 13-118 |
| | | 30 | | | |
| S N25W 21SW | 465 | | X | | GS, CP, DS |
| | | | (40) | | 12-124 |
| | | 35 | | | |

SHEET 1 OF 2

LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

S81031

PLATE A-1.

# LOG OF DRILL HOLE

DRILLED June 2, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI/TPL

DH-6

SURFACE ELEVATION IN FEET 498 DATUM SEE PLATE 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL | SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA M — D (RC) — 0 |
|---|---|---|---|---|---|---|
| VAQUEROS FORMATION (Tv) Sandstone Massive, v.well cemented | 460 | 40 | | | SILTY SAND (SM), green-grey, dry, dense. Refusal in Drill Hole @ 41 ft. | |
| | | 10 15 20 25 30 35 | | | Bottom of Drill Hole @ 41 ft. No water, no caving, Drill Hole backfilled and tamped. | |

SHEET 2 OF 2

LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

S81031

PLATE A-1.7

GTC

# LOG OF DRILL HOLE

DRILLED June 3, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI/TPL

DH-7

SURFACE ELEVATION IN FEET 421 DATUM SEE PLATE 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA D M — — 0 (RC) |
|---|---|---|---|---|---|
| ALLUVIUM (Qal) | 420 | | 2 | SANDY SILT (ML),brown, medium firm | 7-99 |
| | | | | minor amount of gravel | |
| | | 5 | | | 13-106 |
| | 415 | | 2 | Color change to yellow brown | 18-101-CN |
| | | 10 | | | |
| | 410 | | | medium grained | 12-102 |
| | | | | change color to brown | |
| | | 15 | | | |
| | 405 | | P | | 11-105-CN |
| | | | | yellow, medium grained sand lense | |
| | | 20 | | | |
| | 400 | | | | 12-106 |
| | | | | Change to brown | |
| | | 25 | | change to fine sand | |
| | 395 | | (6) | | 17-111 |
| | | 30 | (4) | SILTY SAND (SM), brown, dense, moderate amount of clay | 15-113 |
| | 390 | | | | |
| | | | | | 16-112 |
| | | 35 | (8) | SILTY SAND (SM), dark yellow-brown | |

SHEET 1 OF 2

LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

S81031

PLATE A-1.7

# LOG OF DRILL HOLE

DRILLED June 3, 1981 WITH Rotary Bucket
DIAMETER OF DRILL HOLE IN INCHES 24
LOGGED BY ESI/TPL

DH-7

SURFACE ELEVATION IN FEET 421 DATUM SEE PLATE 1

| GEOLOGICAL CLASSIFICATION DESCRIPTION | ELEVATION IN FEET | DEPTH IN FEET | SYMBOL | SAMPLES | ENGINEERING CLASSIFICATION AND DESCRIPTION | TEST DATA M — D — 0 (RC) |
|---|---|---|---|---|---|---|
| ALLUVIUM (Qal) | 385 | | | (8) | SILTY SAND (SM), minor amount of clay, dense | 14-114 |
| VAQUEROS FORMATION (Tv) | 380 | 40 | | (4) | SANDY SILT (ML),tan to yellow, firm, iron oxide, caliche gravel | 21-104 |
| | | | | 50 | SILTSTONE (R),tan to yellow soft gravel and concretions | 14-117 |
| | | | | | Bottom of Drill Hole @ 44 feet No water, No caving, Drill Hole backfilled and tamped. | |



LEGEND ON PLATE A-2

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL

# GEOTECHNICAL BORING LOG B-8 LB-8

**Date** 10-5-06 **Sheet** 1 of 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 338' **Location** Jeffrey Road (STA 300±00)

**Logged By** SP

**Sampled By** SP

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag-1 | | | | | @0': 6 inches of asphalt concrete over 9 inches of aggregate base. | RV |
| 335 | | | | R-1 | 9<br>11<br>15 | 108.1 | 18.7 | ML | @2.5': Sandy SILT, stiff, dark brown, moist, fine grained sand. | -200 |
| | 5 | | | R-2 | 6<br>7<br>15 | 106.6 | 19.1 | | @5': Same as above. | |
| 330 | | | | | | | | | | |
| | 10 | | | R-3 | 7<br>8<br>19 | 108.5 | 17.5 | | @10': Same as above, very stiff. | |
| 325 | | | | | | | | | | |
| | 15 | | | S-1 | 24<br>38<br>50/5" | | | ML | @15': Clayey SILT, hard, olive green, moist, trace of very fine grained sand. | |
| 320 | | | | | | | | | | |
| | 20 | | | R-4 | 28<br>50/4" | 108.8 | 19.2 | | **Bedrock:**<br>@20': SANDSTONE, very dense, olive green, moist. | |
| 315 | | | | | | | | | | |
| | 25 | | | S-2 | 10<br>26<br>37 | | | | @25': Same as above. | |
| 310 | | | | | | | | | | |
| | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-8

**Date** 10-5-06 **Sheet** 2 **of** 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 338' **Location** Jeffrey Road (STA 300±00)

**Logged By** SP

**Sampled By** SP

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | | R-5 | 50/5" | 94.9 | 11.8 | ML | @30': SANDSTONE, very dense, olive green, moist. | |
| 305 | | | | | | | | | | |
| | 35 | | | S-3 | 26<br>33<br>50/2" | | | | @35': Same as above. | |
| 300 | | | | | | | | | Total depth of borehole: 36.2 feet<br>No free groundwater encountered during drilling.<br>Borehole backfilled with soil cuttings and patched with cold-mix asphalt. | |
| | 40 | | | | | | | | | |
| 295 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| 290 | | | | | | | | | | |
| | 50 | | | | | | | | | |
| 285 | | | | | | | | | | |
| | 55 | | | | | | | | | |
| 280 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-9 LB-9

**Date** 10-6-06 **Sheet** 1 **of** 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 353' **Location** Realignment of Jeffrey Road within El Modeno Gardens.

**Logged By** SP

**Sampled By** SP

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | | SP | **Agricultural Fill:** @0': SAND, olive brown, slightly moist, fine to medium grained. | |
| 350 | | | | Bag-1 | 5 | | | | | |
| | | | | R-1 | 5 5 | 89.1 | 14.1 | | **Alluvium:** @2.5': SAND, loose, olive brown, moist, fine grained. | |
| | 5 | | | R-2 | 4 5 6 | 100.3 | 11.4 | SM-ML | @5': Silty SAND to Sandy SILT, loose/firm, olive green to brown, moist, fine grained sand. | |
| 345 | | | | | | | | | | |
| | 10 | | | R-3 | 7 11 18 | 112.4 | 6.2 | SP | @10': SAND, medium dense, brown, moist, fine to medium grained, trace of gravel up to 1.5 inches in diameter. | |
| 340 | | | | | | | | | | |
| | 15 | | | S-1 | 5 6 6 | | | SP SM | @15': Top: Same as above. Bottom: Silty SAND, medium dense, olive green, slightly moist, fine grained sand. | |
| 335 | | | | | | | | | | |
| | 20 | | | R-4 | 13 30 50/2" | 103.8 | 20.9 | SM | @20': Top: Silty SAND, very dense, olive green to brown, moist, fine to coarse grained sand. **Bedrock:** Bottom: Sandy SILTSTONE, hard, reddish brown, moist. | |
| 330 | | | | | | | | | | |
| | 25 | | | S-2 | 5 6 8 | | | | @25': Same as above, stiff. | |
| 325 | | | | | | | | | | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-9

**Date** 10-6-06 **Sheet** 2 **of** 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 353' **Location** Realignment of Jeffrey Road within El Modeno Gardens.

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** SP<br>**Sampled By** SP | |
| | 30 | | | R-5 | 30<br>24<br>50/3" | 113.0 | 15.3 | | @30': Sandy SILTSTONE, hard, reddish brown, moist. | |
| 320 | | | | | | | | | | |
| | 35 | | | S-3 | 29<br>50/2" | | | | @35': Same as above, olive green. | |
| | | | | | | | | | Total depth of borehole: 35.7 feet<br>No free groundwater encountered during drilling.<br>Borehole backfilled with soil cuttings. | |
| 315 | | | | | | | | | | |
| | 40 | | | | | | | | | |
| 310 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| 305 | | | | | | | | | | |
| | 50 | | | | | | | | | |
| 300 | | | | | | | | | | |
| | 55 | | | | | | | | | |
| 295 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG B-10

LB-10

**Date** 10-6-06 **Sheet** 1 of 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 362' **Location** Realignment of Jeffrey Road within El Modeno Gardens.

| Elevation Feet | Depth Feet | Graphic Log (N–S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By SP; Sampled By SP) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | | | Bag-1 | | | | SP | **Agricultural Fill:** @0': SAND, olive green, moist, fine to medium grained. | RV |
| | | | | R-1 | 6<br>9<br>11 | 104.9 | 7.6 | SM | **Alluvium:** @2.5': Silty SAND, loose, brown, moist, fine grained sand. | |
| 355 | 5 | | | R-2 | 6<br>6<br>7 | 104.9 | 11.2 | | @5': Same as above. | |
| 350 | 10 | | | S-1 | 3<br>4<br>6 | | | | @10': Same as above. | SE |
| 345 | 15 | | | R-3 | 6<br>6<br>22 | 109.1 | 2.7 | SP | @15': SAND, medium dense, brown, slightly moist, fine to coarse grained. | DS |
| 340 | 20 | | | S-2 | 6<br>7<br>10 | | | CL | @20': Silty CLAY with sand, very stiff, dark brown, moist, fine to medium grained sand, low plasticity clay. | |
| 335 | 25 | | | R-4 | 11<br>18<br>27 | 118.1 | 12.8 | | @25': Same as above. | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-10

**Date** 10-6-06 **Sheet** 2 of 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 362' **Location** Realignment of Jeffrey Road within El Modeno Gardens.

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** SP<br>**Sampled By** SP | |
| | 30 | | | S-3 | 11<br>19<br>33 | | | ML | **Bedrock:**<br>@30': Silty SANDSTONE, very dense, olive brown, moist. | |
| 330 | | | | | | | | | | |
| | 35 | | | R-5 | 50/6" | 100.1 | 16.1 | | @35': Same as above. | |
| | | | | | | | | | Total depth of borehole: 35.7 feet<br>No free groundwater encountered during drilling.<br>Borehole backfilled with soil cuttings. | |
| 325 | | | | | | | | | | |
| | 40 | | | | | | | | | |
| 320 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| 315 | | | | | | | | | | |
| | 50 | | | | | | | | | |
| 310 | | | | | | | | | | |
| | 55 | | | | | | | | | |
| 305 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG B-11 LB-11

Date 10-11-06 Sheet 1 of 1

Project Jeffrey Road/ Portola Parkway Street Improvements Project No. 601564-001

Drilling Co. Redman Drilling, Inc. Type of Rig CME-75

Hole Diameter 8" Drive Weight 140 lbs (Auto Hammer) Drop 30"

Elevation Top of Hole 347' Location Portola Parkway (STA 109±00)

Logged By SP

Sampled By SP

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 345 | 0 | N S | | Bag-1 | | | | | @0': 7 inches of asphalt concrete over 11 inches of aggregate base. | CR |
| | | | | R-1 | 2<br>2<br>3 | 102.3 | 13.0 | SP | @2.5': SAND, loose, olive green, moist, medium to coarse grained, trace of clay. | |
| 340 | 5 | | | R-2 | 6<br>8<br>10 | 107.6 | 15.8 | CL | @5': Sandy CLAY, stiff, olive brown, moist, fine to medium grained sand. | |
| | | | | R-3 | 5<br>8<br>13 | 113.9 | 15.4 | SM | @7.5': Silty SAND, medium dense, dark brown, moist, trace of clay, fine to medium grained sand. | |
| 335 | 10 | | | R-4 | 5<br>7<br>7 | 108.1 | 12.4 | SP-SM | @10': SAND to Silty SAND, loose, dark brown, moist, fine to medium grained, trace of clay. | |
| | 15 | | | | | | | | Total Depth of borehole: 11.5 feet<br>No free groundwater encountered during drilling.<br>Borehole backfilled with soil cuttings and patched with cold-mix asphalt. | |
| 330 | | | | | | | | | | |
| | 20 | | | | | | | | | |
| 325 | | | | | | | | | | |
| | 25 | | | | | | | | | |
| 320 | | | | | | | | | | |
| | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-12 LB-12

**Date** 10-11-06 **Sheet** 1 **of** 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 338' **Location** Portola Parkway (STA 116±00)

**Logged By** SP

**Sampled By** SP

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag-1 | | | | | @0': 7 inches of asphalt concrete over 10 inches of aggregate base. | RV |
| 335 | | | | R-1 | 10<br>11<br>13 | 112.7 | 13.6 | SW | @2.5': Gravelly SAND, medium dense, olive brown, moist, fine to medium grained, trace of low plasticity clay, gravel up to 1 inch in diameter. | |
| | 5 | | | R-2 | 7<br>11<br>13 | 113.3 | 16.9 | CL | @5': Sandy CLAY to Clayey SAND, stiff/medium dense, yellowish brown, moist, fine to coarse grained sand, trace of gravel up to 0.5 inches in diameter. | |
| 330 | | | | | | | | | | |
| | 10 | | | R-3 | 9<br>11<br>13 | 103.2 | 12.3 | SM | @10': Silty SAND, medium dense, brown, moist, fine grained sand. | DS |
| 325 | | | | | | | | | | |
| | 15 | | | S-1 | 7<br>9<br>10 | | | SP | @15': SAND, medium dense, brown, slightly moist, medium to coarse grained. | |
| 320 | | | | | | | | | | |
| | 20 | | | R-4 | 3<br>4<br>5 | 101.3 | 6.3 | SP<br>SM | @20': Top: Same as above, loose, dark brown, moist, trace of clay and gravel up to 2 inches in diameter.<br>Bottom: Silty SAND, loose, brown, moist, fine grained sand. | |
| 315 | | | | | | | | | | |
| | 25 | | | S-2 | 3<br>3<br>3 | | | SC | @25': Clayey SAND, loose, dark brown, moist, very fine grained sand, trace of silt. | |
| 310 | | | | | | | | | | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-12

**Date** 10-11-06 **Sheet** 2 **of** 2

**Project** Jeffrey Road/ Portola Parkway Street improvements **Project No.** 601564-001

**Drilling Co.** Redman Drilling, Inc. **Type of Rig** CME-75

**Hole Diameter** 8" **Drive Weight** 140 lbs (Auto Hammer) **Drop** 30"

**Elevation Top of Hole** 338' **Location** Portola Parkway (STA 116±00)

**Logged By** SP

**Sampled By** SP

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | | R-5 | 7<br>9<br>15 | 107.4 | 10.6 | SM | @30': Silty SAND, medium dense, dark brown, moist, fine grained sand, trace of clay. | CN |
| 305 | | | | | | | | | Total Depth of borehole: 31.5 feet<br>No free groundwater encountered during drilling.<br>Borehole backfilled with soil cuttings and patched with cold-mix asphalt. | |
| | 35 | | | | | | | | | |
| 300 | | | | | | | | | | |
| | 40 | | | | | | | | | |
| 295 | | | | | | | | | | |
| | 45 | | | | | | | | | |
| 290 | | | | | | | | | | |
| | 50 | | | | | | | | | |
| 285 | | | | | | | | | | |
| | 55 | | | | | | | | | |
| 280 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG B-13 LB-13

Date 10-11-06 Sheet 1 of 1

Project Jeffrey Road/ Portola Parkway Street improvements Project No. 601564-001

Drilling Co. Redman Drilling, Inc. Type of Rig CME-75

Hole Diameter 8" Drive Weight 140 lbs (Auto Hammer) Drop 30"

Elevation Top of Hole 338' Location Portola Parkway (STA 123±00)

Logged By SP

Sampled By SP

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Six Inches | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag-1 | | | | | @0': 8 inches of asphalt concrete over 9 inches of aggregate base. | |
| 335 | | | | R-1 | 9<br>10<br>13 | 116.7 | 12.0 | SP | @2.5': SAND, medium dense, olive green, moist, fine to coarse grained, trace of gravel up to 1.5 inches in diameter. | |
| | 5 | | | R-2 | 11<br>12<br>19 | 118.9 | 12.1 | SC | @5': Clayey SAND, medium dense, olive brown, moist, fine to coarse grained sand, trace of gravel up to 3 inches in diameter. | |
| 330 | | | | R-3 | 30<br>13<br>17 | 116.7 | 12.8 | | @7.5': Same as above, trace of gravel up to 1.5 inches in diameter. | |
| | 10 | | | R-4 | 10<br>18<br>27 | 125.9 | 10.1 | SP | @10': SAND, medium dense, brown, moist, fine to coarse grained, trace of gravel up to 1 inch in diameter. | |
| 325 | | | | | | | | | Total Depth of borehole: 11.5 feet<br>No free groundwater encountered during drilling.<br>Borehole backfilled with soil cuttings and patched with cold-mix asphalt. | |
| | 15 | | | | | | | | | |
| 320 | | | | | | | | | | |
| | 20 | | | | | | | | | |
| 315 | | | | | | | | | | |
| | 25 | | | | | | | | | |
| 310 | | | | | | | | | | |
| | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE



# Geotechnical Boring Log Borehole LGC-1

**Date:** 3/24/2011 | **Drilling Company:** Cal Pac Drilling

**Project Name:** Bee Canyon Pump Station | **Type of Rig:** B-61 Hollow Stem

**Project Number:** 11046-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~374' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By KTM
Sampled By KTM
Checked By KTM

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| 370 | 0 | B-1 | R-1 | 6<br>6<br>17 | 120.1 | 9.0 | CL | Topsoil - Dark brown SILTY CLAY, wet, soft, roots<br>@2.5' - Orange brown, SAND w/ CLAY, v. moist, med. dense, fine to medium sand<br>@1' to 4' Bulk Sample as above | EI<br>AL<br>S&H<br>CR |
| | 5 | B-2 | R-2 | 10<br>21<br>36 | 125.3 | 5.0 | SM | @5' Lt. orange brown, SILTY SAND, sl. moist,dense | |
| 365 | | | R-3 | 11<br>27<br>40 | 118.6 | 4.5 | | @7.5 Lt. yellow brown SILTY SAND, sl. moist, dense, fine to med. grain, sl. indurated<br>@6' to 9' Bulk Sample as above | |
| | 10 | | R-4 | 21<br>32<br>45 | 117.1 | 8.6 | | @10' Mottled lt. orange & yellow brown, SILTY SANDSTONE, sl. moist, v. dense, partially cemented, iron oxide staining, zones of med. sand | |
| 360 | | | | | | | | | |
| | 15 | | R-5 | 7<br>28<br>50 | 118.0 | 9.9 | ML | @15' Brick red SILTSTONE, moist, v. hard, well indurated, variable color clasts in matrix, live root in rings | |
| 355 | | | | | | | | | |
| | 20 | | R-6 | 9<br>23<br>18 | 117.2 | 11.3 | SM/ML | @20' Gray & black, SILTY SANDSTONE to SANDY SILTSTONE, moist to v. moist, dense/hard, sl. cemented, fine sand, few thin reddish siltstone layers | |
| 350 | | | | | | | | | |
| | 25 | | R-7 | 16<br>23<br>32 | 113.5 | 12.2 | | @25' Mottled lt. brown, gray & orange SILTY SANDSTONE w/ zone of CLAY, sl. moist, dense, oxidation staining, few reddish siltstone interbeds & small pebbles, clast of bentonitic clay in sampler spoils | |
| 345 | 30 | | | | | | | | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| -#200 | % PASSING # 200 SIEVE |

Last Edited: 3/23/2011

# Geotechnical Boring Log Borehole LGC-1

**Date:** 3/24/2011 | **Drilling Company:** Cal Pac Drilling

**Project Name:** Bee Canyon Pump Station | **Type of Rig:** B-61 Hollow Stem

**Project Number:** 11046-01 | **Drop:** 30" | **Hole Diameter:** 8"

**Elevation of Top of Hole:** ~374' MSL | **Drive Weight:** 140 pounds

**Hole Location:** See Geotechnical Map



Logged By KTM
Sampled By KTM
Checked By KTM

| Elevation (ft) | Depth (ft) | Graphic Log | Sample Number | Blow Count | Dry Density (pcf) | Moisture (%) | USCS Symbol | DESCRIPTION | Type of Test |
|---|---|---|---|---|---|---|---|---|---|
| | 30 | | R-8 | 8<br>18<br>30 | 116.2 | 13.3 | | @30' Mottled brown SILTY SANDSTONE, sl. moist, dense, variable color | |
| 340 | 35 | | | | | | | Total Depth = 31.5'<br>Groundwater Not Encountered<br>Backfilled with Cuttings on 3/24/2011 | |
| 335 | 40 | | | | | | | | |
| 330 | 45 | | | | | | | | |
| 325 | 50 | | | | | | | | |
| 320 | 55 | | | | | | | | |
| 315 | 60 | | | | | | | | |

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

**SAMPLE TYPES:**

| | |
|---|---|
| B | BULK SAMPLE |
| R | RING SAMPLE (CA Modified Sampler) |
| G | GRAB SAMPLE |
| SPT | STANDARD PENETRATION TEST SAMPLE |
| ▽ | GROUNDWATER TABLE |

**TEST TYPES:**

| | |
|---|---|
| DS | DIRECT SHEAR |
| MD | MAXIMUM DENSITY |
| SA | SIEVE ANALYSIS |
| S&H | SIEVE AND HYDROMETER |
| EI | EXPANSION INDEX |
| CN | CONSOLIDATION |
| CR | CORROSION |
| AL | ATTERBERG LIMITS |
| CO | COLLAPSE/SWELL |
| RV | R-VALUE |
| #200 | % PASSING # 200 SIEVE |

Report: HOLLOW STEM; Project: 2005STUDY-LOGSFORNEIGH3--98037-03.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 3/24/17

| | | | |
|---|---|---|---|
| Date(s) Drilled | 1/27/05 | Logged By | MD |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 8" |
| Drill Rig Type | CME 55 | Hammer Data | 140 lbs/ 30" Drop |
| Sampling Method(s) | Bulk, Modified California | | |
| Approximate Groundwater Depth: | Groundwater Not Encountered | | |
| Comments | | | |

# H-50

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 40.4 |
| Approximate Ground Surface Elevation (ft) | 365.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | **Alluvium (Qal)** | | | Bag Sample Collected From 0-5' |
| | | | B-1 | | | | | | | |
| | | | D-1 | 11 | | | @ 2.5' Yellowish brown silty fine SAND, moist, loose to medium dense, trace pinhole porosity. | 11.7 | 102.6 | |
| 360 | 5 | | D-2 | 12 | | | @ 5' Dark yellowish brown silty fine SAND, moist, loose to medium dense, micaceous, trace pinhole porosity, slightly friable. | 12.4 | 106.9 | |
| | | | D-3 | 10 | | | @ 7.5' Dark yellowish brown silty fine SAND, moist, loose to medium dense, micaceous, trace pinhole porosity, slightly friable, scattered small pebbles. | 9.2 | 106.9 | |
| | 10 | | D-4 | 12 | | | @ 10' Dark yellowish brown silty fine to medium SAND, moist, loose to medium dense, micaceous, trace pinhole to pencil-tip porosity, slightly friable. | 10.8 | 116.2 | |
| | | | D-5 | 11 | | | @ 12.5' Dark yellowish brown slightly clayey silty fine to medium SAND, moist, loose to medium dense, highly micaceous, slightly friable. | 12.0 | 110.4 | |
| 350 | 15 | | D-6 | 16 | | SM-SC | @ 15' Dark yellowish brown silty clayey fine SAND/clayey silty fine SAND, moist, medium dense, highly micaceous, trace pinhole porosity. | 8.8 | 113.9 | |
| | | | D-7 | 12 | | SM | @ 17.5' Yellowish brown silty fine SAND, moist, loose to medium dense, highly micaceous, trace pinhole porosity. | 10.6 | 106.0 | |
| | 20 | | D-8 | 32 | | SC-CL | @ 20' Dark brown clayey fine SAND/fine sandy CLAY, wet to saturated, medium dense/very stiff, scattered small pebbles, trace pinhole to pencil-tip porosity. | 17.6 | 114.6 | |
| 340 | 25 | | | | | | | | | |

## LOG OF BORING

**ICDC/PA-1 N3**
**Irvine, CA**
**PROJECT NO. 98037-03**

NMG

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 340 | 25 | | D-9 | 42 | | SM | @ 25' Top: Dark yellowish brown silty fine SAND, moist, dense, highly micaceous, trace pinhole porosity. | 13.5 | 119.7 | |
| | | | | | | SM/ML | **Vaqueros Formation (Tv)** Tip: Light olive gray silty fine SANDSTONE/fine sandy SILTSTONE, moist, medium dense/very stiff, FeO staining. | | | |
| | 30 | | D-10 | 50/5" | | SM | @ 30' Light yellowish brown slightly silty fine to medium SANDSTONE, moist, very dense, abundant FeO staining, slightly clayey in tip. | 11.9 | 95.5 | |
| 330 | 35 | | D-11 | 50/3" | | | @ 35' Olive yellow silty fine SANDSTONE, moist, very dense, highly micaceous, scattered MnO and FeO staining. | 17.2 | 99.6 | |
| | 40 | | D-12 | 50/4" | | SM/ML | @ 40' Olive gray silty fine SANDSTONE/fine sandy SILTSTONE, moist to wet, hard/very dense, scattered FeO and MnO staining, micaceous. | 17.9 | 111.8 | |
| 320 | 45 | | | | | | | | | |
| | 50 | | | | | | | | | |

Notes:
Total Depth 40.3 ft.
Groundwater Not Encountered.
Backfilled with Cuttings 1/27/05.

## LOG OF BORING

**ICDC/PA-1 N3**
**Irvine, CA**

**PROJECT NO. 98037-03**

NMG

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/11/16 | Logged By | ZKH |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 10" |
| Drill Rig Type | CME 75 Hollow Stem | Hammer Data | 140 lbs @ 30" Drop |
| Sampling Method(s) | Modified California | | |
| Approximate Groundwater Depth: | 36.8 Feet | | |
| Comments | | | |

**H-77**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 50.5 |
| Approximate Ground Surface Elevation (ft) | 385.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | CL | Alluvium (Qal) | | | |
| | | | D-1 | 12 | | | @ 2.5': Very dark brown to dark yellowish brown sandy/silty CLAY, stiff, moist, pinhole pores, caliche stringers, trace root hairs, micaceous. | 9.8 | 101.8 | |
| 380 | 5 | | D-2 | 14 | | SM | @ 5': Upper: Yellowish brown fine to coarse SAND, damp, medium dense, micaceous, | 7.9 | 100.3 | |
| | | | | | | CL | Lower: Reddish brown silty CLAY, damp, stiff, pinhole pores, trace fine gravel. | | | |
| | | | D-3 | 18 | | | @ 7.5': Yellowish brown sandy/silty CLAY, damp, stiff, caliche, pinhole pores. | 8.4 | 107.4 | CN |
| | 10 | | D-4 | 20 | | SM | @ 10': Upper: Yellowish brown silty fine SAND, damp, medium dense, trace pinhole pores, micaceous. | 7.6 | 104.4 | |
| | | | | | | CL | Lower: Reddish brown silty CLAY, very moist, stiff, caliche, pinhole pores. | | | |
| | | | D-5 | 23 | | | @ 12.5': Upper: Reddish brown silty CLAY, wet, stiff, caliche, pinhole pores. | 29.3 | 92.0 | |
| | | | | | | SC | Lower: Brown clayey fine to medium SAND, moist, medium dense, micaceous. | | | |
| 370 | 15 | | D-6 | 28 | | SM-SC | @ 15': Brown clayey/silty fine SAND, damp to moist, medium dense, pinhole pores, micaceous, trace fine gravel. | 8.1 | 113.1 | |
| | 20 | | D-7 | 61 | | | @ 20': Strong brown silty and clayey SAND, moist, dense, mottled, micaceous, trace pinhole pores and fine gravel. | 9.7 | 116.6 | |
| 360 | 25 | | D-8 | 81 | | SC-CL | @ 25': Yellowish brown clayey SAND/sandy CLAY, moist, medium dense, micaceous, trace pinhole pores. | 12.5 | 119.3 | |
| | 30 | | | | | | | | | |

## LOG OF BORING

ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 7/29/19

ICDC/PA1 N4 Irvine, California

H-77
Sheet 2 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | D | 9 | 80/11" | | SC | @ 30': Yellowish brown clayey fine to coarse SAND, saturated, very dense, micaceous, caliche. | 35.3 | 95.2 | |
| -350 | 35 | D | 10 | 37 | | ML | @ 35': Light olive brown sandy SILT, saturated, stiff, caliche, trace pinhole pores. | 20.2 | 108.2 | |
| | | | | | | SC | Tip: Light olive brown clayey fine to coarse SAND, saturated, dense. | | | |
| | 40 | D | 11 | 23 | | SC-CL | @ 40': Brown clayey fine to coarse SAND/sandy CLAY, saturated, medium dense/stiff, trace caliche, micaceous. | 19.3 | 109.7 | |
| -340 | 45 | D | 12 | 25 | | CL | @ 45': Light yellowish brown sandy/silty CLAY, saturated, stiff, caliche. | 20.6 | 110.2 | |
| | 50 | D | 13 | 50/3" | | SM | Vaqueros Formation (Tv)<br>@ 50': Light olive brown to olive yellow silty fine to medium SANDSTONE, saturated, very dense, micaceous, caliche. | 16.7 | 129.0 | |
| -330 | 55 | | | | | | Notes:<br>Total Depth: 50.5 Feet.<br>Groundwater at 36.8 Feet After 15 Minutes.<br>Backfilled with Cuttings. | | | |
| | 60 | | | | | | | | | |
| -320 | 65 | | | | | | | | | |

## LOG OF BORING
ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT Printed: 7/29/19

Template: HOLLOW STEM; Prj ID: 98037-73.GPJ; Printed: 7/29/19

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/11/16 | Logged By | ZKH |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 10" |
| Drill Rig Type | CME 75 Hollow Stem | Hammer Data | 140 lbs @ 30" Drop |
| Sampling Method(s) | Modified California | | |
| Approximate Groundwater Depth: | Groundwater Not Encountered | | |
| Comments | | | |

**H-78**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 45.3 |
| Approximate Ground Surface Elevation (ft) | 400.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 0 | | | | | SM-ML | Surface: Orchard Access Road<br>**Slopewash Material (Qsw)** | | | |
| | | | D-1 | 23 | | | @ 2.5': Brown silty fine SAND/sandy SILT, damp, medium dense/stiff, abundant pencil-tip pores, micaceous, root hairs. | 2.7 | 105.5 | |
| | 5 | | D-2 | 63 | | ML | @ 5': Brown sandy SILT, damp, very stiff, pinhole pores, caliche, micaceous, root hairs. | 4.5 | 113.0 | |
| | | | D-3 | 50 | | SM-ML | @ 7.5': Brown silty fine SAND/sandy SILT, damp, pinhole pores, micaceous, caliche, root hairs. | 5.0 | 113.6 | |
| 390 | 10 | | D-4 | 40 | | | @ 10': Brown silty fine SAND/sandy SILT, damp, pinhole pores, micaceous, caliche, root hairs. | 5.2 | 103.3 | |
| | | | D-5 | 42 | | ML-CL | @ 12.5': Brown clayey SILT/silty CLAY, damp, very stiff, pinhole pores, micaceous, abundant pinhole pores. | 6.6 | 118.4 | |
| | 15 | | D-6 | 24 | | | @ 15': Brown to yellowish brown clayey SILT/silty CLAY, damp, stiff, abundant caliche and pinhole pores, micaceous, root hairs. | 8.5 | 98.9 | |
| 380 | 20 | | D-7 | 35 | | CL | @ 20': Yellowish brown silty/sandy CLAY, damp, very stiff, pinhole pores, caliche, micaceous. | 9.0 | 114.0 | |
| | 25 | | D-8 | 33 | | | @ 25': Dark yellowish brown silty CLAY, moist, very stiff, abundant caliche, pinhole pores, micaceous. | 12.1 | 111.8 | |
| 370 | 30 | | | | | | | | | |

## LOG OF BORING

ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 3/24/17

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 370 | 30 | | D-9 | 75 | | CL | **Vaqueros Formation (Tv)**<br>@ 30': Olive gray silty sandy CLAYSTONE, wet, hard, pinhole pores, caliche, micaceous. | 16.0 | 114.8 | |
| | 35 | | D-10 | 50/4" | | | @ 35': Olive gray silty sandy CLAYSTONE, moist, hard, abundant caliche, micaceous, sheared clay laminations. | 14.5 | 107.4 | |
| 360 | 40 | | D-11 | 100 | | ML | @ 40': Olive gray clayey SILTSTONE, moist, hard, micaceous. | 14.7 | 114.6 | |
| | 45 | | D-12 | 50/4" | | | @ 45': Olive gray clayey SILTSTONE, moist, hard, micaceous, dipping approximately 45°. | 11.4 | 120.8 | |
| 350 | 50 | | | | | | Notes:<br>Total Depth: 45.3 Feet.<br>Groundwater Not Encountered.<br>Backfilled With Cuttings. | | | |
| | 55 | | | | | | | | | |
| 340 | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

## LOG OF BORING
ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 3/24/17

Template: HOLLOW STEM; Prj ID: 98037-73.GPJ; Printed: 3/24/17

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/7/16 | Logged By | ZKH |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 10" |
| Drill Rig Type | CME 75 Hollow Stem | Hammer Data | 140 lbs @ 30" Drop |
| Sampling Method(s) | Modified California | | |
| Approximate Groundwater Depth: | 43.3 Feet | | |
| Comments | | | |

**H-79**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 50.8 |
| Approximate Ground Surface Elevation (ft) | 416.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM-SC | Surface: Access Road.<br>**Undocumented Fill (Afu)** | | | |
| | | | D-1 | 35 | | | @ 2.5': Dark brown to light brown silty/clayey SAND, damp, loose, trace gravel. No ring sample recovery. | | | |
| | 5 | | D-2 | 64 | | SM-GM | @ 5': Light yellowish brown silty SAND/silty/fine to coarse GRAVEL, damp, medium dense, friable. | 3.1 | 123.2 | |
| 410 | | | D-3 | 20 | | SM | @ 7.5': Very pale brown silty fine SAND, damp, medium dense, friable, micaceous, root hairs, pinhole pores, metal nail in sampler tip. | 2.4 | 104.3 | |
| | 10 | | D-4 | 36 | | SP | **Alluvium (Qal)**<br>@ 10': Pale olive fine to coarse SAND, damp, medium dense, some medium gravel, friable. | 3.2 | | |
| | | | D-5 | 53 | | SP-GP | @ 12.5': Pale yellow to olive fine to coarse SAND/sandy GRAVEL, damp, dense, friable | 3.0 | | |
| | 15 | | | | | | | | | |
| 400 | | | D-6 | 45 | | SP | @ 15': Pale yellow to olive fine to coarse SAND, damp, medium dense, friable. | 2.5 | 117.8 | |
| | 20 | | D-7 | 19 | | SM | @ 20': Light yellow brown silty fine SAND, damp, medium dense, micaceous, trace coarse gravel and pinhole pores. | 6.5 | 106.4 | |
| | 25 | | D-8 | 32 | | | @ 25': Light yellow brown silty fine SAND, damp, medium dense, micaceous, trace coarse gravel and pinhole pores. Trace sandy SILT lenses in upper rings (not collected in sample). | 6.4 | 106.4 | |
| 390 | | | | | | GM | Tip: Silty/sandy coarse GRAVEL, friable. | | | |
| | 30 | | | | | | | | | |

## LOG OF BORING

ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM, Project: 98037-73.GPJ, Data Template: NMG_GINT_2016.GDT, Printed: 3/24/17

ICDC/PA1 N4 Irvine, California

H-79
Sheet 2 of 2

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | D | 9 | 48 | | SP | @ 30': Pale yellow gravelly fine to coarse SAND, damp, medium dense, micaceous, friable. | 3.0 | 113.2 | |
| 380 | 35 | D | 10 | 45 | | SP-GP | @ 35': Pale yellow fine to coarse SAND/sandy fine to coarse GRAVEL, damp, medium dense, micaceous, friable. | 3.0 | 113.5 | |
| | 40 | D | 11 | 75 | | SM-GM | @ 40': Yellow brown silty fine to coarse SAND/sandy fine to coarse GRAVEL, wet, very dense. | 13.5 | 97.5 | |
| 370 | 45 | D | 12 | 100 | | SP | @ 45': Light brown fine to coarse SAND, saturated, very dense, trace fine gravel. | 8.5 | 130.1 | |
| | 50 | D | 13 | 85/10" | | | @ 50': Light brown fine to coarse SAND, saturated, very dense, trace fine gravel. | 12.6 | 123.3 | |
| 360 | 55 | | | | | | Notes:<br>Total Depth: 50.8 Feet.<br>Groundwater Encountered at 43.3 after 5 Minutes.<br>Backfilled with Cuttings and Tamped. | | | |
| | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

## LOG OF BORING
ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 3/24/17

Template: HOLLOW STEM; Prj ID: 98037-73.GPJ; Printed: 3/24/17

| | | | |
|---|---|---|---|
| Date(s) Drilled | 4/7/16 | Logged By | ZKH |
| Drilling Company | 2R Drilling | Drill Bit Size/Type | 10" |
| Drill Rig Type | CME 75 Hollow Stem | Hammer Data | 140 lbs @ 30" Drop |
| Sampling Method(s) | Modified California, Bulk | | |
| Approximate Groundwater Depth: | 42.0 Feet | | |
| Comments | | | |

**H-80**

**Sheet 1 of 2**

| | |
|---|---|
| Total Depth Drilled (ft) | 51.0 |
| Approximate Ground Surface Elevation (ft) | 427.0 msl |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | SM | Surface: Access Road.<br>**Alluvium (Qal)** | | | B-1 @ 0-5' |
| | | | B-1<br>D-1 | 22 | | | @ 2.5': Strong brown silty fine SAND, moist, medium dense, abundant pinhole and pencil-tip pores, root hairs, micaceous, trace caliche stringers. | 10.4 | 115.4 | |
| | 5 | | D-2 | 22 | | | @ 5': Pale yellow brown fine to medium SAND, damp, medium dense, pinhole pores, caliche stringers, slightly friable. | 4.4 | 106.5 | CN |
| 420 | | | D-3 | 20 | | | @ 7.5': Pale yellow brown fine to coarse SAND, damp, medium dense, pinhole pores, caliche stringers, slightly friable. | 4.5 | 110.4 | |
| | 10 | | D-4 | 18 | | | @ 10': Upper: Olive silty SAND, moist, medium dense, bedrock fragments in upper rings (not collected in sample). Lower: Light yellowish brown fine to medium silty SAND, moist, medium dense, pinhole pores, caliche, slightly friable. | 9.1 | 104.9 | |
| | | | D-5 | 22 | | | @ 12.5': Light yellowish brown silty fine to medium SAND, damp, medium dense, trace caliche, micaceous. | 3.4 | 105.1 | |
| | 15 | | D-6 | 85/11" | | SM-GM | @ 15': Light yellowish brown gravelly silty fine to medium SAND/sandy medium to coarse GRAVEL, damp, dense, trace caliche, micaceous.<br>Tip: Trace clayey SAND. | 2.6 | 117.4 | |
| 410 | | | | | | | | | | |
| | 20 | | D-7 | 27 | | SM | @ 20': Dark yellowish brown silty fine to medium SAND, damp, medium dense, micaceous, friable, trace clay, fine gravel and pinhole pores. | 5.2 | 113.9 | |
| | 25 | | D-8 | 27 | | | @ 25': Light yellow brown silty fine to coarse SAND, damp, medium dense, trace pinhole pores, micaceous, friable. | 4.5 | 103.5 | |
| 400 | | | | | | | | | | |
| | 30 | | | | | | | | | |

## LOG OF BORING

ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 3/24/17

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per foot | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | D | 9 | 91/11" | | SP-GP | @ 30': Light yellowish brown gravelly SAND/sandy fine to coarse GRAVEL, damp, very dense, friable. | 2.6 | 120.9 | |
| | 35 | D | 10 | 18 | | SM | @ 35': Upper: Yellowish brown silty fine to coarse SAND, moist, medium dense, trace pinhole pores. | 6.8 | 117.1 | |
| 390 | | | | | | SC | Lower: Dark yellowish brown clayey fine to medium SAND, moist, medium dense, trace pinhole pores. | | | |
| | 40 | D | 11 | 27 | | SM | @ 40': Upper: Yellowish brown silty fine to coarse SAND, saturated, medium dense, trace pinhole pores. | 17.8 | 109.0 | |
| | | | | | | CL | Lower: Dark brown sandy CLAY, saturated, stiff, trace pinhole pores. | | | |
| | 45 | D | 12 | 27 | | SC-CL | @ 45': Grayish brown clayey fine to medium SAND/sandy CLAY, saturated, medium dense/stiff, some bedrock fragments, caliche. | 23.6 | 102.6 | |
| 380 | | | | | | | | | | |
| | 50 | D | 13 | 100 | | | @ 50': Grayish brown clayey fine to coarse SAND/sandy CLAY, saturated, very dense, trace gravel. | 24.1 | 108.4 | |
| | | | | | | | Notes:<br>Total Depth: 51 Feet.<br>Groundwater Encountered at 42.0 Feet after 3 Minutes.<br>Backfilled with Cuttings and Tamped. | | | |
| | 55 | | | | | | | | | |
| 370 | | | | | | | | | | |
| | 60 | | | | | | | | | |
| | 65 | | | | | | | | | |

## LOG OF BORING
ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG

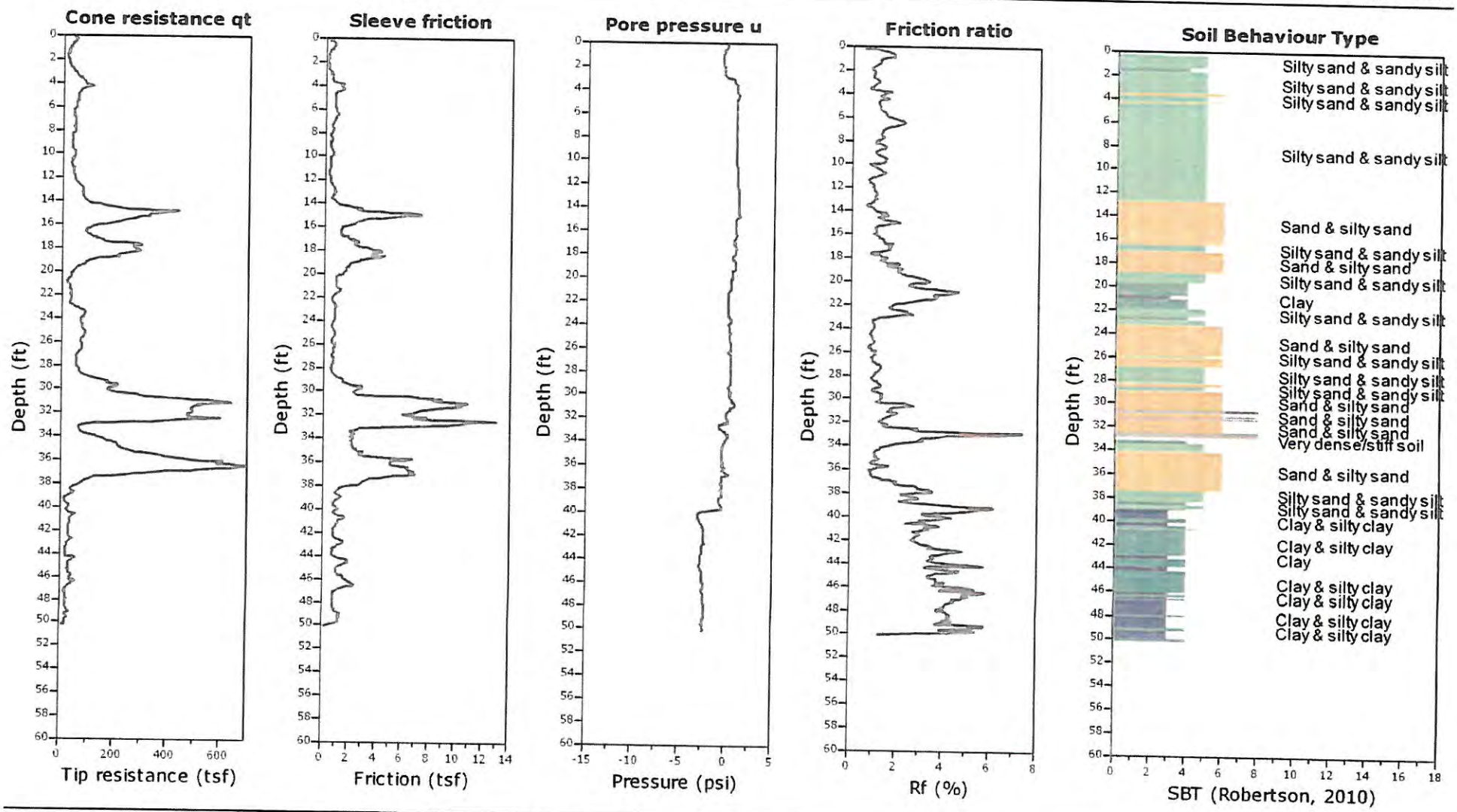
Report: HOLLOW STEM; Project: 98037-73.GPJ; Data Template: NMG_GINT_2016.GDT; Printed: 3/24/17

Template: HOLLOW STEM; Prj ID: 98037-73.GPJ; Printed: 3/24/17

**Kehoe Testing and Engineering**
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

**Project:** NMG Geotechnical, Inc./Orchard Hills Neighborhood 4
**Location:** Orchard Hills & Big Sycamore Irvine, CA

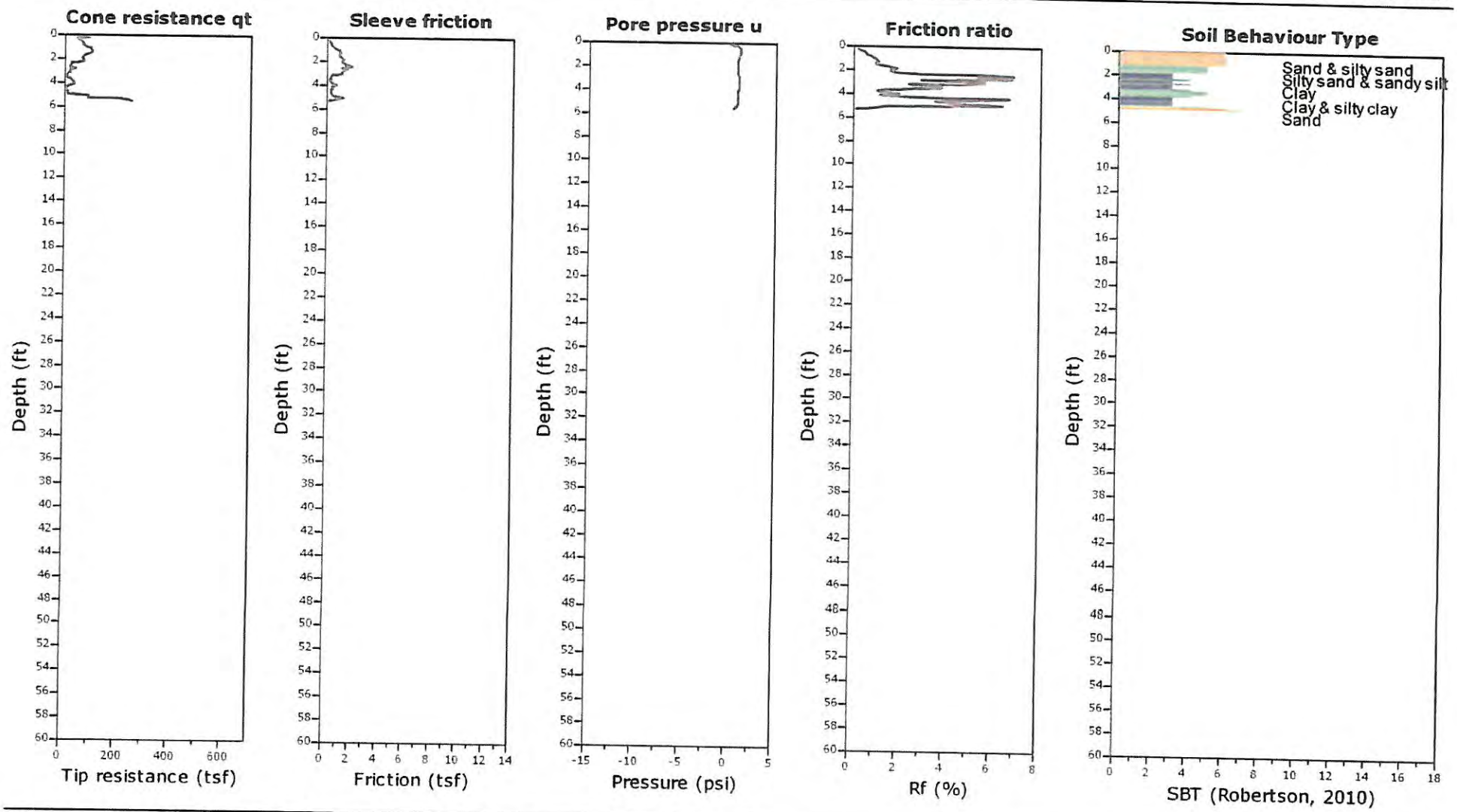
**CPT: CPT-53**
Total depth: 50.22 ft, Date: 5/9/2016
Cone Type: Vertek



**Kehoe Testing and Engineering**
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

**Project:** NMG Geotechnical, Inc./Orchard Hills Neighborhood 4
**Location:** Orchard Hills & Big Sycamore Irvine, CA

**CPT: CPT-54**
Total depth: 5.55 ft, Date: 5/9/2016
Cone Type: Vertek



# *Appendix C*
# *Laboratory Test Results*

## *APPENDIX C*

## ***Laboratory Testing Procedures and Test Results***

The laboratory testing program was formulated towards providing data relating to the relevant engineering properties of the soils with respect to residential construction. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Moisture and Density Determination Tests: Moisture content (ASTM D2216) and dry density determinations (ASTM D2937) were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from undisturbed or disturbed samples.

Grain Size Distribution/Fines Content: Representative samples were dried, weighed and soaked in water until individual soil particles were separated (per ASTM D421) and then washed on a No. 200 sieve (ASTM D1140). Where applicable, the portion retained on the No. 200 sieve and dried and then sieved on a U.S. Standard brass sieve set in accordance with ASTM D6913 (sieve).

| **Sample Location** | **Description** | **% Passing # 200 Sieve** |
|---|---|---|
| I-5 @ 28.5 feet | Silty Sand | 24 |
| I-8 @ 3.5 feet | Silty Sand | 29 |
| I-9 @ 28.5 feet | Sandy Silt | 66 |
| I-10 @ 3.5 feet | Silty Sand | 24 |

Expansion Index: The expansion potential of selected samples was evaluated by the Expansion Index Test, Standard ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch-thick by 4-inch-diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below.

| **Sample Location** | **Expansion Index** | **Expansion Potential*** |
|---|---|---|
| TP-2 @ 3-5 feet | 29 | Low |
| TP-10 @ 2-4 feet | 7 | Very Low |
| TP-15 @ 2-10 feet | 30 | Low |

* ASTM D4829

***Laboratory Testing Procedures and Test Results***

Atterberg Limits: The liquid and plastic limits ("Atterberg Limits") were determined per ASTM D4318 for engineering classification of fine-grained material and presented in the table below. The USCS soil classification indicated in the table below is based on the portion of sample passing the No. 40 sieve and may not necessarily be representative of the entire sample. The plots are provided in this Appendix.

| Sample Location | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | USCS Soil Classification |
|---|---|---|---|---|
| HS-3 @ 7.5 feet | 37 | 19 | 18 | CL |

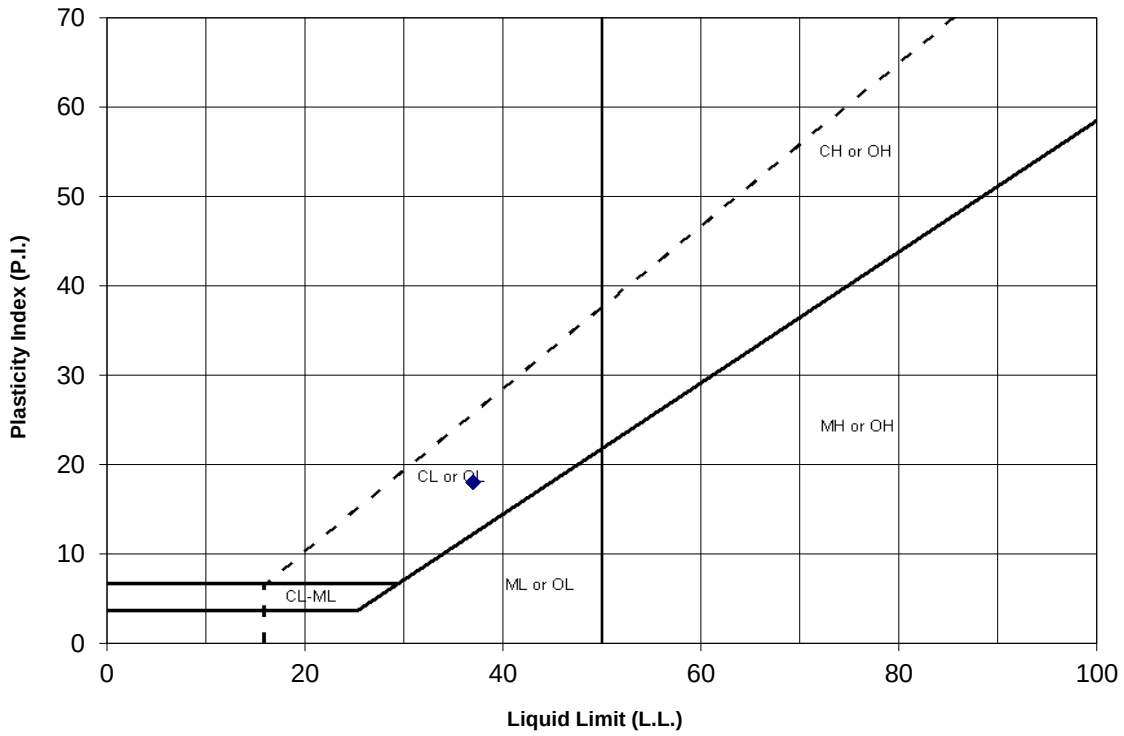
Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM D1557. The results of these tests are presented in the table below:

| Sample Location | Sample Description | Maximum Dry Density (pcf) | Optimum Moisture Content (%) |
|---|---|---|---|
| TP-2 @ 3-5 feet | Brown Clayey Silty Sand | 126.0 | 9.5 |
| TP-10 @ 2-4 feet | Brown Silty Sand | 126.5 | 9.5 |
| TP-15 @ 2-10 feet | Brown Clayey Sand | 128.5 | 9.5 |
| HS-1 @ 1-5 feet | Brown Clayey/Silty Sand | 126.0 | 9.5 |
| HS-4 @ 1-5 feet | Brown Silty Sand | 127.0 | 9.5 |

Collapse/Swell Potential: Six collapse tests were performed per ASTM D4546. A sample (2.4 inches in diameter and 1-inch in height) was placed in a consolidometer and loaded to the approximate in-situ effective stress. The curve is presented in this Appendix.

Consolidation: One consolidation test was performed per ASTM D2435. A sample (2.4 inches in diameter and 1 inch in height) was placed in a consolidometer and increasing loads were applied. The sample was allowed to consolidate under "double drainage" and total deformation for each loading step was recorded. The percent consolidation for each load step was recorded as the ratio of the amount of vertical compression to the original sample height. The consolidation pressure curves are provided in this Appendix.

PLASTICITY CHART - CLASSIFICATION OF FINE-GRAINED SOILS




| Symbol | Location.: | Sample No.: | Depth (ft) | Passing No. 200 Sieve (%) | Liquid Limit (%) LL | Plastic Limit (%) PL | Plasticity Index (%) PI | USCS |
|---|---|---|---|---|---|---|---|---|
| ◆ | HS-3 | R-4 | 7.5' | - | 37 | 19 | 18 | CL |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

LGC Geotechnical, Inc.

**ATTERBERG LIMITS**
(ASTM D 4318)

**Project Number:** 23203-01
**Date:** Oct-24

**Gateway Village**

# ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

**ASTM D 4546**

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | G. Bathala | Date: | 10/14/24 |
| Project No.: | 23203-01 | Checked By: | J. Ward | Date: | 10/21/24 |
| Boring No.: | HS-1 | Sample Type: | Ring | | |
| Sample No.: | R-4 | Depth (ft.) | 7.5 | | |
| Sample Description: | Olive brown silty, clayey sand (SC-SM) | | | | |

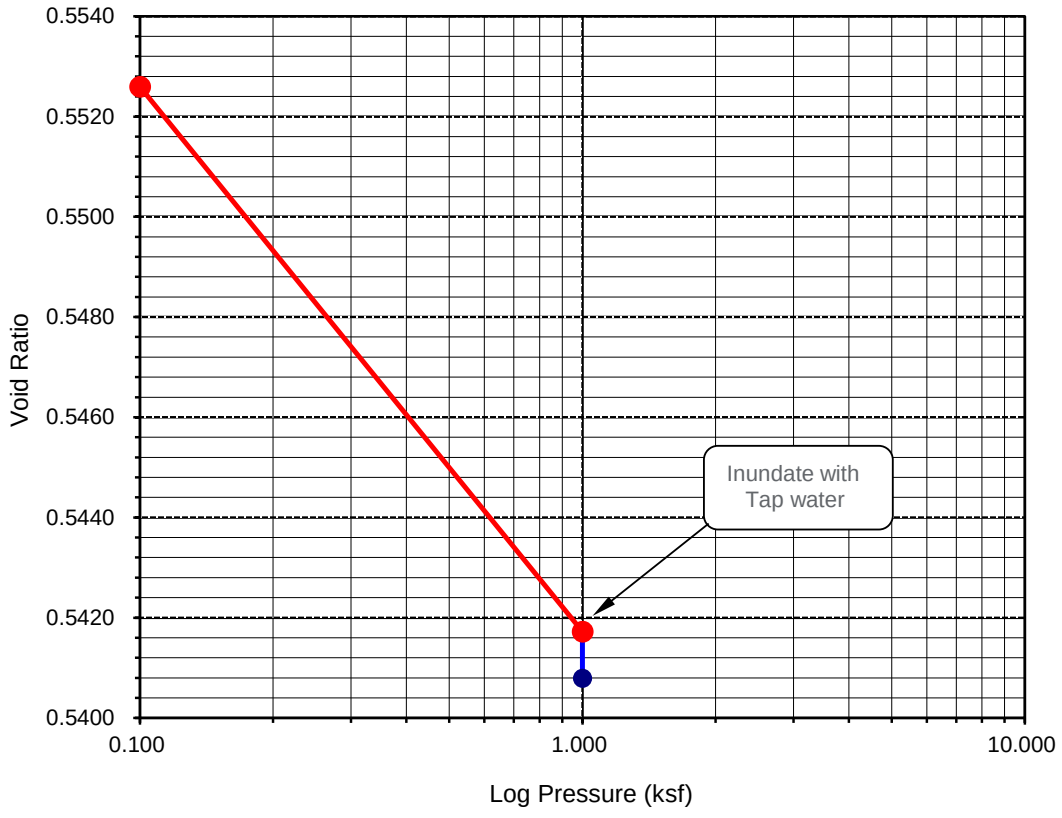
| | |
|---|---|
| Initial Dry Density (pcf): | 108.5 |
| Initial Moisture (%): | 10.76 |
| Initial Length (in.): | 1.0000 |
| Initial Dial Reading: | 0.1181 |
| Diameter(in): | 2.415 |

| | |
|---|---|
| Final Dry Density (pcf): | 109.9 |
| Final Moisture (%) : | 17.3 |
| Initial Void ratio: | 0.5529 |
| Specific Gravity(assumed): | 2.70 |
| Initial Saturation (%) | 52.5 |

| Pressure (p) (ksf) | Final Reading (in) | Apparent Thickness (in) | Load Compliance (%) | Swell (+) Settlement (-) % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.100 | 0.1183 | 0.9998 | 0.00 | -0.02 | 0.5526 | -0.02 |
| 1.000 | 0.1274 | 0.9907 | 0.21 | -0.93 | 0.5417 | -0.72 |
| H2O | 0.1280 | 0.9901 | 0.21 | -0.99 | 0.5408 | -0.78 |

**Percent Swell (+) / Settlement (-) After Inundation = -0.06**

Void Ratio - Log Pressure Curve



# ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

**ASTM D 4546**

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | G. Bathala | Date: | 10/15/24 |
| Project No.: | 23203-01 | Checked By: | J. Ward | Date: | 10/21/24 |
| Boring No.: | HS-3 | Sample Type: | Ring | | |
| Sample No.: | R-6 | Depth (ft.) | 15.0 | | |
| Sample Description: | Brown lean clay with sand (CL)s | | | | |

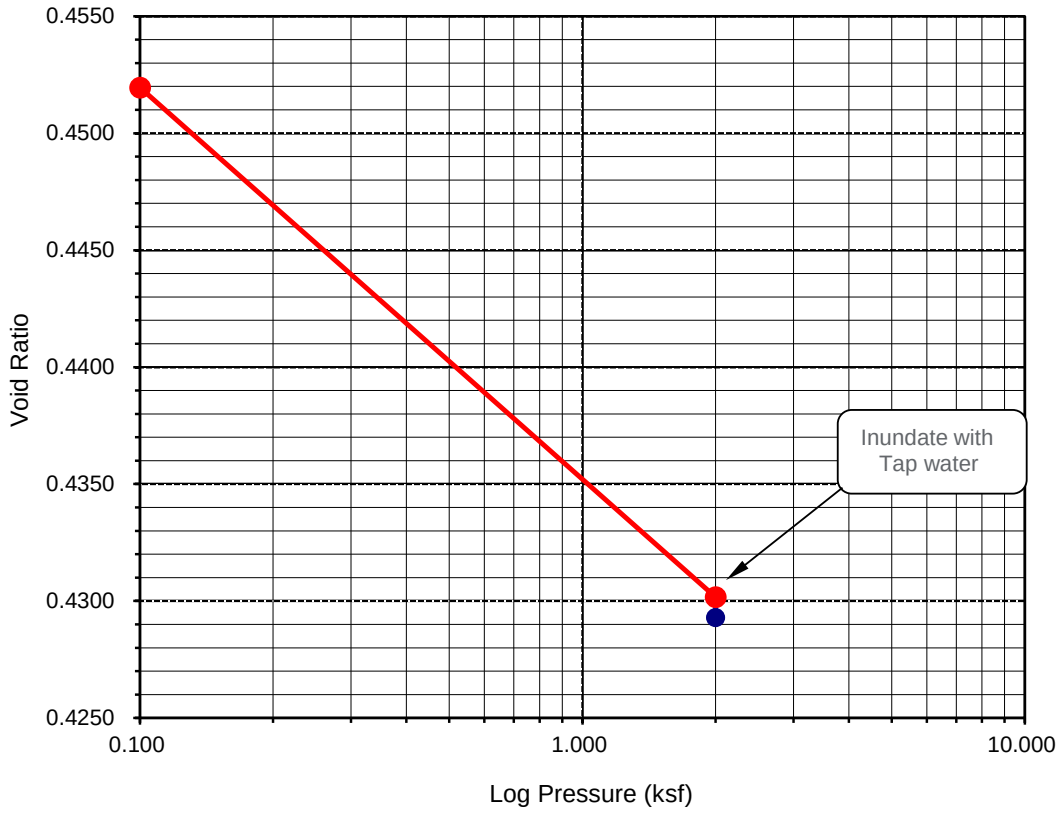
| | |
|---|---|
| Initial Dry Density (pcf): | 116.0 |
| Initial Moisture (%): | 13.81 |
| Initial Length (in.): | 1.0000 |
| Initial Dial Reading: | 0.0742 |
| Diameter(in): | 2.415 |

| | |
|---|---|
| Final Dry Density (pcf): | 118.7 |
| Final Moisture (%) : | 13.7 |
| Initial Void ratio: | 0.4527 |
| Specific Gravity(assumed): | 2.70 |
| Initial Saturation (%) | 82.4 |

| Pressure (p) (ksf) | Final Reading (in) | Apparent Thickness (in) | Load Compliance (%) | Swell (+) Settlement (-) % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.100 | 0.0747 | 0.9995 | 0.00 | -0.05 | 0.4520 | -0.05 |
| 2.000 | 0.0927 | 0.9815 | 0.30 | -1.85 | 0.4302 | -1.55 |
| H2O | 0.0933 | 0.9809 | 0.30 | -1.91 | 0.4293 | -1.61 |

**Percent Swell (+) / Settlement (-) After Inundation = -0.06**

Void Ratio - Log Pressure Curve



# ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

**ASTM D 4546**

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | G. Bathala | Date: | 10/14/24 |
| Project No.: | 23203-01 | Checked By: | J. Ward | Date: | 10/21/24 |
| Boring No.: | HS-4 | Sample Type: | Ring | | |
| Sample No.: | R-5 | Depth (ft.) | 10.0 | | |
| Sample Description: | Light olive brown silty sand (SM) | | | | |

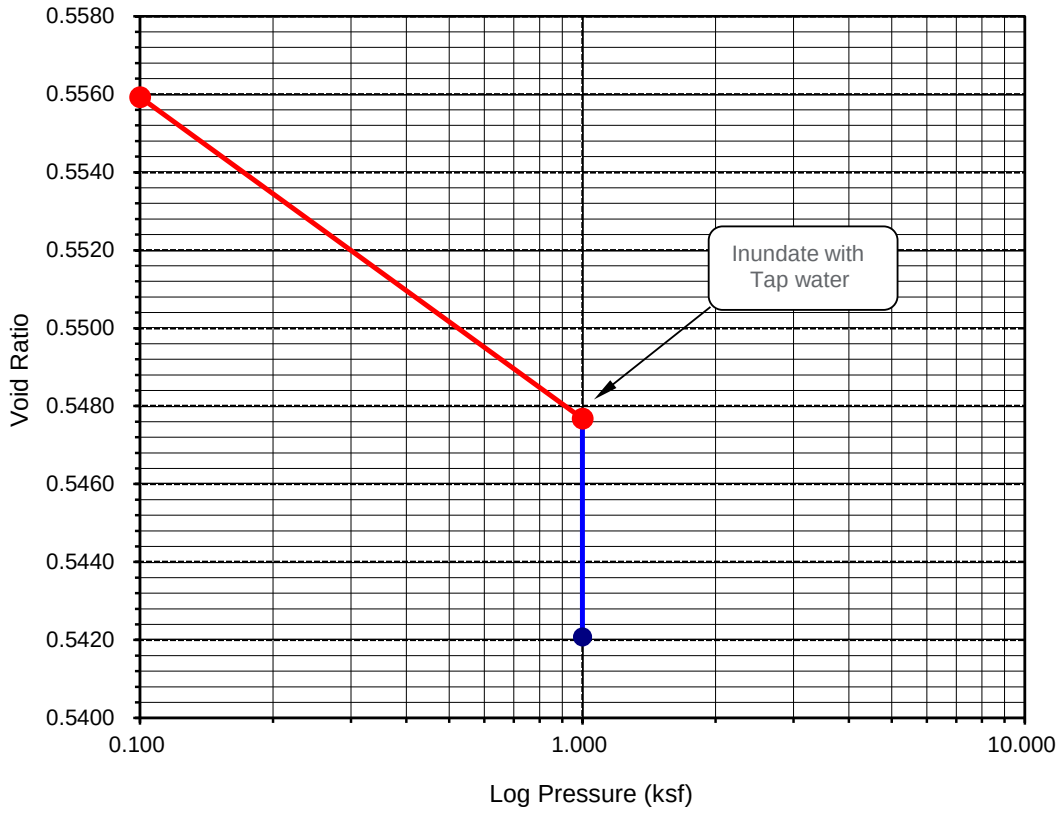
| | |
|---|---|
| Initial Dry Density (pcf): | 108.3 |
| Initial Moisture (%): | 6.00 |
| Initial Length (in.): | 1.0000 |
| Initial Dial Reading: | 0.1421 |
| Diameter(in): | 2.415 |

| | |
|---|---|
| Final Dry Density (pcf): | 109.6 |
| Final Moisture (%) : | 16.8 |
| Initial Void ratio: | 0.5561 |
| Specific Gravity(assumed): | 2.70 |
| Initial Saturation (%) | 29.2 |

| Pressure (p) (ksf) | Final Reading (in) | Apparent Thickness (in) | Load Compliance (%) | Swell (+) Settlement (-) % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.100 | 0.1422 | 0.9999 | 0.00 | -0.01 | 0.5559 | -0.01 |
| 1.000 | 0.1487 | 0.9934 | 0.12 | -0.66 | 0.5477 | -0.54 |
| H2O | 0.1523 | 0.9898 | 0.12 | -1.02 | 0.5421 | -0.90 |

**Percent Swell (+) / Settlement (-) After Inundation = -0.36**

Void Ratio - Log Pressure Curve



# ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

**ASTM D 4546**

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | G. Bathala | Date: | 10/15/24 |
| Project No.: | 23203-01 | Checked By: | J. Ward | Date: | 10/21/24 |
| Boring No.: | HS-4 | Sample Type: | Ring | | |
| Sample No.: | R-6 | Depth (ft.) | 20.0 | | |
| Sample Description: | Yellowish brown silty sand (SM) | | | | |

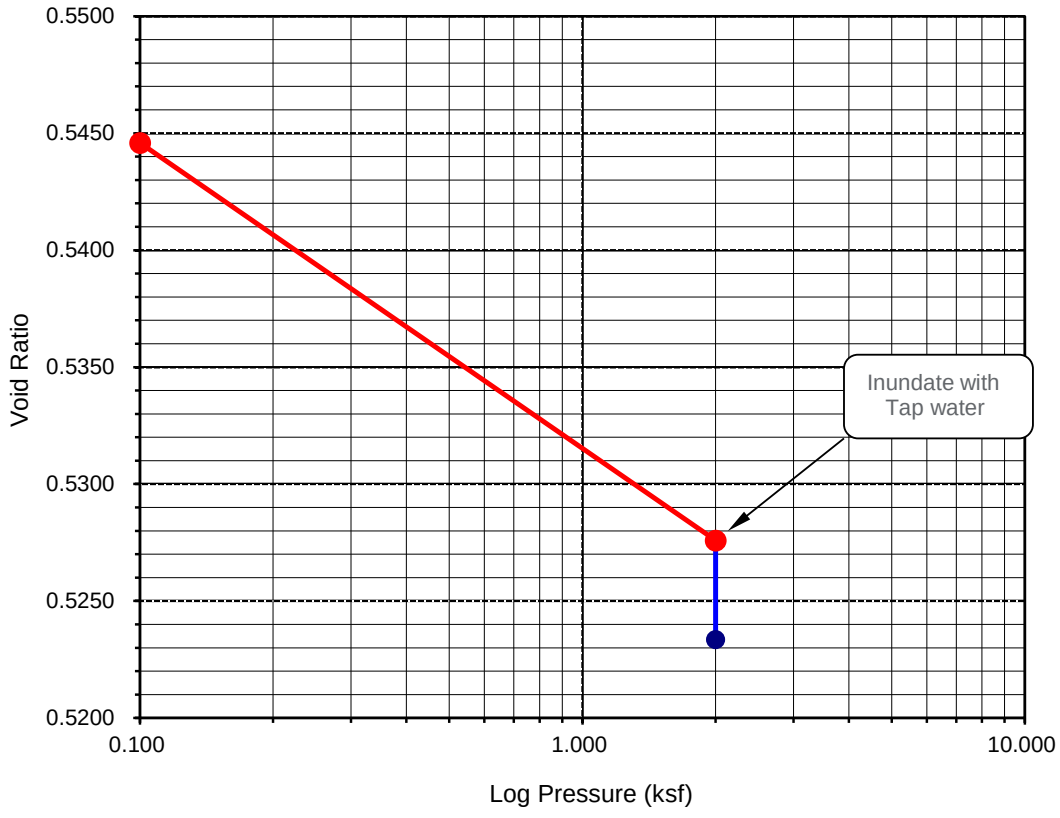
| | |
|---|---|
| Initial Dry Density (pcf): | 109.1 |
| Initial Moisture (%): | 6.20 |
| Initial Length (in.): | 1.0000 |
| Initial Dial Reading: | 0.1202 |
| Diameter(in): | 2.415 |

| | |
|---|---|
| Final Dry Density (pcf): | 111.2 |
| Final Moisture (%) : | 14.9 |
| Initial Void ratio: | 0.5449 |
| Specific Gravity(assumed): | 2.70 |
| Initial Saturation (%) | 30.7 |

| Pressure (p) (ksf) | Final Reading (in) | Apparent Thickness (in) | Load Compliance (%) | Swell (+) Settlement (-) % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.100 | 0.1204 | 0.9998 | 0.00 | -0.02 | 0.5446 | -0.02 |
| 2.000 | 0.1338 | 0.9864 | 0.24 | -1.36 | 0.5276 | -1.12 |
| H2O | 0.1366 | 0.9837 | 0.24 | -1.64 | 0.5233 | -1.40 |

**Percent Swell (+) / Settlement (-) After Inundation = -0.28**

Void Ratio - Log Pressure Curve



# ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

**ASTM D 4546**

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | G. Bathala | Date: | 10/14/24 |
| Project No.: | 23203-01 | Checked By: | J. Ward | Date: | 10/21/24 |
| Boring No.: | HS-5 | Sample Type: | Ring | | |
| Sample No.: | R-4 | Depth (ft.) | 7.5 | | |
| Sample Description: | Brown sandy silt s(ML) | | | | |

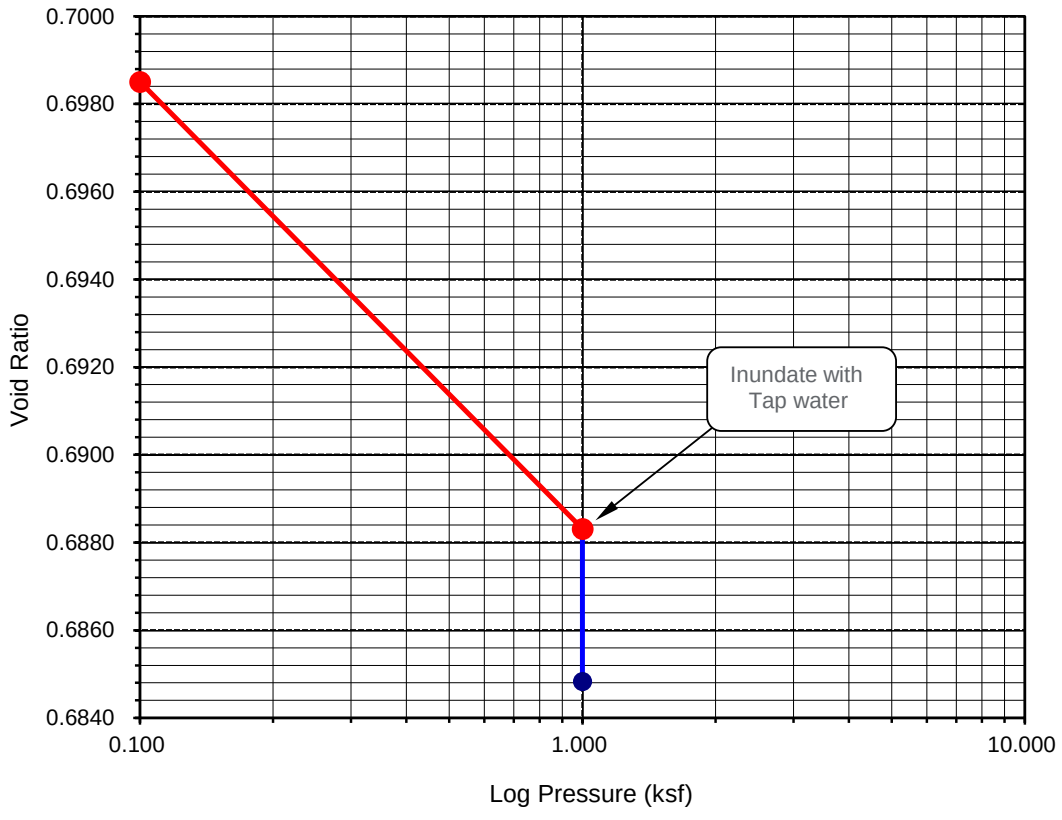
| | |
|---|---|
| Initial Dry Density (pcf): | 99.2 |
| Initial Moisture (%): | 4.01 |
| Initial Length (in.): | 1.0000 |
| Initial Dial Reading: | 0.1113 |
| Diameter(in): | 2.415 |

| | |
|---|---|
| Final Dry Density (pcf): | 100.3 |
| Final Moisture (%) : | 22.8 |
| Initial Void ratio: | 0.6988 |
| Specific Gravity(assumed): | 2.70 |
| Initial Saturation (%) | 15.5 |

| Pressure (p) (ksf) | Final Reading (in) | Apparent Thickness (in) | Load Compliance (%) | Swell (+) Settlement (-) % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.100 | 0.1115 | 0.9998 | 0.00 | -0.02 | 0.6985 | -0.02 |
| 1.000 | 0.1188 | 0.9925 | 0.13 | -0.75 | 0.6883 | -0.62 |
| H2O | 0.1209 | 0.9905 | 0.13 | -0.95 | 0.6848 | -0.82 |

**Percent Swell (+) / Settlement (-) After Inundation = -0.21**

Void Ratio - Log Pressure Curve



# ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

**ASTM D 4546**

| | | | | | |
|---|---|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | G. Bathala | Date: | 10/15/24 |
| Project No.: | 23203-01 | Checked By: | J. Ward | Date: | 10/21/24 |
| Boring No.: | HS-5 | Sample Type: | Ring | | |
| Sample No.: | R-5 | Depth (ft.) | 10.0 | | |
| Sample Description: | Brown poorly-graded sand (SP) | | | | |

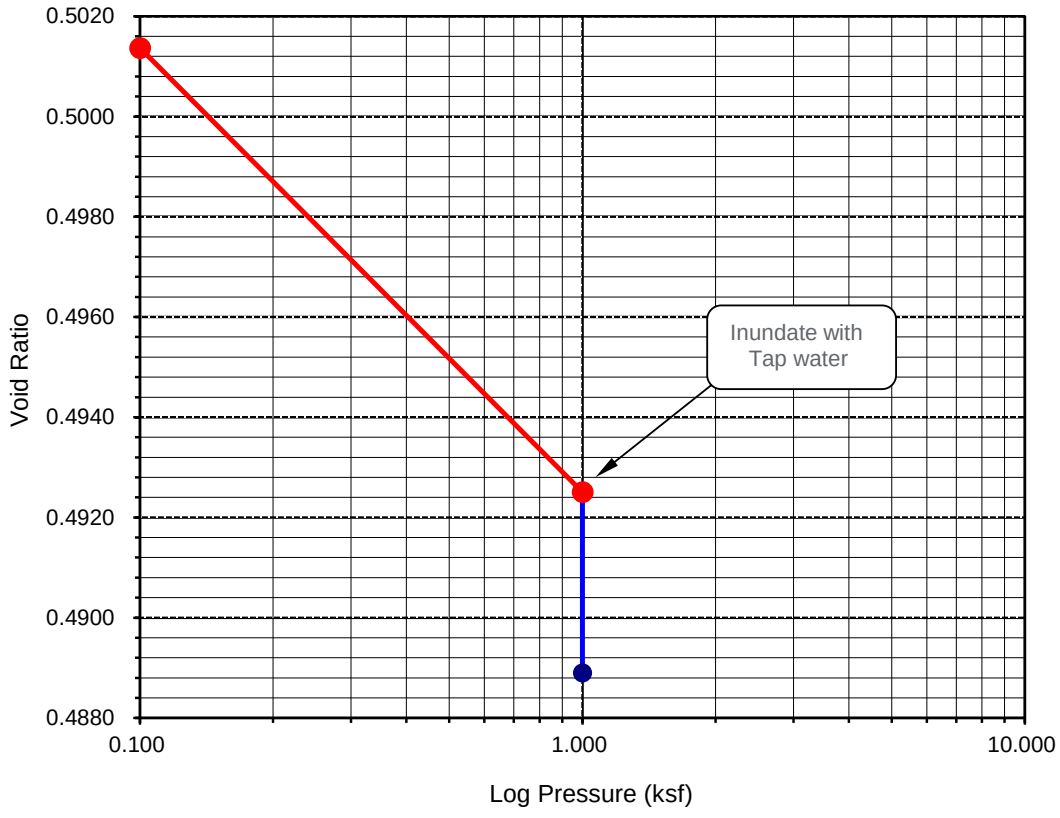
| | |
|---|---|
| Initial Dry Density (pcf): | 112.2 |
| Initial Moisture (%): | 3.36 |
| Initial Length (in.): | 1.0000 |
| Initial Dial Reading: | 0.0844 |
| Diameter(in): | 2.415 |

| | |
|---|---|
| Final Dry Density (pcf): | 113.6 |
| Final Moisture (%) : | 13.2 |
| Initial Void ratio: | 0.5021 |
| Specific Gravity(assumed): | 2.70 |
| Initial Saturation (%) | 18.1 |

| Pressure (p) (ksf) | Final Reading (in) | Apparent Thickness (in) | Load Compliance (%) | Swell (+) Settlement (-) % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.100 | 0.0849 | 0.9995 | 0.00 | -0.05 | 0.5014 | -0.05 |
| 1.000 | 0.0925 | 0.9919 | 0.17 | -0.81 | 0.4925 | -0.64 |
| H2O | 0.0949 | 0.9895 | 0.17 | -1.05 | 0.4889 | -0.88 |

**Percent Swell (+) / Settlement (-) After Inundation = -0.24**

Void Ratio - Log Pressure Curve



# ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

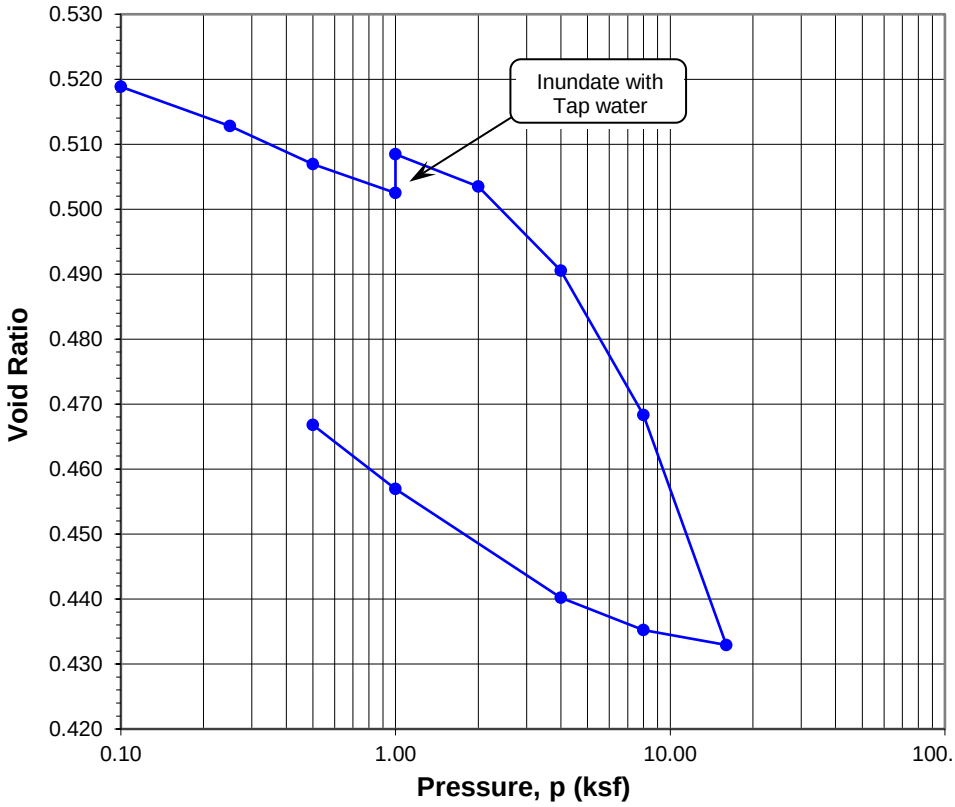
**ASTM D 2435**

| | | | |
|---|---|---|---|
| Project Name: | Gateway Village | Tested By: | JD/GB |
| Project No.: | 23203-01 | Checked By: | J. Ward |
| Boring No.: | HS-3 | Depth (ft.): | 7.5 |
| Sample No.: | R-4 | Sample Type: | Ring |
| Soil Identification: | Brown clayey sand (SC) | | |

Date: 10/09/24

Date: 10/21/24

| | |
|---|---|
| Sample Diameter (in.): | 2.415 |
| Sample Thickness (in.): | 1.000 |
| Weight of Sample + ring (g): | 196.82 |
| Weight of Ring (g): | 42.15 |
| Height after consol. (in.): | 0.9655 |
| **Before Test** | |
| Wt. of Wet Sample+Cont. (g): | 215.09 |
| Wt. of Dry Sample+Cont. (g): | 194.75 |
| Weight of Container (g): | 67.11 |
| Initial Moisture Content (%) | 15.9 |
| Initial Dry Density (pcf) | 111.0 |
| Initial Saturation (%): | 83 |
| Initial Vertical Reading (in.) | 0.1091 |
| **After Test** | |
| Wt. of Wet Sample+Cont. (g): | 264.60 |
| Wt. of Dry Sample+Cont. (g): | 241.55 |
| Weight of Container (g): | 67.32 |
| Final Moisture Content (%) | 17.45 |
| Final Dry Density (pcf): | 113.8 |
| Final Saturation (%): | 98 |
| Final Vertical Reading (in.) | 0.1459 |
| Specific Gravity (assumed): | 2.70 |
| Water Density (pcf): | 62.43 |

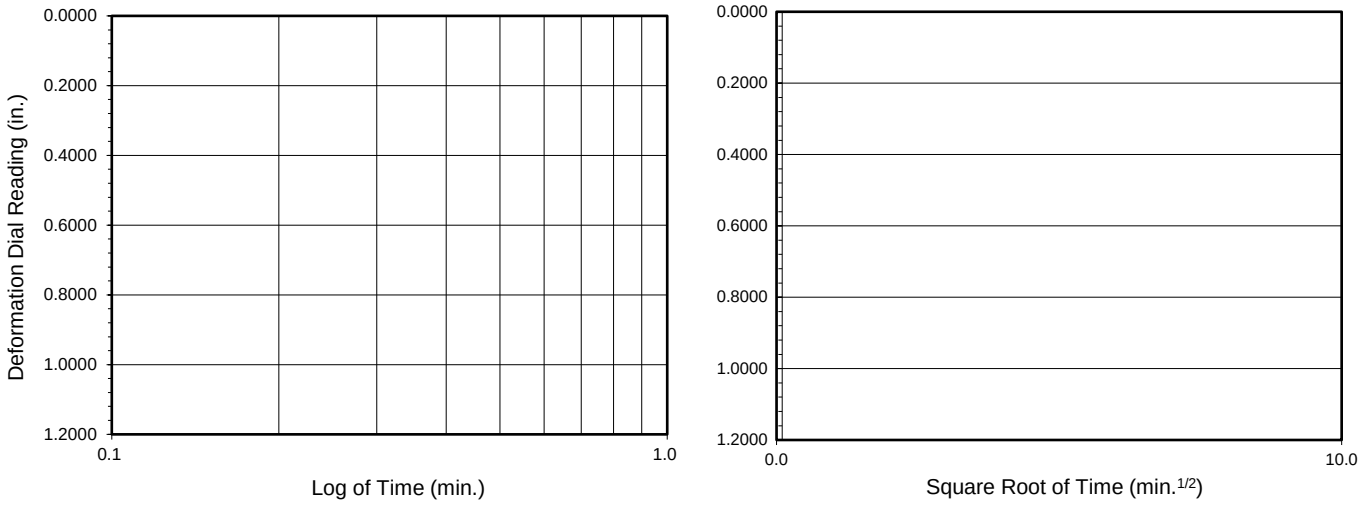


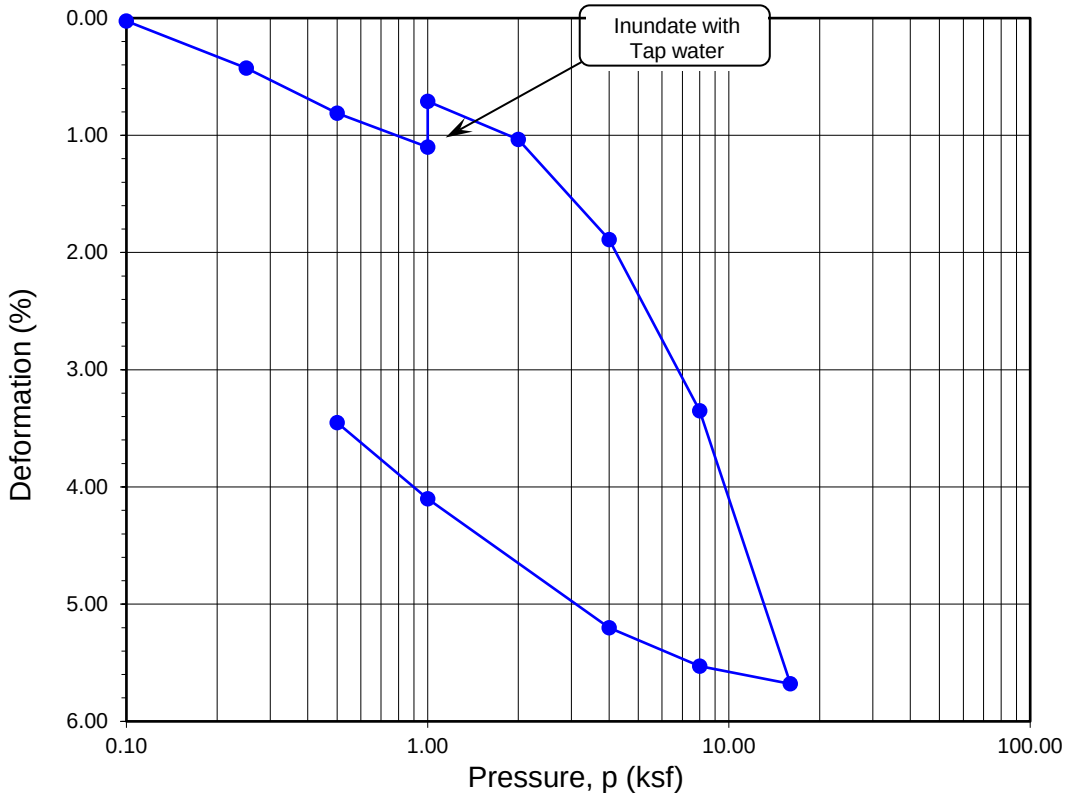

| Pressure (p) (ksf) | Final Reading (in.) | Apparent Thickness (in.) | Load Compliance (%) | Deformation % of Sample Thickness | Void Ratio | Corrected Deformation (%) |
|---|---|---|---|---|---|---|
| 0.10 | 0.1094 | 0.9998 | 0.00 | 0.02 | 0.519 | 0.02 |
| 0.25 | 0.1135 | 0.9957 | 0.01 | 0.43 | 0.513 | 0.42 |
| 0.50 | 0.1176 | 0.9915 | 0.04 | 0.85 | 0.507 | 0.81 |
| 1.00 | 0.1209 | 0.9882 | 0.08 | 1.18 | 0.503 | 1.10 |
| 1.00 | 0.1170 | 0.9921 | 0.08 | 0.79 | 0.508 | 0.71 |
| 2.00 | 0.1210 | 0.9882 | 0.15 | 1.19 | 0.503 | 1.04 |
| 4.00 | 0.1304 | 0.9787 | 0.24 | 2.13 | 0.491 | 1.89 |
| 8.00 | 0.1460 | 0.9631 | 0.34 | 3.69 | 0.468 | 3.35 |
| 16.00 | 0.1707 | 0.9384 | 0.48 | 6.16 | 0.433 | 5.68 |
| 8.00 | 0.1684 | 0.9407 | 0.40 | 5.93 | 0.435 | 5.53 |
| 4.00 | 0.1645 | 0.9446 | 0.34 | 5.54 | 0.440 | 5.20 |
| 1.00 | 0.1527 | 0.9564 | 0.26 | 4.36 | 0.457 | 4.10 |
| 0.50 | 0.1459 | 0.9632 | 0.23 | 3.68 | 0.467 | 3.45 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Time Readings

| Date | Time | Elapsed Time (min) | Square Root of Time | Dial Rdgs. (in.) |
|---|---|---|---|---|
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Time Readings




| Boring No. | Sample No. | Depth (ft.) | Moisture Content (%) | | Dry Density (pcf) | | Void Ratio | | Degree of Saturation (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| **HS-3** | **R-4** | **7.5** | **15.9** | **17.5** | **111.0** | **113.8** | **0.519** | **0.467** | **83** | **98** |

Soil Identification: Brown clayey sand (SC)

**ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS**
**ASTM D 2435**

Project No.: 23203-01

Gateway Village

**COI/Gateway**
**Project Number: 23007-01**

# APPENDIX C
# SUMMARY OF SOIL LABORATORY DATA

**Irvine, CA**

| Boring/Sample Information | | | | | | Field Wet Density (pcf) | Field Dry Density (pcf) | Field Moisture Content (%) | Degree of Sat. (%) | Sieve/ Hydrometer | | Atterberg Limits | | USCS Group Symbol | Direct Shear | | | | Compaction | | Expansion Index | R-Value | Soluble Sulfate Content (% by wt) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Ultimate | | Peak | | | | | | | |
| Boring No. | Sample No. | Depth (feet) | End Depth (feet) | Elevation (feet) | Blow Count (N) | | | | | Fines Content (% pass. #200) | Clay Content (% pass. 2µ) | LL (%) | PI (%) | | Cohesion (psf) | Friction Angle (°) | Cohesion (psf) | Friction Angle (°) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | | | | |
| H- 1 | D-1 | 5.0 | | 335.0 | 11 | 120.0 | 106.1 | 13.1 | 60.0 | | | | | | | | | | | | | | | |
| H- 1 | D-2 | 10.0 | | 330.0 | 9 | 123.0 | 106.0 | 16.1 | 73.6 | | | | | | | | | | | | | | | |
| H- 1 | D-3 | 15.0 | | 325.0 | 7 | 105.3 | 95.5 | 10.4 | 36.6 | 51 | | | | ML | | | | | | | | | | CN |
| H- 1 | D-4 | 20.0 | | 320.0 | 10 | 129.9 | 113.6 | 14.3 | 80.0 | | | 30 | 14 | CL | 100 | 28 | 425 | 28.0 | | | | | | CN |
| H- 1 | D-5 | 25.0 | | 315.0 | 28 | 134.2 | 117.8 | 14.0 | 87.5 | | | | | | | | | | | | | | | |
| H- 1 | D-6 | 30.0 | | 310.0 | 42 | 136.0 | 118.5 | 14.8 | 94.8 | | | | | | | | | | | | | | | |
| H- 1 | D-7 | 35.0 | | 305.0 | 30 | 134.3 | 117.1 | 14.7 | 90.4 | | | | | | | | | | | | | | | |
| H- 1 | D-8 | 40.0 | | 300.0 | 21 | 122.7 | 112.0 | 9.6 | 51.2 | | | | | | | | | | | | | | | |
| H- 1 | D-9 | 45.0 | | 295.0 | 32 | 123.3 | 104.4 | 18.0 | 79.4 | | | | | | | | | | | | | | | |
| H- 1 | D-10 | 50.0 | | 290.0 | 32 | 111.3 | 108.8 | 2.2 | 11.0 | | | | | | | | | | | | | | | |
| H- 1 | D-11 | 55.0 | | 285.0 | 62 | 126.5 | 123.9 | 2.1 | 15.7 | | | | | | | | | | | | | | | |
| H- 1 | D-12 | 60.0 | | 280.0 | 51 | | | 4.6 | | | | | | | | | | | | | | | | Disturbed |
| H- 1 | D-13 | 65.0 | | 275.0 | 50/5" | 122.5 | 120.4 | 1.8 | 12.0 | | | | | | | | | | | | | | | |
| H- 1 | D-14 | 70.0 | | 270.0 | 35 | 112.3 | 105.6 | 6.3 | 28.7 | | | | | | | | | | | | | | | |
| H- 1 | D-15 | 75.0 | | 265.0 | 31 | 119.4 | 111.4 | 7.2 | 38.0 | | | | | | | | | | | | | | | |
| H- 1 | D-16 | 80.0 | | 260.0 | 39 | 116.8 | 110.3 | 5.9 | 30.2 | | | | | | | | | | | | | | | |
| H- 1 | D-17 | 85.0 | | 255.0 | 67 | 118.2 | 113.8 | 3.9 | 21.7 | | | | | | | | | | | | | | | |
| H- 1 | D-18 | 90.0 | | 250.0 | 78 | 125.0 | 108.3 | 15.4 | 74.7 | | | | | | | | | | | | | | | |
| H- 1 | D-19 | 95.0 | | 245.0 | 50/1.5" | | | 11.4 | | | | | | | | | | | | | | | | Disturbed |
| H- 1 | SPT-1 | 100.0 | | 240.0 | 60/9" | | | | | | | | | | | | | | | | | | | |
| H- 2 | D-1 | 5.0 | | 364.0 | 17 | 120.8 | 111.5 | 8.4 | 44.3 | | | | | | | | | | | | | | | |
| H- 2 | B-1 | 5.0 | 9.0 | 364.0 | | | 116.5 | 18.4 | | 36 | 12 | 28 | 9 | SC | 200 | 26 | 600 | 26.5 | 129.5 | 9.5 | 12 | | 0.05 | |
| H- 2 | D-2 | 10.0 | | 359.0 | 8 | 110.4 | 100.8 | 9.5 | 38.2 | 73 | | | | ML | 150 | 27 | 150 | 30.0 | | | | | | |
| H- 2 | D-3 | 15.0 | | 354.0 | 10 | 106.5 | 98.4 | 8.3 | 31.3 | | | | | | | | | | | | | | | |
| H- 2 | D-4 | 20.0 | | 349.0 | 9 | 110.8 | 98.7 | 12.3 | 46.8 | | | | | | | | | | | | | | | |
| H- 2 | D-5 | 25.0 | | 344.0 | 45 | 136.1 | 123.2 | 10.5 | 77.0 | | | | | | | | | | | | | | | |
| H- 2 | D-6 | 30.0 | | 339.0 | 13 | 123.9 | 113.3 | 9.3 | 51.8 | | | | | | | | | | | | | | | |
| H- 2 | D-7 | 35.0 | | 334.0 | 32 | 123.2 | 111.0 | 11.0 | 57.5 | | | | | | | | | | | | | | | |
| H- 2 | D-8 | 40.0 | | 329.0 | 37 | 115.6 | 106.2 | 8.8 | 40.6 | | | | | | | | | | | | | | | |
| H- 2 | D-9 | 45.0 | | 324.0 | 41 | 133.7 | 120.7 | 10.8 | 73.9 | | | | | | | | | | | | | | | |
| H- 2 | D-10 | 50.0 | | 319.0 | 53 | 127.5 | 117.8 | 8.2 | 51.4 | | | | | | | | | | | | | | | |
| H- 2 | D-11 | 55.0 | | 314.0 | 49 | 130.1 | 112.9 | 15.3 | 83.7 | | | | | | | | | | | | | | | |
| H- 2 | D-12 | 65.0 | | 304.0 | 82/9" | 141.5 | 132.0 | 7.2 | 70.2 | | | | | | | | | | | | | | | |
| H- 2 | D-13 | 75.0 | | 294.0 | 85/7" | 133.7 | 116.5 | 14.8 | 89.5 | | | | | | | | | | | | | | | |
| H- 3 | D-1 | 5.0 | | 383.0 | 11 | 121.3 | 114.1 | 6.4 | 36.0 | | | | | | | | | | | | | | | |

# APPENDIX C
## SUMMARY OF SOIL LABORATORY DATA



| Boring/Sample Information | | | | | | Field Wet Density (pcf) | Field Dry Density (pcf) | Field Moisture Content (%) | Degree of Sat. (%) | Sieve/ Hydrometer | | Atterberg Limits | | USCS Group Symbol | Direct Shear | | | | Compaction | | Expansion Index | R-Value | Soluble Sulfate Content (% by wt) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Ultimate | | Peak | | | | | | | |
| Boring No. | Sample No. | Depth (feet) | End Depth (feet) | Elevation (feet) | Blow Count (N) | | | | | Fines Content (% pass. #200) | Clay Content (% pass. 2μ) | LL (%) | PI (%) | | Cohesion (psf) | Friction Angle (°) | Cohesion (psf) | Friction Angle (°) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | | | | |
| H- 3 | D-2 | 10.0 | | 378.0 | 14 | 111.4 | 108.1 | 3.1 | 14.8 | | | | | | | | | | | | | | | |
| H- 3 | D-3 | 15.0 | | 373.0 | 9 | 103.4 | 98.0 | 5.4 | 20.4 | 27 | | | | SM | | | | | | | | | | CN |
| H- 3 | D-4 | 20.0 | | 368.0 | 15 | | | 5.0 | | | | | | | | | | | | | | | | Disturbed |
| H- 3 | D-5 | 25.0 | | 363.0 | 60 | 127.5 | 124.7 | 2.3 | 17.5 | | | | | | | | | | | | | | | |
| H- 3 | D-6 | 30.0 | | 358.0 | 10 | 115.5 | 106.1 | 8.9 | 40.9 | | | | | | | | | | | | | | | |
| H- 3 | D-7 | 35.0 | | 353.0 | 28 | 128.7 | 114.8 | 12.1 | 70.0 | | | | | | | | | | | | | | | |
| H- 3 | D-8 | 40.0 | | 348.0 | 36 | 124.5 | 106.3 | 17.1 | 79.1 | | | | | | | | | | | | | | | |
| H- 3 | D-9 | 45.0 | | 343.0 | 41 | 137.6 | 123.8 | 11.2 | 83.4 | | | | | | | | | | | | | | | |
| H- 3 | D-10 | 50.0 | | 338.0 | 55 | 125.2 | 122.0 | 2.6 | 18.7 | | | | | | | | | | | | | | | |
| H- 3 | D-11 | 55.0 | | 333.0 | 36 | 119.6 | 113.0 | 5.8 | 31.8 | | | | | | | | | | | | | | | |
| H- 3 | D-12 | 65.0 | | 323.0 | 70/10" | 131.4 | 110.4 | 19.0 | 97.7 | | | | | | | | | | | | | | | |
| H- 3 | D-13 | 75.0 | | 313.0 | 30 | 132.6 | 114.7 | 15.6 | 90.0 | | | | | | | | | | | | | | | |
| H- 3 | D-14 | 85.0 | | 303.0 | 85/9" | 135.7 | 117.7 | 15.3 | 95.6 | | | | | | | | | | | | | | | |
| H- 4 | B-1 | 3.0 | 6.0 | 419.5 | | | | | | 16 | | | | SM | | | | | 129.5 | 7.5 | 0 | | 0.05 | |
| H- 4 | D-1 | 5.0 | | 417.5 | 11 | 105.5 | 101.6 | 3.9 | 15.9 | | | | | | | | | | | | | | | |
| H- 4 | D-2 | 10.0 | | 412.5 | 12 | | | 1.3 | | | | | | | | | | | | | | | | Disturbed |
| H- 4 | D-3 | 15.0 | | 407.5 | 11 | | | 1.8 | | | | | | | | | | | | | | | | Disturbed |
| H- 4 | D-4 | 20.0 | | 402.5 | 26 | 126.0 | 124.2 | 1.5 | 11.2 | | | | | | | | | | | | | | | |
| H- 4 | D-5 | 25.0 | | 397.5 | 33 | 122.4 | 110.5 | 10.8 | 55.3 | | | 34 | 18 | CL | | | | | | | | | | CN |
| H- 4 | D-6 | 30.0 | | 392.5 | 56 | 125.6 | 111.2 | 13.0 | 68.0 | | | | | | | | | | | | | | | |
| H- 4 | D-7 | 35.0 | | 387.5 | 64 | 122.8 | 112.9 | 8.8 | 48.0 | | | | | | | | | | | | | | | |
| H- 4 | D-8 | 40.0 | | 382.5 | 85/9" | 118.5 | 109.5 | 8.2 | 41.2 | | | | | | | | | | | | | | | |
| H- 5 | D-1 | 5.0 | | 348.5 | 11 | 122.0 | 105.6 | 15.5 | 70.5 | | | | | | | | | | | | | | | |
| H- 5 | D-2 | 10.0 | | 343.5 | 8 | 119.3 | 107.4 | 11.0 | 52.4 | | | NP | NP | SM | | | | | | | | | | CN |
| H- 5 | D-3 | 15.0 | | 338.5 | 9 | 109.6 | 96.9 | 13.2 | 48.0 | | | | | | | | | | | | | | | |
| H- 5 | D-4 | 20.0 | | 333.5 | 25 | 130.0 | 111.9 | 16.1 | 86.2 | | | | | | | | | | | | | | | |
| H- 5 | D-5 | 25.0 | | 328.5 | 41 | 135.4 | 117.5 | 15.2 | 94.8 | | | | | | | | | | | | | | | |
| H- 5 | D-6 | 30.0 | | 323.5 | 28 | 133.7 | 114.7 | 16.6 | 95.4 | | | | | | | | | | | | | | | |
| H- 5 | D-7 | 35.0 | | 318.5 | 19 | 123.0 | 114.8 | 7.1 | 41.1 | | | | | | | | | | | | | | | |
| H- 5 | D-8 | 40.0 | | 313.5 | 29 | 116.1 | 110.9 | 4.7 | 24.4 | | | | | | | | | | | | | | | |
| H- 5 | D-9 | 45.0 | | 308.5 | 31 | 124.5 | 105.1 | 18.5 | 82.7 | | | | | | | | | | | | | | | |
| H- 5 | D-10 | 50.0 | | 303.5 | 38 | 125.8 | 116.0 | 8.5 | 50.7 | | | | | | | | | | | | | | | |
| H- 5 | SPT-1 | 60.0 | | 293.5 | 90/11" | | | 7.6 | | | | | | | | | | | | | | | | |
| H- 6 | D-1 | 5.0 | | 340.0 | 20 | 124.4 | 114.4 | 8.8 | 50.0 | | | | | | | | | | | | | | | |
| H- 6 | D-2 | 10.0 | | 335.0 | 9 | 103.9 | 95.0 | 9.4 | 32.7 | 17 | | NP | NP | SM | | | | | | | | | | |

# APPENDIX C
## SUMMARY OF SOIL LABORATORY DATA



| Boring/Sample Information | | | | | | Field Wet Density (pcf) | Field Dry Density (pcf) | Field Moisture Content (%) | Degree of Sat. (%) | Sieve/ Hydrometer | | Atterberg Limits | | USCS Group Symbol | Direct Shear | | | | Compaction | | Expansion Index | R-Value | Soluble Sulfate Content (% by wt) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Ultimate | | Peak | | | | | | | |
| Boring No. | Sample No. | Depth (feet) | End Depth (feet) | Elevation (feet) | Blow Count (N) | | | | | Fines Content (% pass. #200) | Clay Content (% pass. 2μ) | LL (%) | PI (%) | | Cohesion (psf) | Friction Angle (°) | Cohesion (psf) | Friction Angle (°) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | | | | |
| H- 6 | D-3 | 15.0 | | 330.0 | 9 | 111.2 | 101.2 | 9.9 | 40.2 | | | | | SM | | | | | | | | | | |
| H- 6 | D-4 | 20.0 | | 325.0 | 13 | 130.9 | 114.6 | 14.3 | 81.9 | 46 | | 28 | 12 | SC/CL | | | | | | | | | | |
| H- 6 | D-5 | 25.0 | | 320.0 | 50/6" | 138.7 | 123.5 | 12.3 | 91.1 | | | | | | | | | | | | | | | |
| H- 6 | D-6 | 30.0 | | 315.0 | 50 | 132.0 | 114.8 | 15.0 | 86.5 | | | | | | | | | | | | | | | |
| H- 7 | D-1 | 5.0 | | 346.0 | 11 | 81.7 | 79.0 | 3.4 | 8.0 | | | | | | | | | | | | | | | |
| H- 7 | D-2 | 10.0 | | 341.0 | 20 | 110.3 | 104.1 | 6.0 | 26.0 | 19 | 6 | | | SM | | | | | | | | | | Collapse |
| H- 7 | D-3 | 15.0 | | 336.0 | 37 | 118.0 | 114.7 | 2.9 | 16.8 | | | | | | | | | | | | | | | |
| H- 7 | D-4 | 20.0 | | 331.0 | 46 | | | 3.6 | | | | | | | | | | | | | | | | Disturbed |
| H- 7 | D-5 | 25.0 | | 326.0 | 76 | 117.8 | 114.8 | 2.6 | 14.8 | | | | | | | | | | | | | | | |
| H- 7 | D-6 | 30.0 | | 321.0 | 84 | | | 3.4 | | | | | | | | | | | | | | | | Disturbed |
| H- 7 | D-7 | 35.0 | | 316.0 | 50/6" | | | | | | | | | | | | | | | | | | | |
| H- 7 | D-8 | 40.0 | | 311.0 | 50/2" | | | | | | | | | | | | | | | | | | | |
| H- 8 | D-1 | 5.0 | | 357.0 | 27 | 123.3 | 118.5 | 4.1 | 26.1 | | | | | | | | | | | | | | | |
| H- 8 | D-2 | 10.0 | | 352.0 | 19 | 117.0 | 107.4 | 8.9 | 42.4 | 43 | | | | SM | | | | | | | | | | Collapse |
| H- 8 | D-3 | 15.0 | | 347.0 | 44 | 123.5 | 120.1 | 2.8 | 19.0 | | | | | | | | | | | | | | | |
| H- 8 | D-4 | 20.0 | | 342.0 | 80 | 120.0 | 117.1 | 2.5 | 15.2 | | | | | | | | | | | | | | | |
| H- 8 | D-5 | 25.0 | | 337.0 | 35 | 106.4 | 103.9 | 2.4 | 10.5 | | | | | | | | | | | | | | | |
| H- 8 | D-6 | 30.0 | | 332.0 | 34 | 115.0 | 109.6 | 4.9 | 24.7 | | | | | | | | | | | | | | | |
| H- 9 | D-1 | 5.0 | | 371.0 | 33 | 128.8 | 118.8 | 8.4 | 54.2 | | | | | | | | | | | | | | | |
| H- 9 | D-2 | 10.0 | | 366.0 | 12 | 112.4 | 84.1 | 33.7 | 90.7 | | | NP | NP | SM | | | | | | | | | | |
| H- 9 | D-3 | 15.0 | | 361.0 | 21 | 118.4 | 113.6 | 4.2 | 23.6 | | | | | | | | | | | | | | | |
| H- 9 | D-4 | 20.0 | | 356.0 | 20 | 110.0 | 100.6 | 9.4 | 37.5 | 14 | | | | SM | | | | | | | | | | Collapse |
| H- 9 | D-5 | 25.0 | | 351.0 | 61 | 126.8 | 121.4 | 4.5 | 31.1 | | | | | | | | | | | | | | | |
| H- 9 | D-6 | 30.0 | | 346.0 | 38 | | | | | | | | | | | | | | | | | | | |
| H-10 | D-1 | 5.0 | | 405.0 | 35 | 117.5 | 108.4 | 8.4 | 40.8 | | | | | | | | | | | | | | | |
| H-10 | D-2 | 10.0 | | 400.0 | 13 | 120.4 | 111.7 | 7.8 | 41.5 | | | | | | | | | | | | | | | |
| H-10 | D-3 | 15.0 | | 395.0 | 66 | 110.9 | 105.6 | 5.0 | 22.5 | | | | | | | | | | | | | | | |
| H-10 | D-4 | 20.0 | | 390.0 | 38 | 120.8 | 108.7 | 11.2 | 54.9 | | | 35 | 19 | CL | | | | | | | | | | |
| H-10 | D-5 | 25.0 | | 385.0 | 25 | 105.9 | 94.3 | 12.3 | 42.3 | | | | | | | | | | | | | | | |
| H-10 | SPT-1 | 30.0 | | 380.0 | 9 | | | 8.8 | | | | | | | | | | | | | | | | |
| H-10 | D-6 | 35.0 | | 375.0 | 39 | 127.5 | 119.1 | 7.0 | 45.8 | | | | | | | | | | | | | | | |
| H-10 | SPT-2 | 37.5 | | 372.5 | 14 | | | 5.5 | | | | | | | | | | | | | | | | |
| H-10 | D-7 | 40.0 | | 370.0 | 40 | 124.9 | 108.1 | 15.6 | 75.1 | | | | | | | | | | | | | | | |
| H-10 | SPT-3 | 42.5 | | 367.5 | 18 | | | 9.0 | | | | | | | | | | | | | | | | |
| H-10 | D-8 | 45.0 | | 365.0 | 60 | 120.9 | 114.9 | 5.2 | 30.0 | | | | | | | | | | | | | | | |

# APPENDIX C
## SUMMARY OF SOIL LABORATORY DATA



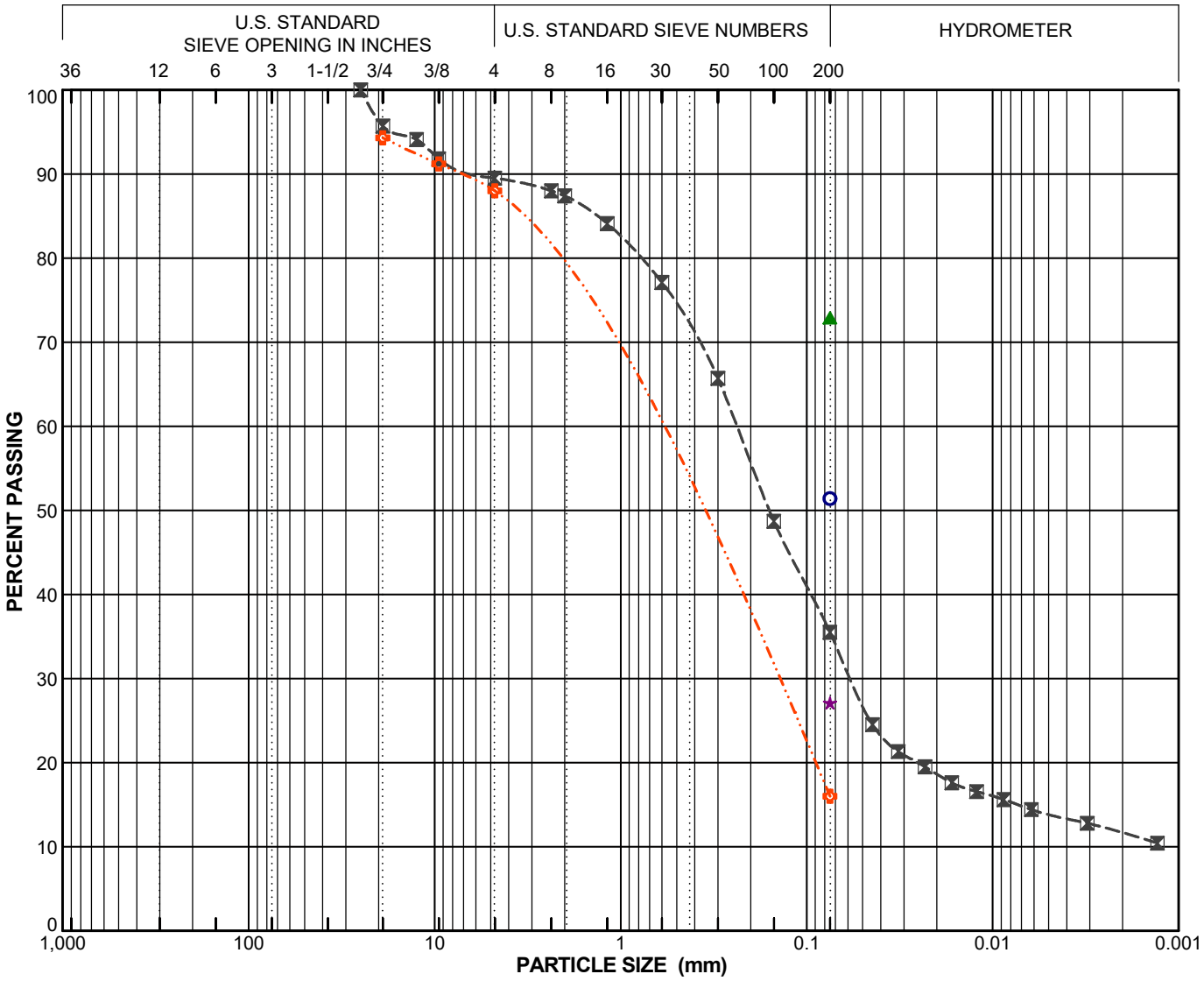
| Boring/Sample Information | | | | | | Field Wet Density (pcf) | Field Dry Density (pcf) | Field Moisture Content (%) | Degree of Sat. (%) | Sieve/ Hydrometer | | Atterberg Limits | | USCS Group Symbol | Direct Shear | | | | Compaction | | Expansion Index | R-Value | Soluble Sulfate Content (% by wt) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Ultimate | | Peak | | | | | | | |
| Boring No. | Sample No. | Depth (feet) | End Depth (feet) | Elevation (feet) | Blow Count (N) | | | | | Fines Content (% pass. #200) | Clay Content (% pass. 2μ) | LL (%) | PI (%) | | Cohesion (psf) | Friction Angle (°) | Cohesion (psf) | Friction Angle (°) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | | | | |
| H-11 | D-1 | 5.0 | | 412.0 | 21 | 119.4 | 109.0 | 9.6 | 47.2 | | | | | | | | | | | | | | | |
| H-11 | SPT-1 | 7.5 | | 409.5 | 8 | | | 7.1 | | | | | | | | | | | | | | | | |
| H-11 | D-2 | 10.0 | | 407.0 | 34 | 116.4 | 111.6 | 4.3 | 22.6 | 26 | | | | SM | | | | | | | | | | Collapse |
| H-11 | SPT-2 | 12.5 | | 404.5 | 5 | | | 3.7 | | | | | | | | | | | | | | | | |
| H-11 | D-3 | 15.0 | | 402.0 | 14 | | | | | | | | | | | | | | | | | | | NR |
| H-11 | SPT-3 | 17.5 | | 399.5 | 14 | | | 4.2 | | | | | | | | | | | | | | | | |
| H-11 | D-4 | 20.0 | | 397.0 | 30 | 126.1 | 110.8 | 13.9 | 71.9 | | | | | | | | | | | | | | | |
| H-11 | SPT-4 | 25.0 | | 392.0 | 31 | | | 5.6 | | | | | | | | | | | | | | | | |
| H-11 | D-5 | 30.0 | | 387.0 | 43 | 113.2 | 108.6 | 4.3 | 21.2 | | | | | | | | | | | | | | | |
| H-12 | SPT-1 | 5.0 | | 418.0 | 7 | | | 7.8 | | | | | | | | | | | | | | | | |
| H-12 | D-1 | 7.5 | | 415.5 | 35 | 109.5 | 107.6 | 1.8 | 8.4 | 11 | | | | SP-SM | | | | | | | | | | Collapse |
| H-12 | SPT-2 | 10.0 | | 413.0 | 10 | | | 11.9 | | | | | | | | | | | | | | | | |
| H-12 | D-2 | 12.5 | | 410.5 | 66 | 113.5 | 110.5 | 2.7 | 13.7 | | | | | | | | | | | | | | | |
| H-12 | SPT-3 | 15.0 | | 408.0 | 15 | | | 7.3 | | | | | | | | | | | | | | | | |
| H-12 | D-3 | 17.5 | | 405.5 | 20 | 126.3 | 113.0 | 11.8 | 64.6 | | | | | | | | | | | | | | | |
| H-12 | SPT-4 | 20.0 | | 403.0 | 19 | | | 14.4 | | | | | | | | | | | | | | | | |
| H-12 | D-4 | 25.0 | | 398.0 | 43 | 117.0 | 88.8 | 31.7 | 95.5 | 92 | | 49 | 25 | CL/CH | | | | | | | | | | |
| H-12 | SPT-5 | 30.0 | | 393.0 | 30 | | | 6.5 | | | | | | | | | | | | | | | | |
| H-13 | D-1 | 5.0 | | 431.0 | 32 | 123.4 | 120.1 | 2.8 | 18.5 | | | | | | | | | | | | | | | |
| H-13 | SPT-1 | 7.5 | | 428.5 | 13 | | | 7.7 | | | | | | | | | | | | | | | | |
| H-13 | D-2 | 10.0 | | 426.0 | 43 | 112.6 | 106.9 | 5.3 | 24.9 | | | | | | | | | | | | | | | |
| H-13 | SPT-2 | 12.5 | | 423.5 | 7 | | | 6.5 | | | | | | | | | | | | | | | | |
| H-13 | D-3 | 15.0 | | 421.0 | 15 | 122.8 | 112.3 | 9.4 | 50.6 | 41 | | NP | NP | SM | | | | | | | | | | Collapse |
| H-13 | SPT-3 | 17.5 | | 418.5 | 8 | | | 10.6 | | | | | | | | | | | | | | | | |
| H-13 | D-4 | 20.0 | | 416.0 | 41 | 117.6 | 113.6 | 3.5 | 19.6 | 27 | 9 | NP | NP | SM | | | | | | | | | | |
| H-13 | SPT-4 | 25.0 | | 411.0 | 10 | | | 3.6 | | | | | | | | | | | | | | | | |
| H-13 | D-5 | 30.0 | | 406.0 | 28 | 121.7 | 107.3 | 13.4 | 63.4 | | | | | | | | | | | | | | | |
| H-14 | SPT-1 | 5.0 | | 387.0 | 3 | | | 5.7 | | | | | | | | | | | | | | | | |
| H-14 | D-1 | 7.5 | | 384.5 | 14 | 107.7 | 102.9 | 4.6 | 19.6 | | | | | | | | | | | | | | | |
| H-14 | SPT-2 | 10.0 | | 382.0 | 13 | | | 4.9 | | | | | | | | | | | | | | | | |
| H-14 | D-2 | 12.5 | | 379.5 | | | | | | | | | | | | | | | | | | | | NR |
| H-14 | SPT-3 | 15.0 | | 377.0 | 32 | | | 6.7 | | | | | | | | | | | | | | | | |
| H-14 | D-3 | 17.5 | | 374.5 | 62 | | | 2.7 | | | | | | | | | | | | | | | | Disturbed |
| H-14 | SPT-4 | 20.0 | | 372.0 | 10 | | | 8.9 | | | | | | | | | | | | | | | | |
| H-14 | D-4 | 25.0 | | 367.0 | 52 | 115.5 | 111.9 | 3.2 | 17.2 | | | | | | | | | | | | | | | |

# APPENDIX C
## SUMMARY OF SOIL LABORATORY DATA



| Boring/Sample Information | | | | | | Field Wet Density (pcf) | Field Dry Density (pcf) | Field Moisture Content (%) | Degree of Sat. (%) | Sieve/ Hydrometer | | Atterberg Limits | | USCS Group Symbol | Direct Shear | | | | Compaction | | Expansion Index | R-Value | Soluble Sulfate Content (% by wt) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Ultimate | | Peak | | | | | | | |
| Boring No. | Sample No. | Depth (feet) | End Depth (feet) | Elevation (feet) | Blow Count (N) | | | | | Fines Content (% pass. #200) | Clay Content (% pass. 2μ) | LL (%) | PI (%) | | Cohesion (psf) | Friction Angle (°) | Cohesion (psf) | Friction Angle (°) | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | | | | |
| H-14 | SPT-5 | 30.0 | | 362.0 | 28 | | | 2.9 | | | | | | | | | | | | | | | | |
| P-1 | D-1 | 5.0 | | 335.0 | 13 | 121.5 | 113.5 | 7.1 | 39.5 | | | | | | | | | | | | | | | |
| P-1 | D-2 | 11.0 | | 329.0 | 7 | 115.8 | 103.1 | 12.3 | 52.3 | 28 | | | | SM | | | | | | | | | | CN |
| P-2 | D-1 | 5.0 | | 345.0 | 19 | | | 11.9 | | | | | | | | | | | | | | | | Disturbed |
| P-2 | D-2 | 8.0 | | 342.0 | 7 | 110.6 | 94.8 | 16.6 | 57.6 | | | | | | | | | | | | | | | |
| P-2 | D-3 | 11.0 | | 339.0 | 11 | 101.2 | 98.1 | 3.2 | 11.9 | | | | | | | | | | | | | | | |
| P-3 | D-1 | 5.0 | | 331.0 | 17 | 115.5 | 106.9 | 8.1 | 37.8 | | | | | | | | | | | | | | | |
| P-3 | D-2 | 8.5 | | 327.5 | 14 | 123.3 | 112.0 | 10.1 | 54.1 | | | | | | | | | | | | | | | |
| P-4 | D-1 | 5.0 | | 329.0 | 23 | 132.8 | 118.8 | 11.8 | 76.2 | | | | | | | | | | | | | | | |
| P-4 | D-2 | 7.5 | | 326.5 | 26 | 129.9 | 117.7 | 10.4 | 64.8 | | | | | | | | | | | | | | | |
| P-4 | D-3 | 10.0 | | 324.0 | 21 | 127.8 | 118.2 | 8.1 | 51.1 | | | | | | | | | | | | | | | |
| T- 3 | SB-1 | 1.5 | | | | | | 15.9 | | | | | | | | | | | | | | | | |
| T- 3 | SB-2 | 12.0 | | | | | | 13.1 | | | | | | | | | | | | | | | | |
| T- 5 | SB-1 | 3.0 | | | | | | 7.0 | | 24 | | | | SM | | | | | | | | | | |
| T- 7 | SB-1 | 11.0 | | | | | | 3.8 | | 8 | | | | SP-SM | | | | | | | | | | |
| T- 7 | SB-2 | 15.0 | | | | | | 3.1 | | 4 | | | | SP | | | | | | | | | | |
| T-11 | SB-1 | 3.5 | | | | | | 8.1 | | | | | | | | | | | | | | | | |
| T-11 | SB-2 | 9.0 | | | | | | 13.7 | | | | | | | | | | | | | | | | |
| T-12 | SB-1 | 11.0 | | | | | | 7.7 | | | | | | | | | | | | | | | | |
| T-12 | SB-2 | 15.0 | | | | | | 10.2 | | | | | | | | | | | | | | | | |
| T-14 | | 1.0 | | | | | | 4.2 | | | | | | | | | | | | | | | | |
| T-15 | | 2.5 | | | | | | 9.6 | | | | | | | | | | | | | | | | |
| T-15 | | 12.0 | | | | | | 7.5 | | 29 | | | | SM | | | | | | | | | | |

| BOULDERS | COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|---|
| | | coarse | fine | coarse | medium | fine | |



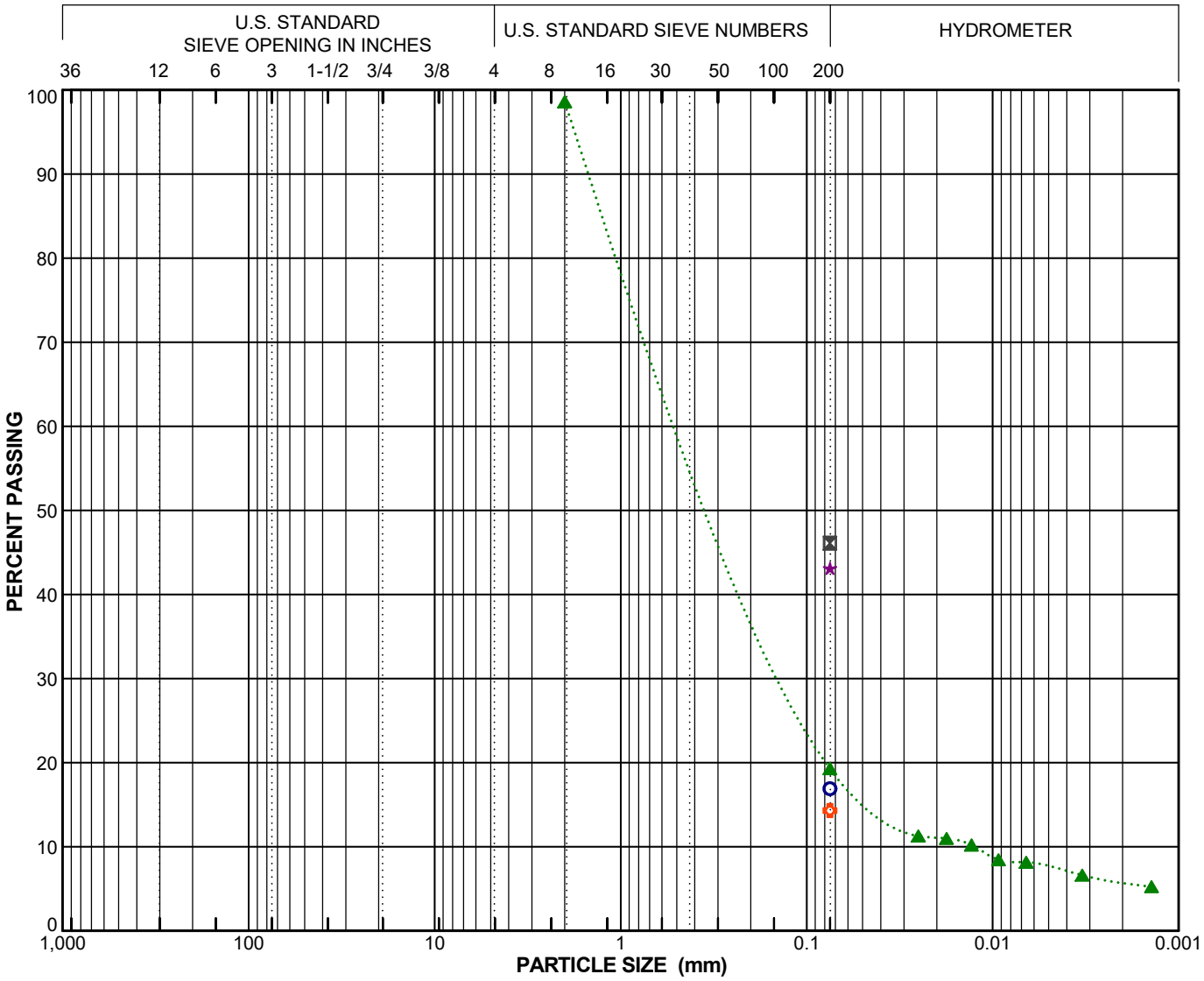

| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | Activity PI/-2μ | $C_u$ | $C_c$ | Passing No. 200 Sieve (%) | Passing 2μ (%) | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | H- 1 | D-3 | 15.0 | 10 | | | | | | 51 | | ML |
| ⊠ | H- 2 | B-1 | 5.0 - 9.0 | 18 | 28 | 9 | 0.75 | | | 36 | 12 | SC |
| ▲ | H- 2 | D-2 | 10.0 | 9 | | | | | | 73 | | ML |
| ★ | H- 3 | D-3 | 15.0 | 5 | | | | | | 27 | | SM |
| ✿ | H- 4 | B-1 | 3.0 - 6.0 | | | | | | | 16 | | SM |

## PARTICLE SIZE DISTRIBUTION

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| BOULDERS | COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|---|
| | | coarse | fine | coarse | medium | fine | |



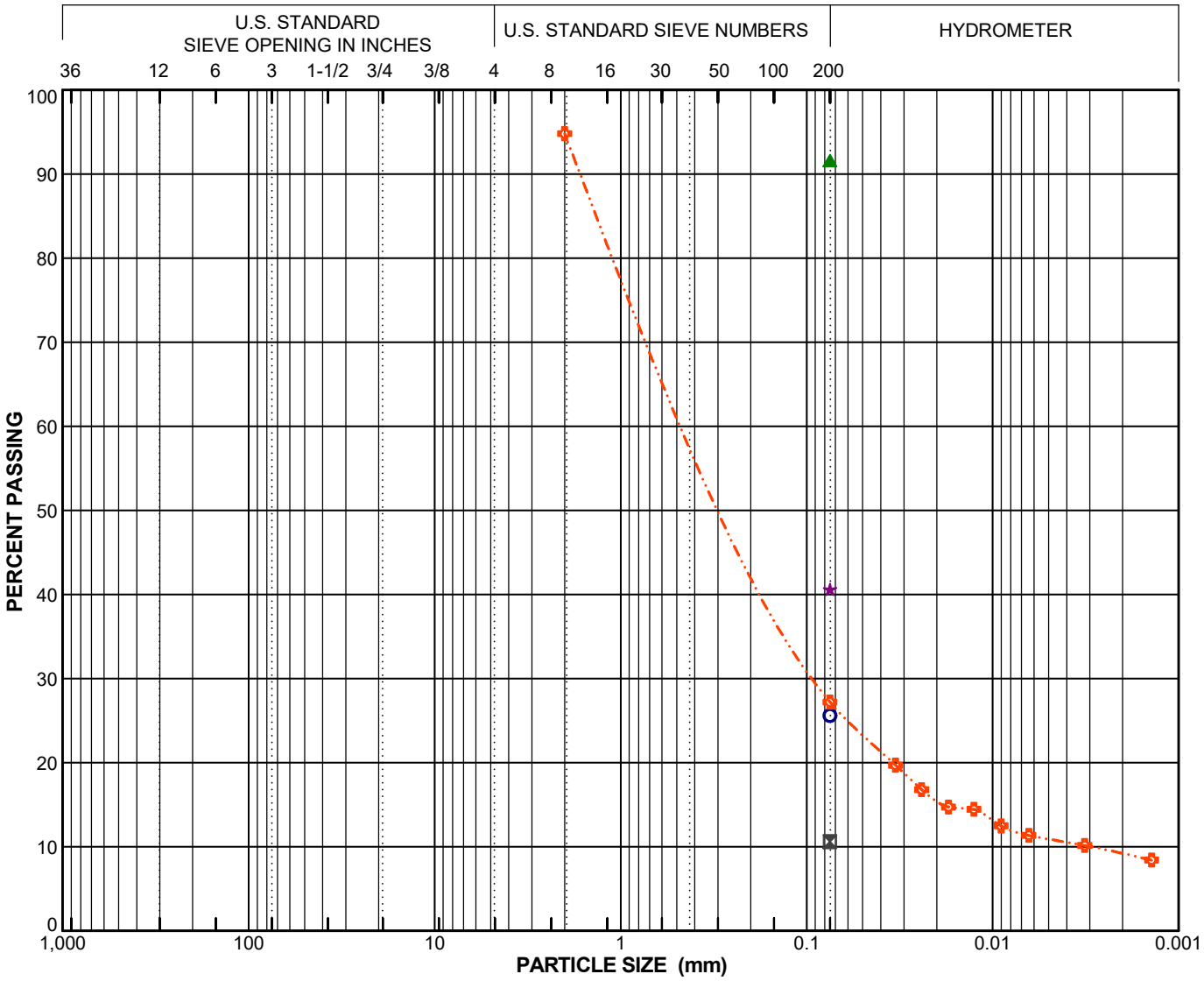

| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | Activity PI/-2μ | $C_u$ | $C_c$ | Passing No. 200 Sieve (%) | Passing 2μ (%) | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | H- 6 | D-2 | 10.0 | 9 | NP | NP | | | | 17 | | SM |
| ⊠ | H- 6 | D-4 | 20.0 | 14 | 28 | 12 | | | | 46 | | SC/CL |
| ▲ | H- 7 | D-2 | 10.0 | 6 | | | | | | 19 | 6 | SM |
| ★ | H- 8 | D-2 | 10.0 | 9 | | | | | | 43 | | SM |
| ✿ | H- 9 | D-4 | 20.0 | 9 | | | | | | 14 | | SM |

## PARTICLE SIZE DISTRIBUTION

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**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.

| BOULDERS | COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|---|
| | | coarse | fine | coarse | medium | fine | |



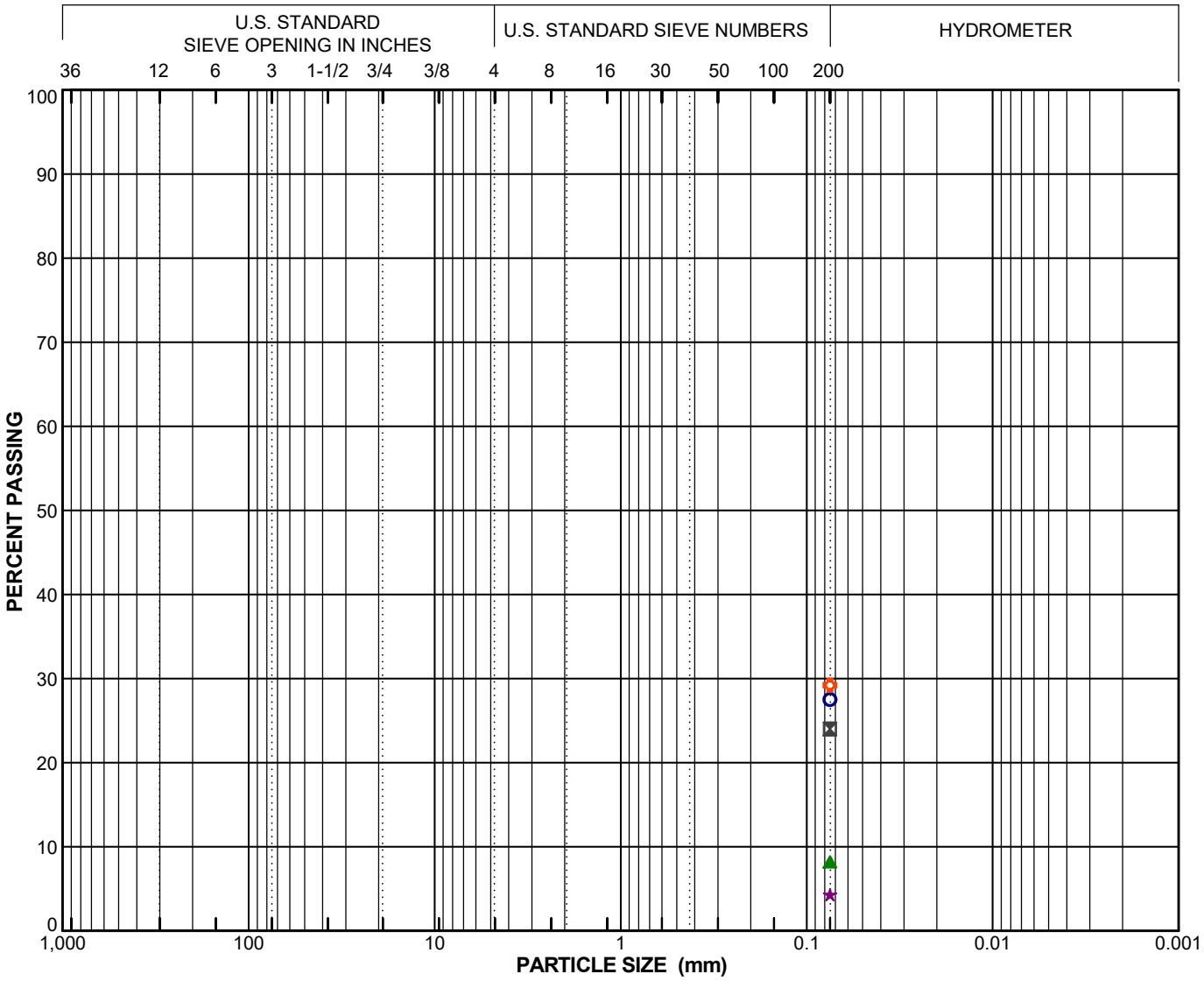

| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | Activity PI/-2μ | $C_u$ | $C_c$ | Passing No. 200 Sieve (%) | Passing 2μ (%) | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | H-11 | D-2 | 10.0 | 4 | | | | | | 26 | | SM |
| ⊠ | H-12 | D-1 | 7.5 | 2 | | | | | | 11 | | SP-SM |
| ▲ | H-12 | D-4 | 25.0 | 32 | 49 | 25 | | | | 92 | | CL/CH |
| ★ | H-13 | D-3 | 15.0 | 9 | NP | NP | | | | 41 | | SM |
| ✿ | H-13 | D-4 | 20.0 | 4 | NP | NP | | | | 27 | 9 | SM |

## PARTICLE SIZE DISTRIBUTION

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**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.

| BOULDERS | COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|---|
| | | coarse | fine | coarse | medium | fine | |

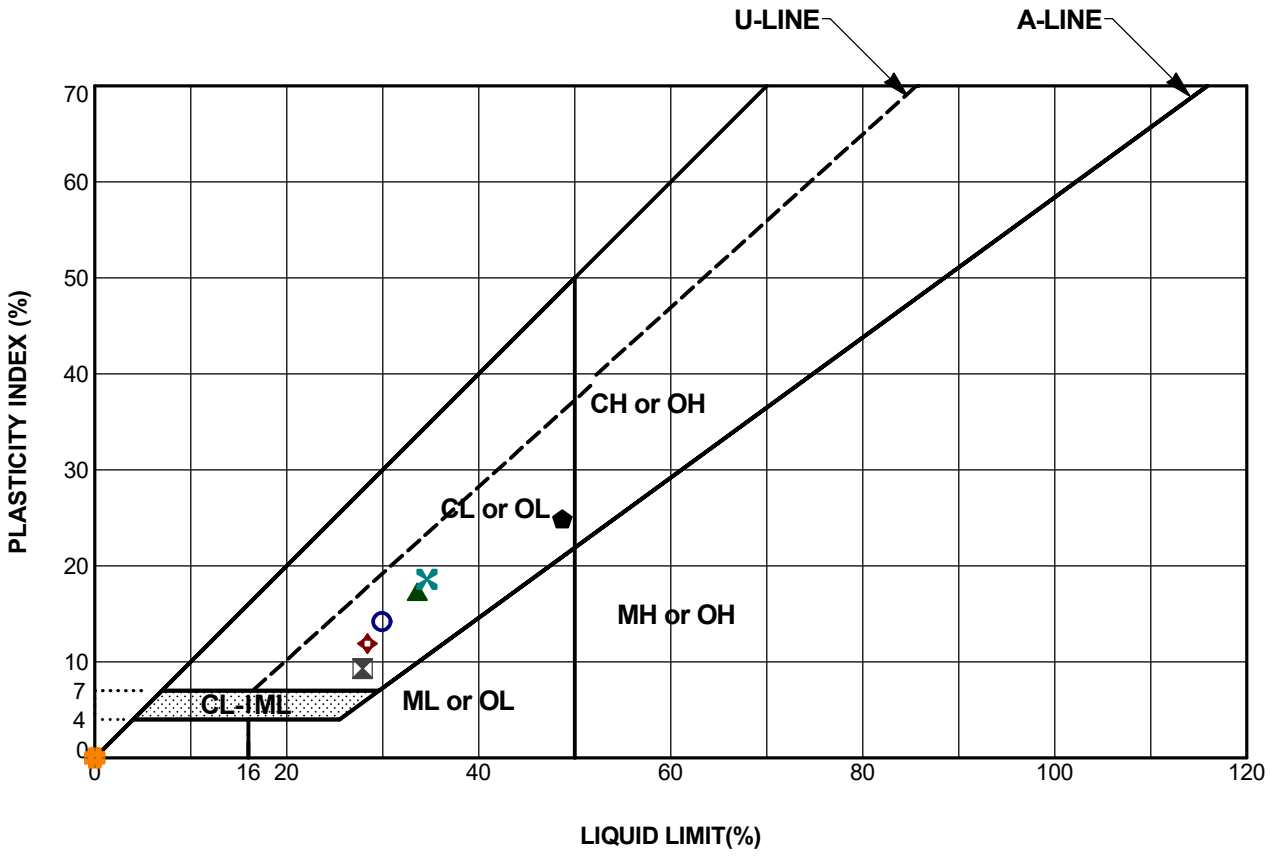



| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | Activity PI/-2μ | $C_u$ | $C_c$ | Passing No. 200 Sieve (%) | Passing 2μ (%) | USCS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | P-1 | D-2 | 11.0 | 12 | | | | | | 28 | | SM |
| ⊠ | T- 5 | SB-1 | 3.0 | 7 | | | | | | 24 | | SM |
| ▲ | T- 7 | SB-1 | 11.0 | 4 | | | | | | 8 | | SP-SM |
| ★ | T- 7 | SB-2 | 15.0 | 3 | | | | | | 4 | | SP |
| ✿ | T-15 | SB-2 | 12.0 | 8 | | | | | | 29 | | SM |

## PARTICLE SIZE DISTRIBUTION

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.

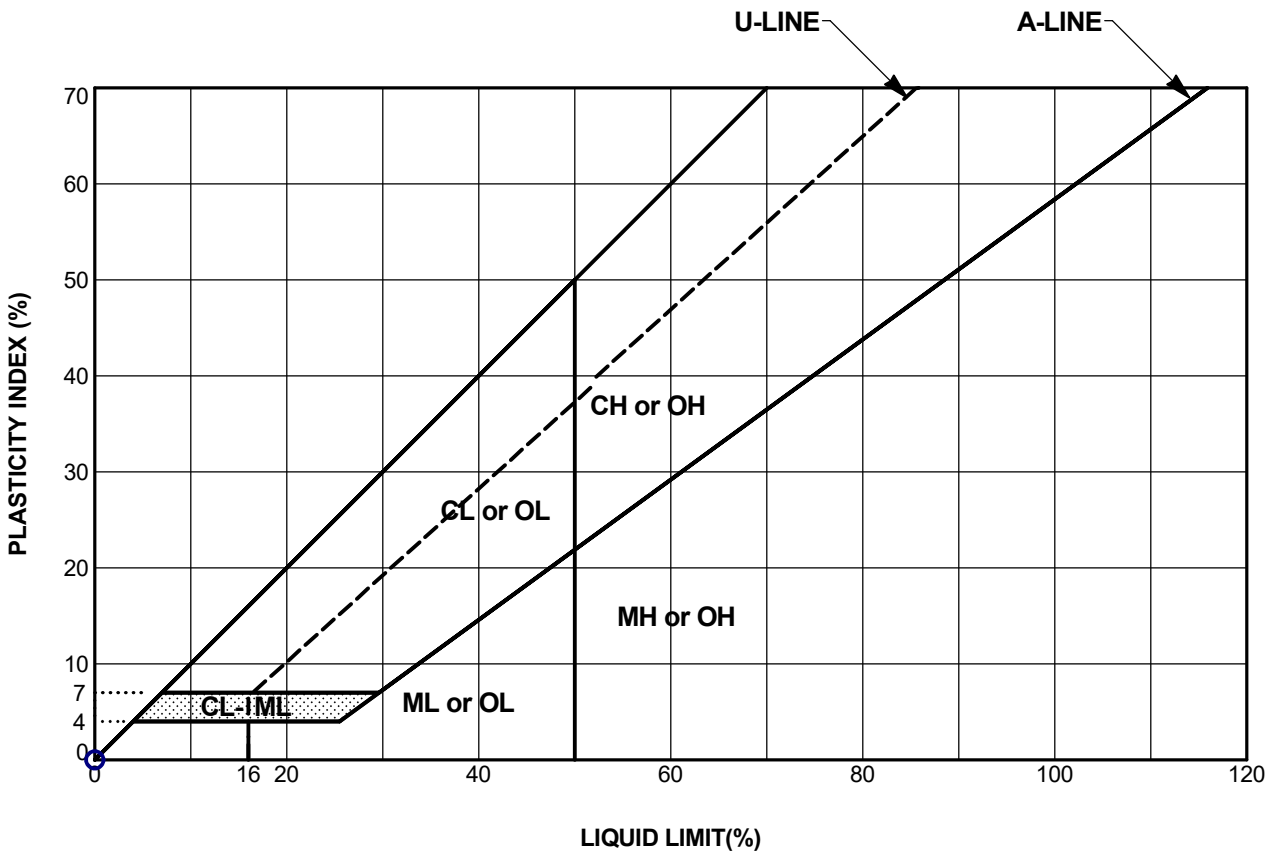



| Symbol | Boring Number | Sample Number | Depth (feet) | Passing No. 200 Sieve (%) | LL | PI | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| ○ | H- 1 | D-4 | 20.0 | | 30 | 14 | CL | (Qal) Dark yellowish brown silty sandy CLAY |
| ⊠ | H- 2 | B-1 | 5.0 - 9.0 | 36 | 28 | 9 | SC | (Qal) Dark yellowish brown clayey SAND |
| ▲ | H- 4 | D-5 | 25.0 | | 34 | 18 | CL | (Qal) Brownish yellow silty CLAY |
| ★ | H- 5 | D-2 | 10.0 | | NP | NP | SM | (Qal) Brown silty SAND |
| ✿ | H- 6 | D-2 | 10.0 | 17 | NP | NP | SM | (Qal) Dark yellowish brown silty SAND |
| ◈ | H- 6 | D-4 | 20.0 | 46 | 28 | 12 | SC/CL | (Qal) Dark yellowish brown clayey SAND/sandy CLAY |
| ● | H- 9 | D-2 | 10.0 | | NP | NP | SM | (Qal) Dark yellowish brown silty SAND |
| ✕ | H-10 | D-4 | 20.0 | | 35 | 19 | CL | (Qal) Dark yellowish brown sandy CLAY |
| ⬟ | H-12 | D-4 | 25.0 | 92 | 49 | 25 | CL/CH | (Qal) Strong brown sandy CLAY/fat CLAY |
| ✹ | H-13 | D-3 | 15.0 | 41 | NP | NP | SM | (Qal) Yellowish brown silty SAND |

## PLASTICITY CHART

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.

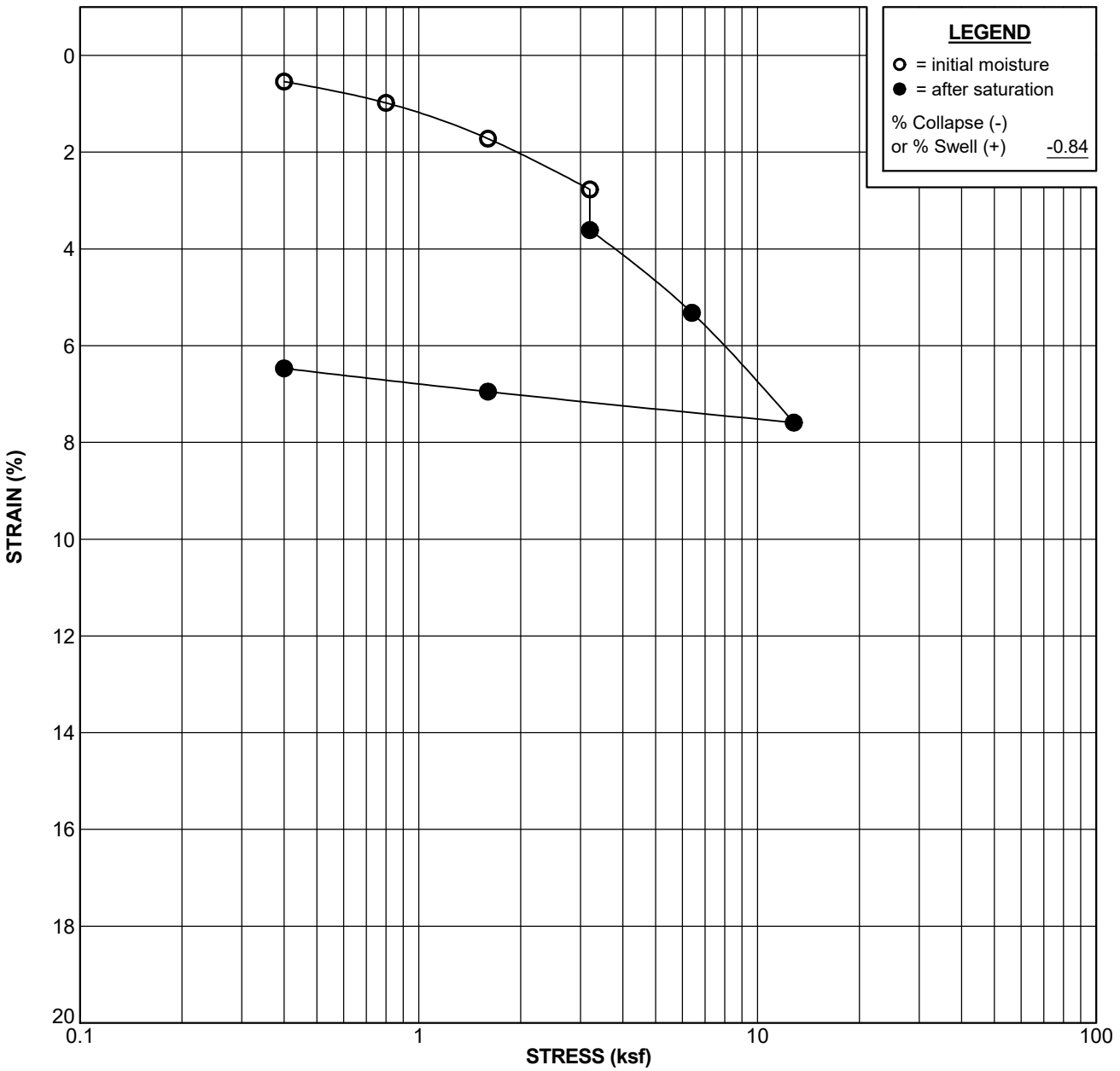



| Symbol | Boring Number | Sample Number | Depth (feet) | Passing No. 200 Sieve (%) | LL | PI | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| o | H-13 | D-4 | 20.0 | 27 | NP | NP | SM | (Qal) Dark yellowish brown silty SAND |
| | | | | | | | | |
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## PLASTICITY CHART

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



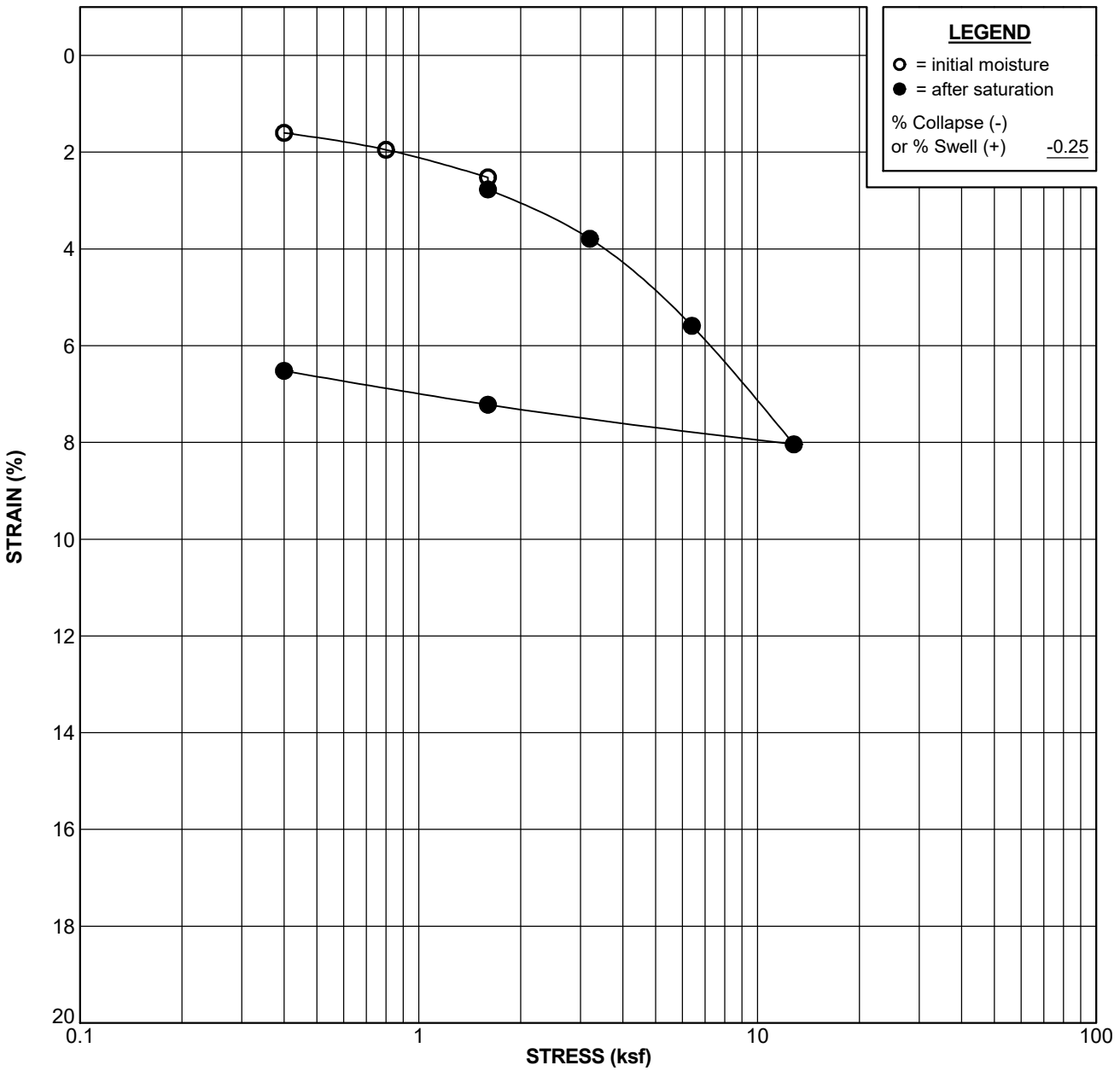

| | | |
|---|---|---|
| **Boring No. H- 1** | **Sample No. D-3** | **Depth: 15.0 ft** |
| **Sample Description:** (Qal) Yellowish brown sandy SILT | | **USCS:** ML |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 51 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 11.8 | 91.9 | 41.4 | 0.725 |
| **Final** | 24.3 | 97.8 | 99.5 | 0.621 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



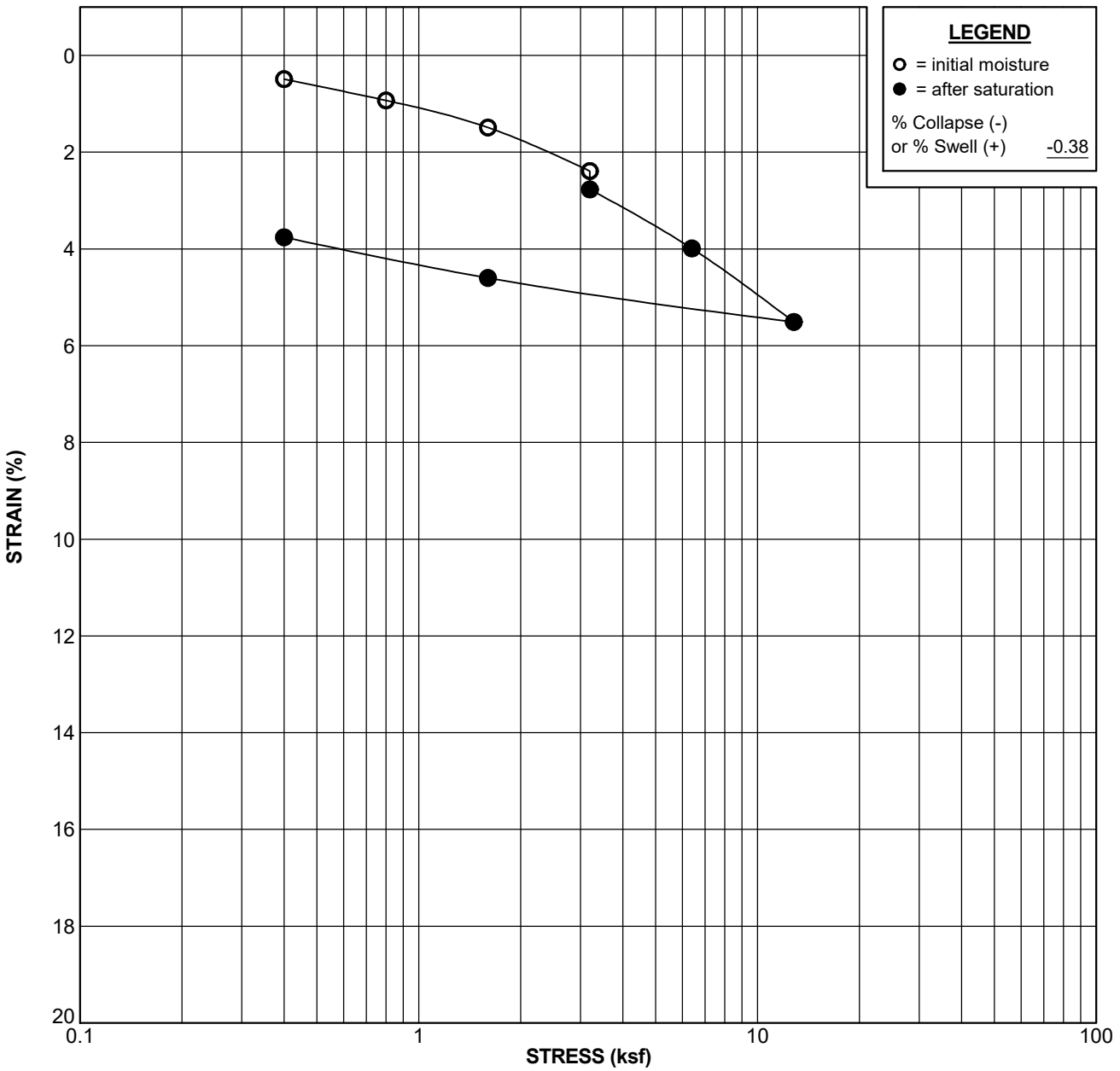

| | | |
|---|---|---|
| **Boring No. H- 1** | **Sample No. D-4** | **Depth: 20.0 ft** |
| **Sample Description:** (Qal) Dark yellowish brown silty sandy CLAY | | **USCS:** CL |
| **Liquid Limit:** 30 | **Plasticity Index:** 14 | **Percent Passing No. 200 Sieve:** |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 14.6 | 108.7 | 71.7 | 0.550 |
| **Final** | 16.8 | 115.8 | 99.7 | 0.455 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



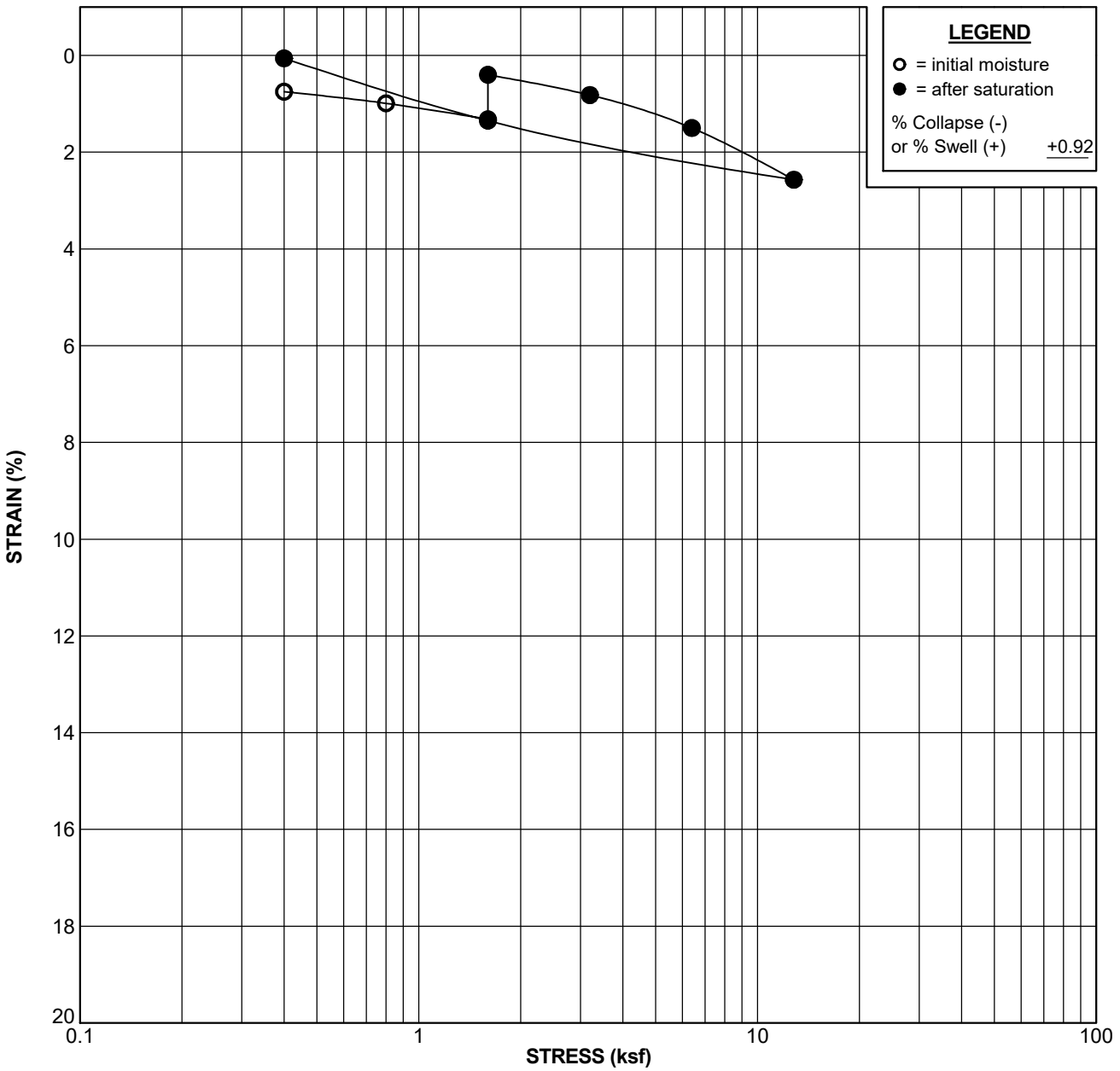

| | | |
|---|---|---|
| **Boring No. H- 3** | **Sample No. D-3** | **Depth: 15.0 ft** |
| **Sample Description:** (Qal) Brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 27 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 11.4 | 89.0 | 37.9 | 0.753 |
| **Final** | 27.1 | 92.4 | 98.4 | 0.688 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



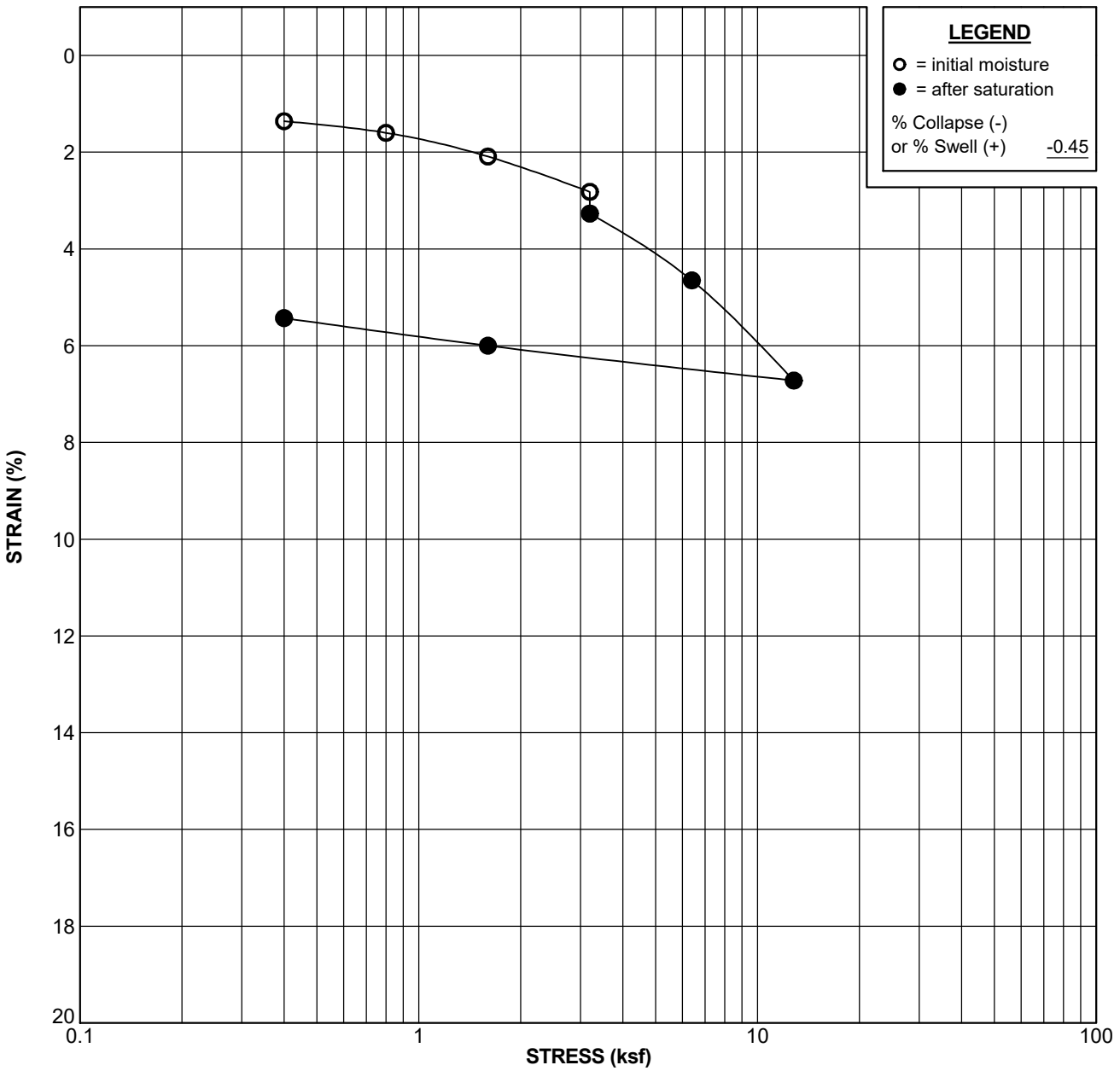

| | | |
|---|---|---|
| **Boring No. H- 4** | **Sample No. D-5** | **Depth: 25.0 ft** |
| **Sample Description:** (Qal) Brownish yellow silty CLAY | | **USCS:** CL |
| **Liquid Limit:** 34 | **Plasticity Index:** 18 | **Percent Passing No. 200 Sieve:** |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 11.5 | 112.1 | 62.2 | 0.497 |
| **Final** | 18.4 | 112.1 | 99.5 | 0.497 |

# CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



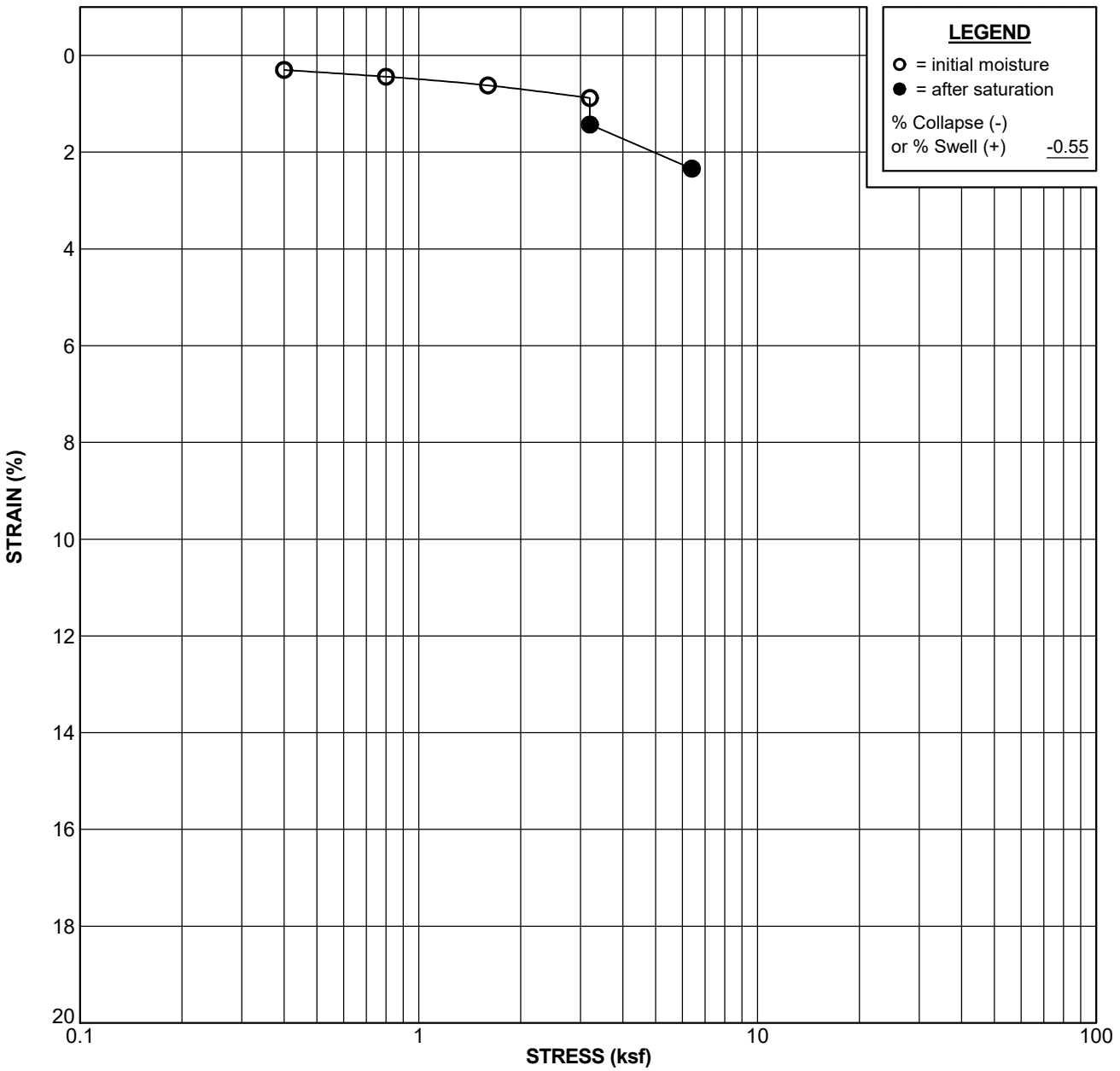

| | | |
|---|---|---|
| **Boring No. H- 5** | **Sample No. D-2** | **Depth: 10.0 ft** |
| **Sample Description:** (Qal) Brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** NP | **Plasticity Index:** NP | **Percent Passing No. 200 Sieve:** |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 12.0 | 103.9 | 55.2 | 0.568 |
| **Final** | 18.6 | 109.5 | 99.6 | 0.487 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



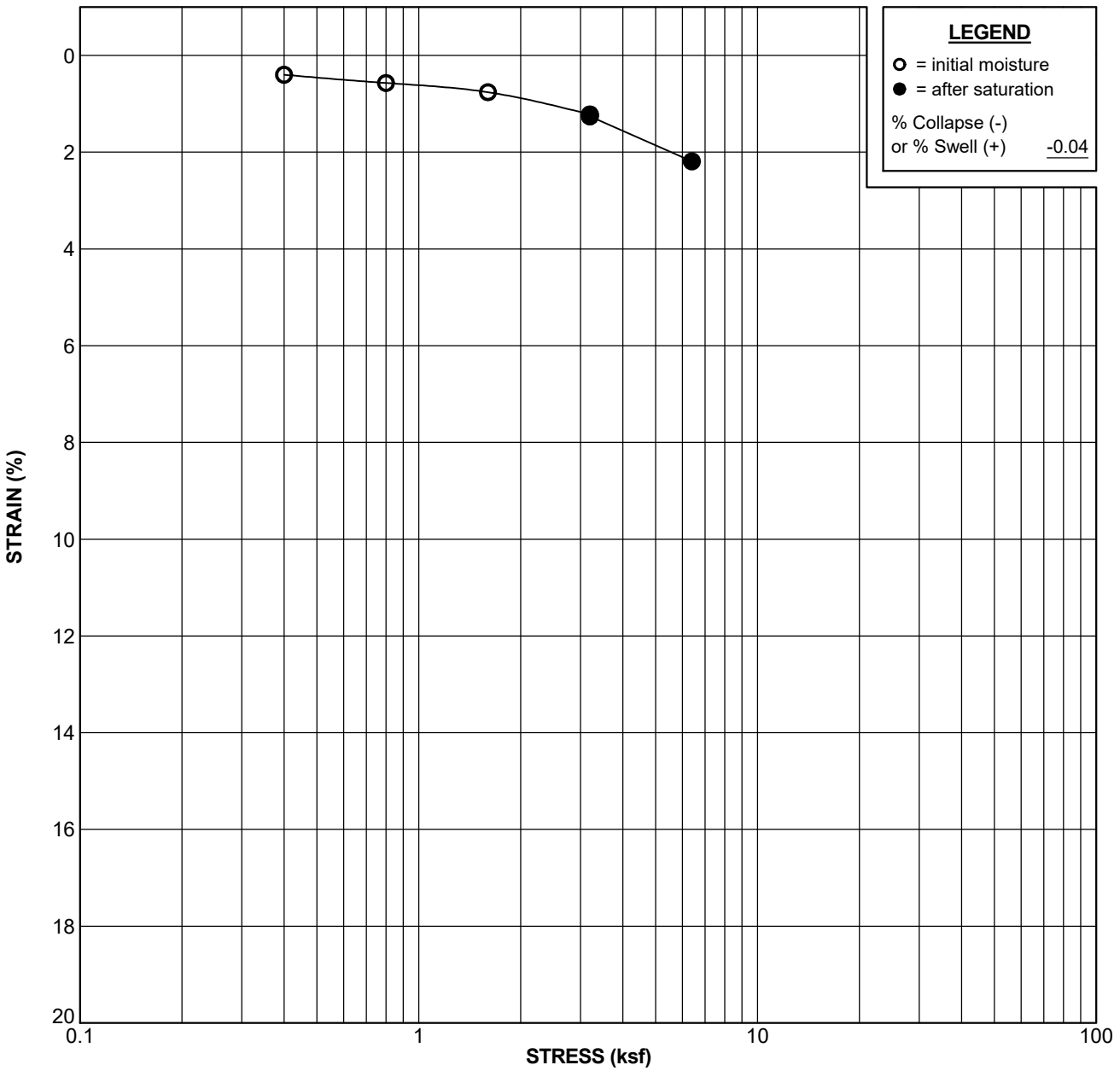

| | | |
|---|---|---|
| **Boring No. H- 7** | **Sample No. D-2** | **Depth: 10.0 ft** |
| **Sample Description:** (Afu) Dark yellowish brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 19 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 4.0 | 101.0 | 19.7 | 0.489 |
| **Final** | 18.8 | 103.4 | 99.7 | 0.454 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



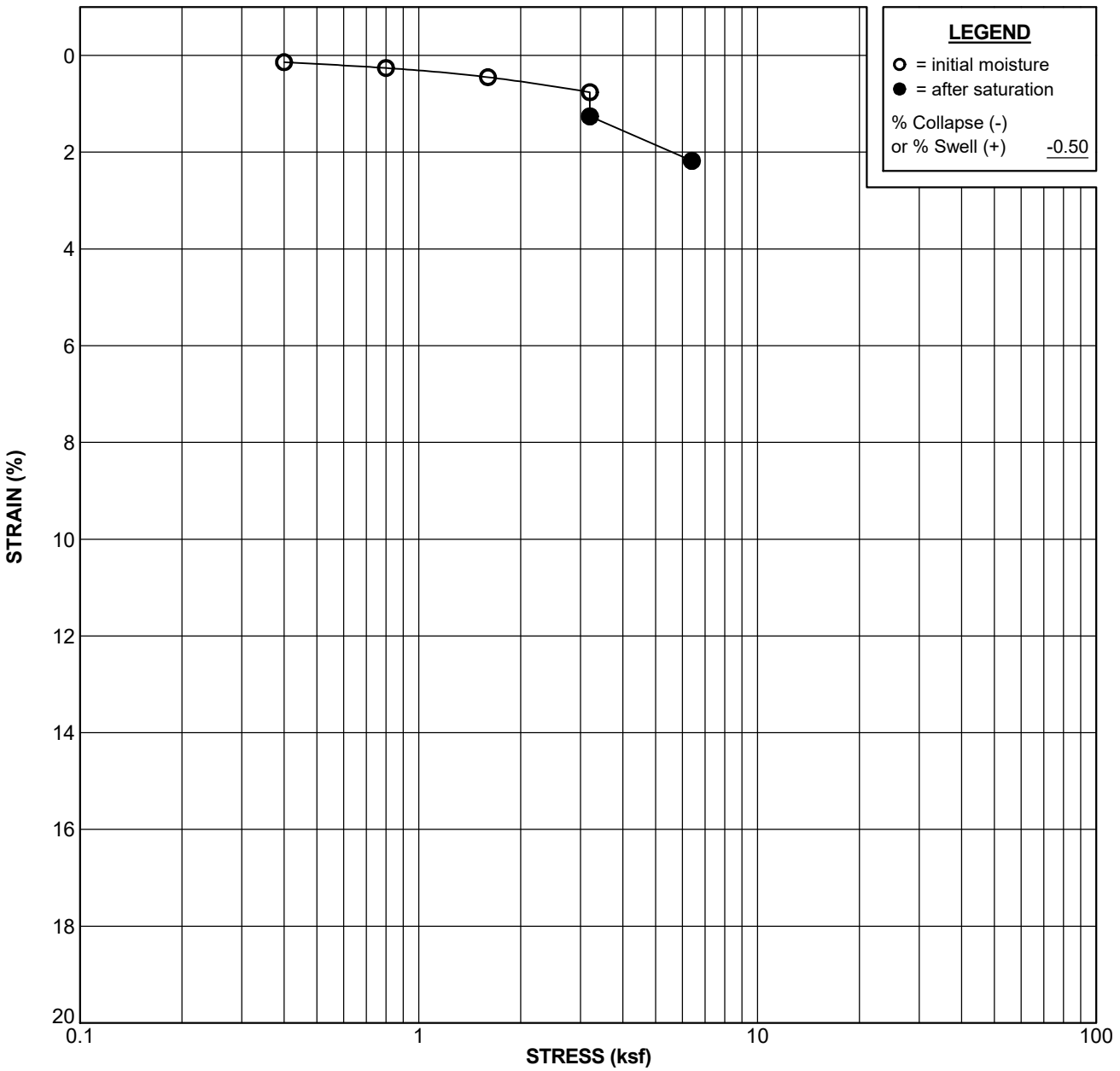

| | | |
|---|---|---|
| **Boring No. H- 8** | **Sample No. D-2** | **Depth: 10.0 ft** |
| **Sample Description:** (Qal) Dark yellowish brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 43 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 12.3 | 104.0 | 57.9 | 0.548 |
| **Final** | 19.7 | 106.3 | 98.8 | 0.515 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



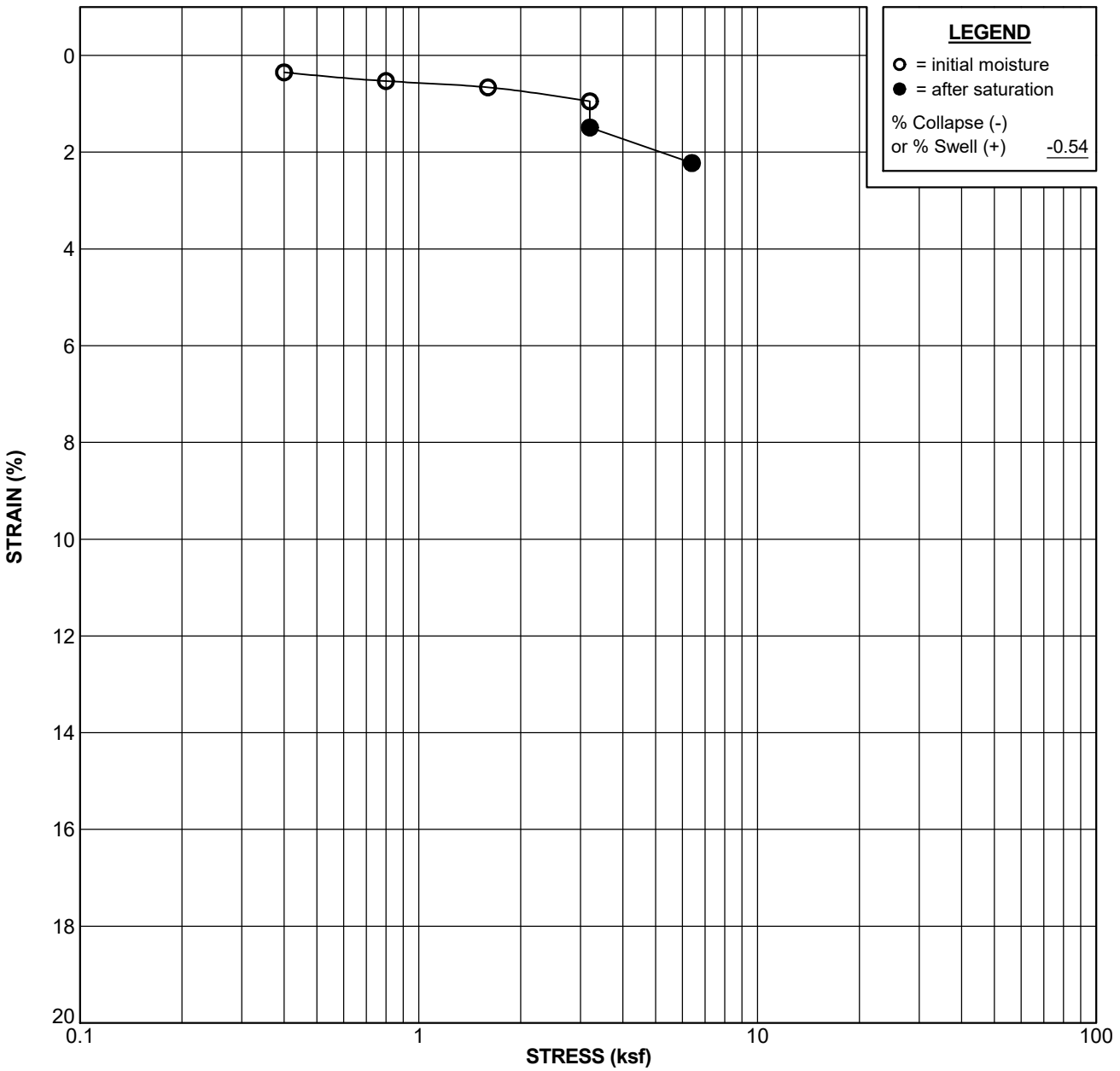

| | | |
|---|---|---|
| **Boring No. H- 9** | **Sample No. D-4** | **Depth: 20.0 ft** |
| **Sample Description:** (Qal) Pale brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 14 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 5.1 | 94.0 | 19.9 | 0.626 |
| **Final** | 24.0 | 96.1 | 99.5 | 0.591 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



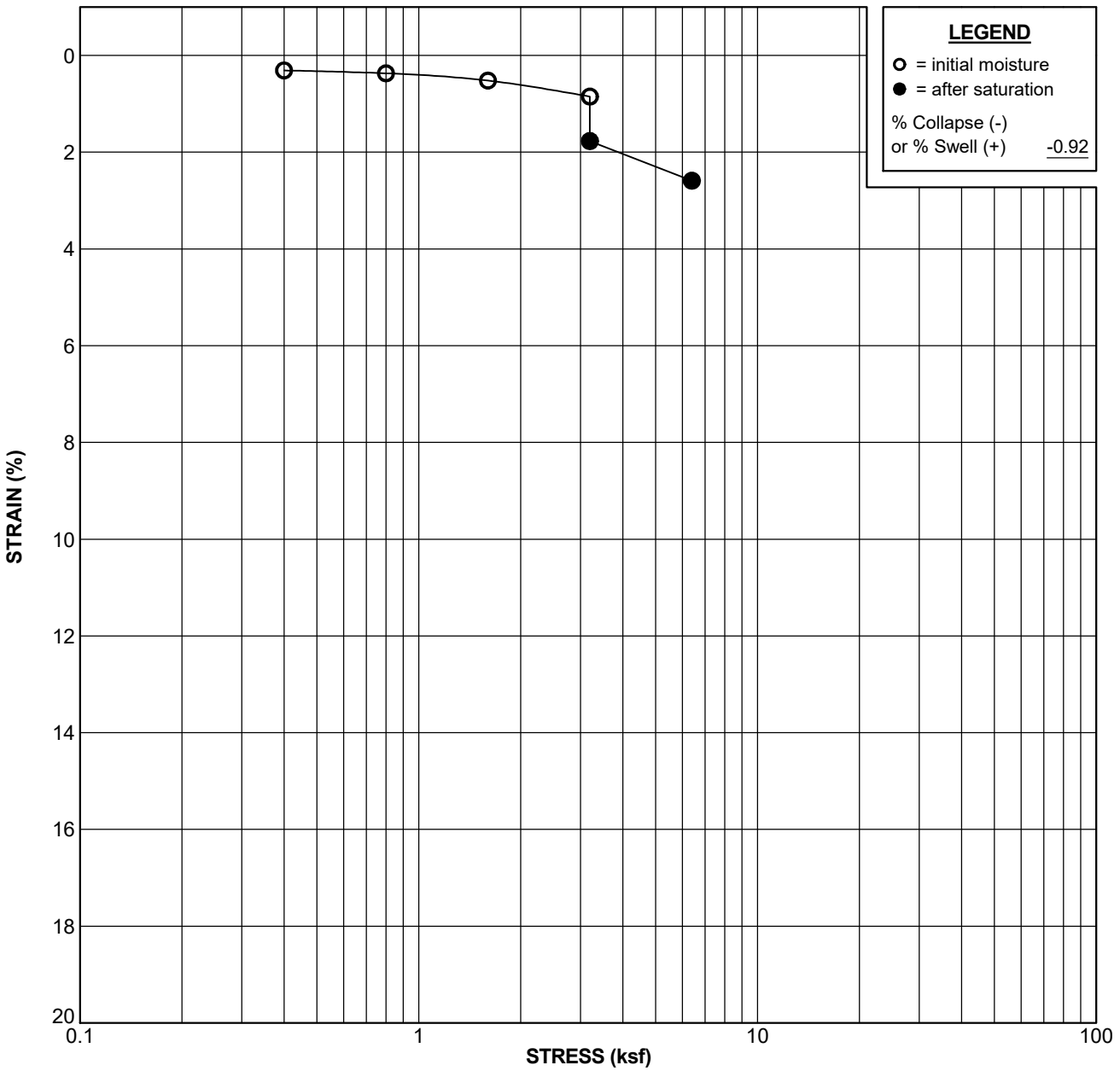

| | | |
|---|---|---|
| **Boring No. H-11** | **Sample No. D-2** | **Depth: 10.0 ft** |
| **Sample Description:** (Afu) Yellowish brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 26 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 4.8 | 108.8 | 27.2 | 0.445 |
| **Final** | 16.2 | 111.3 | 98.9 | 0.413 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



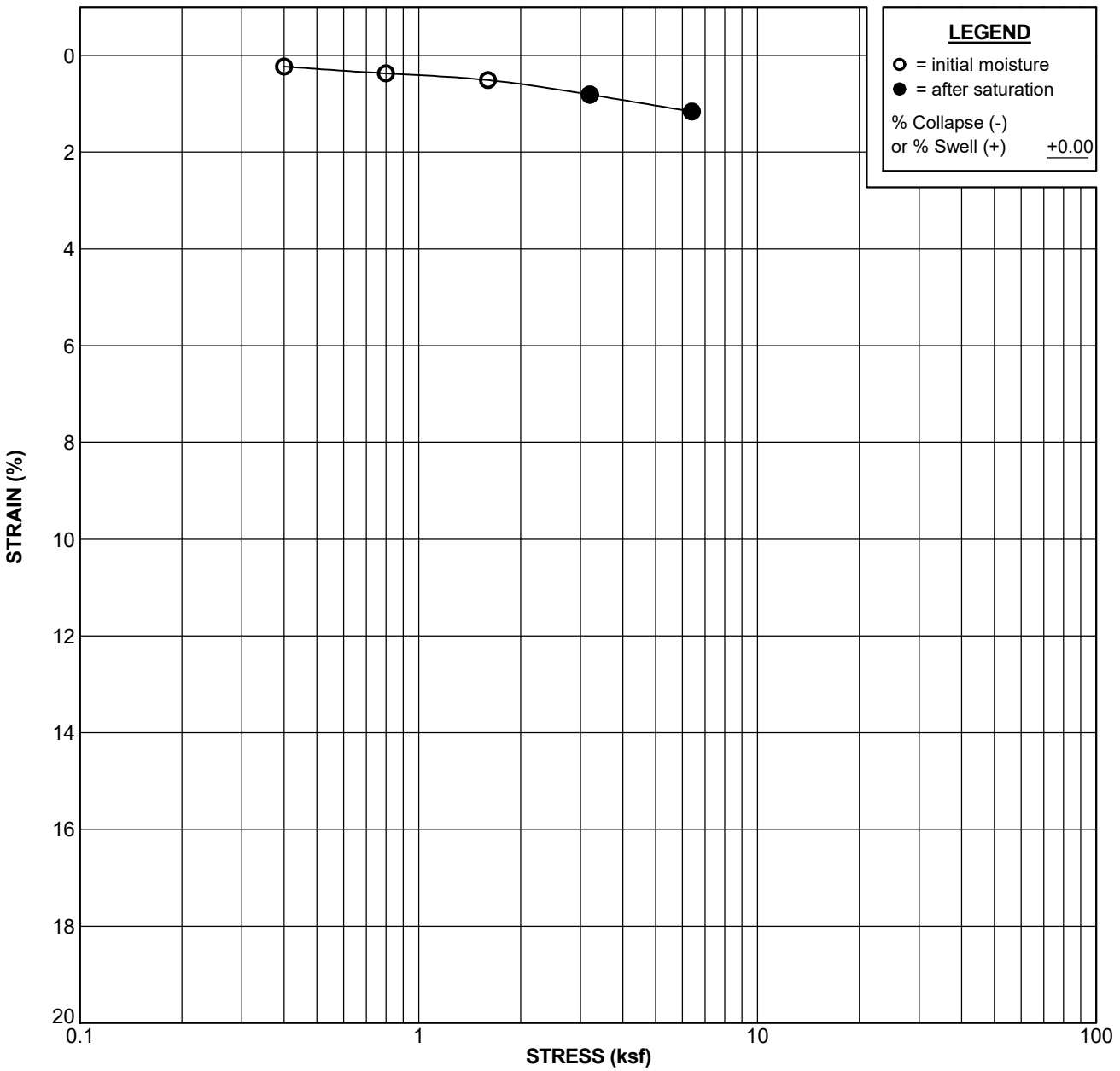

| | | |
|---|---|---|
| **Boring No. H-12** | **Sample No. D-1** | **Depth: 7.5 ft** |
| **Sample Description:** (Qal) Light yellowish brown SAND with silt | | **USCS:** SP-SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 11 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 2.5 | 101.1 | 13.0 | 0.450 |
| **Final** | 17.4 | 103.7 | 98.7 | 0.414 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



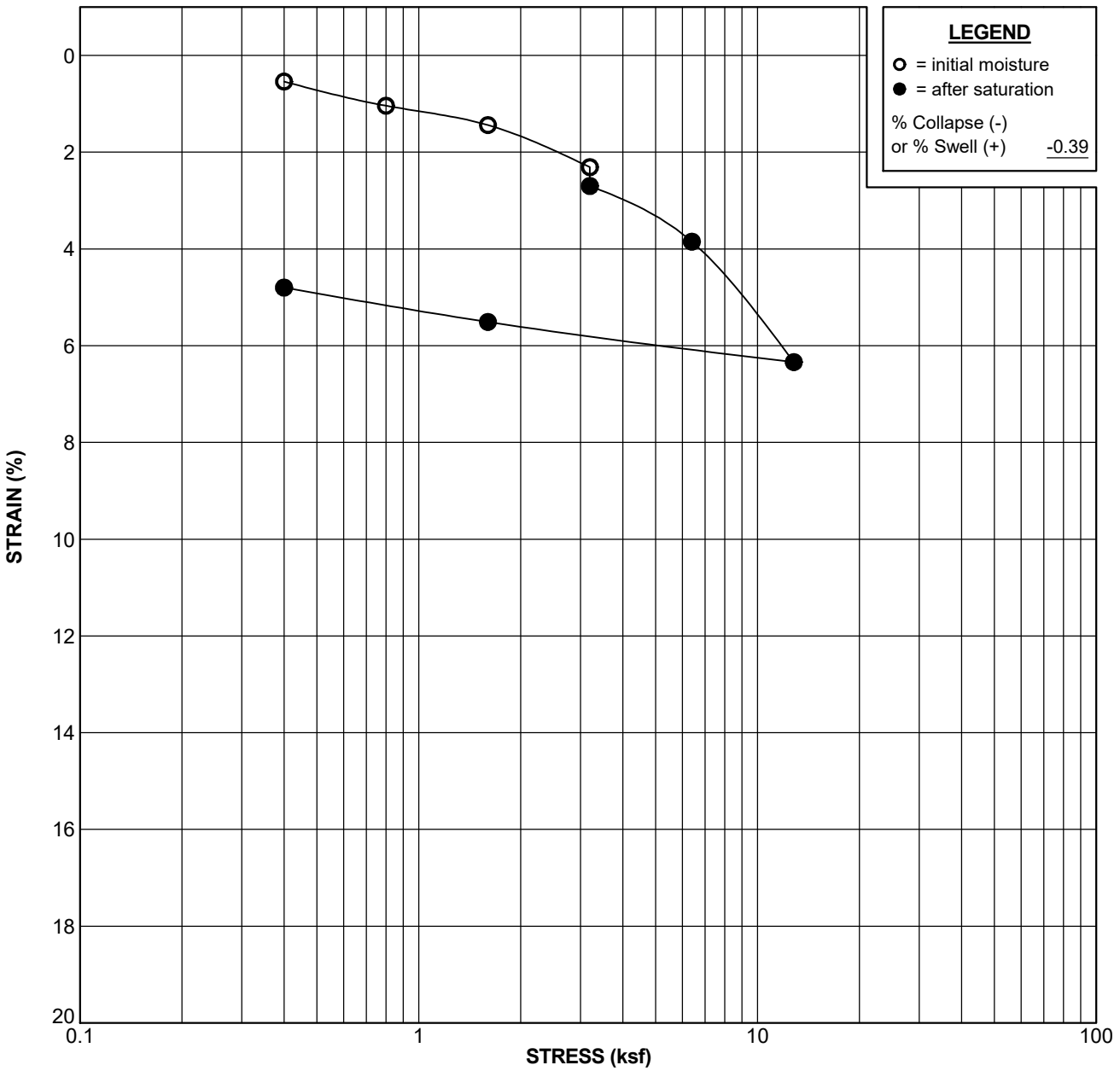

| | | |
|---|---|---|
| **Boring No. H-13** | **Sample No. D-3** | **Depth: 15.0 ft** |
| **Sample Description:** (Qal) Yellowish brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** NP | **Plasticity Index:** NP | **Percent Passing No. 200 Sieve:** 41 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 9.0 | 114.0 | 54.7 | 0.430 |
| **Final** | 15.7 | 115.4 | 99.4 | 0.413 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



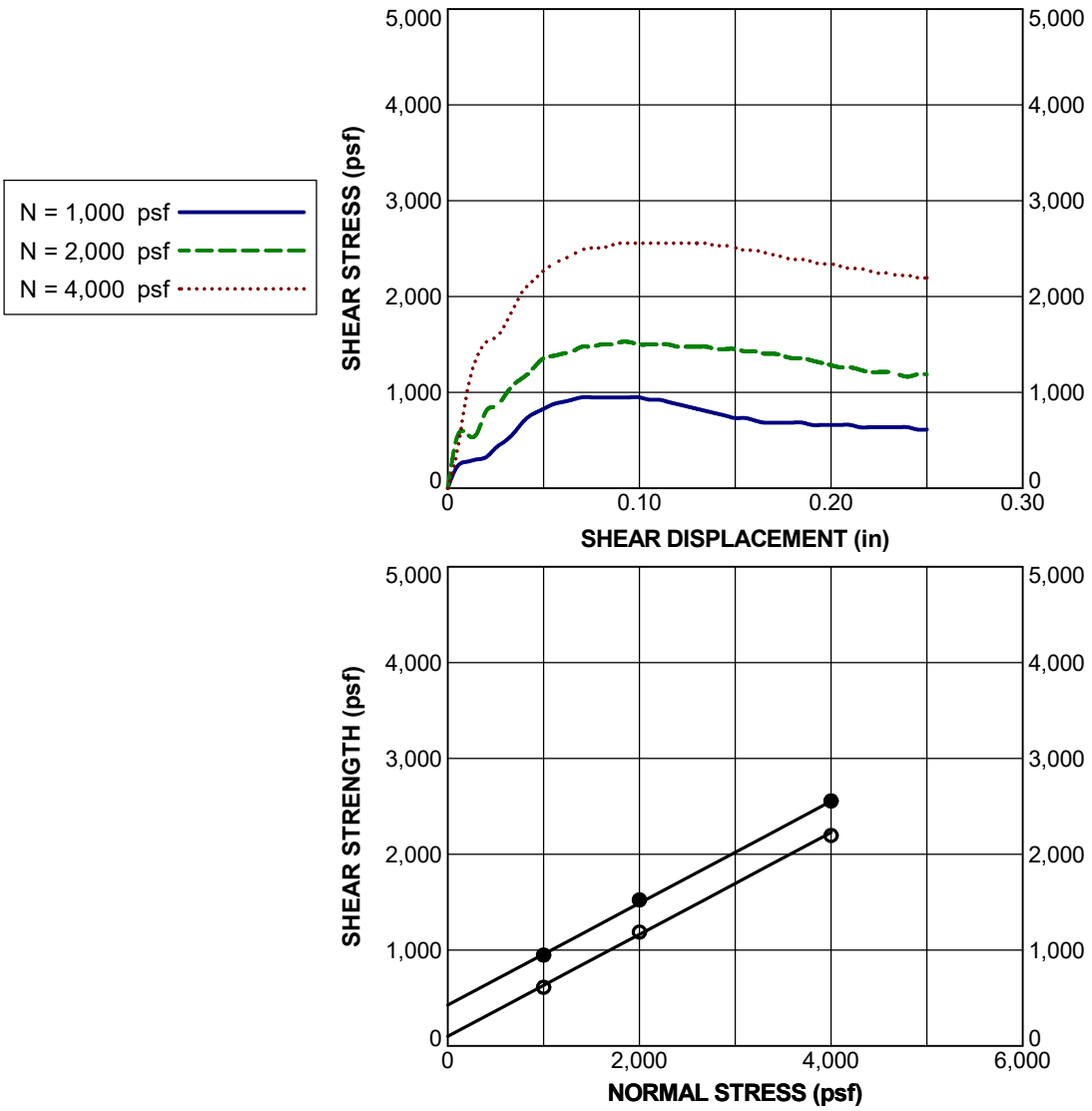

| | | |
|---|---|---|
| **Boring No. P-1** | **Sample No. D-2** | **Depth: 11.0 ft** |
| **Sample Description:** (Qal) Yellowish brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 28 |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| **Initial** | 12.8 | 104.2 | 59.3 | 0.563 |
| **Final** | 18.7 | 109.2 | 99.3 | 0.491 |

## CONSOLIDATION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.




| | | | | | |
|---|---|---|---|---|---|
| **Boring No. H-1** | | **Sample No. D-4** | | **Depth: 20.0 ft** | |
| **Sample Description:** (Qal) Dark yellowish brown silty sandy CLAY | | | | **USCS:** | CL |
| **Liquid Limit:** | 30 | **Plasticity Index:** | 14 | **Percent Passing No. 200 Sieve:** | |
| **Final Moisture Content (%):** | 20.4 | **Final Dry Density (pcf):** | 113.5 | **Degree of Saturation (%):** | 100 |
| **Sample Type:** | Undisturbed | **Rate of Shear (in./min.):** | 0.005 | | |

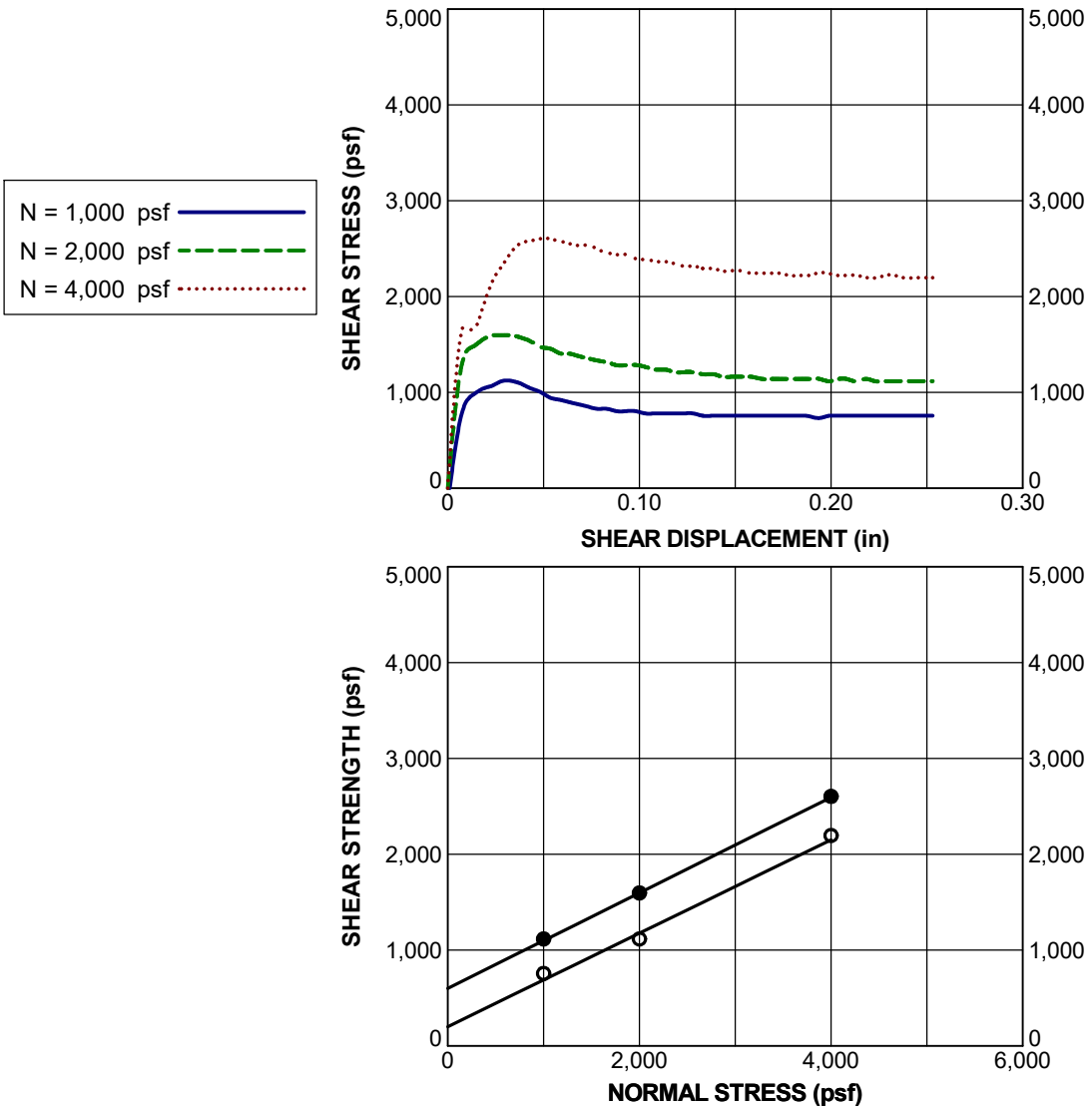
**SHEAR STRENGTH PARAMETERS**

| Parameter | Peak ● | Ultimate ○ |
|---|---|---|
| Cohesion (psf) | 425 | 100 |
| Friction Angle (degrees) | 28.0 | 28.0 |

## DIRECT SHEAR TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



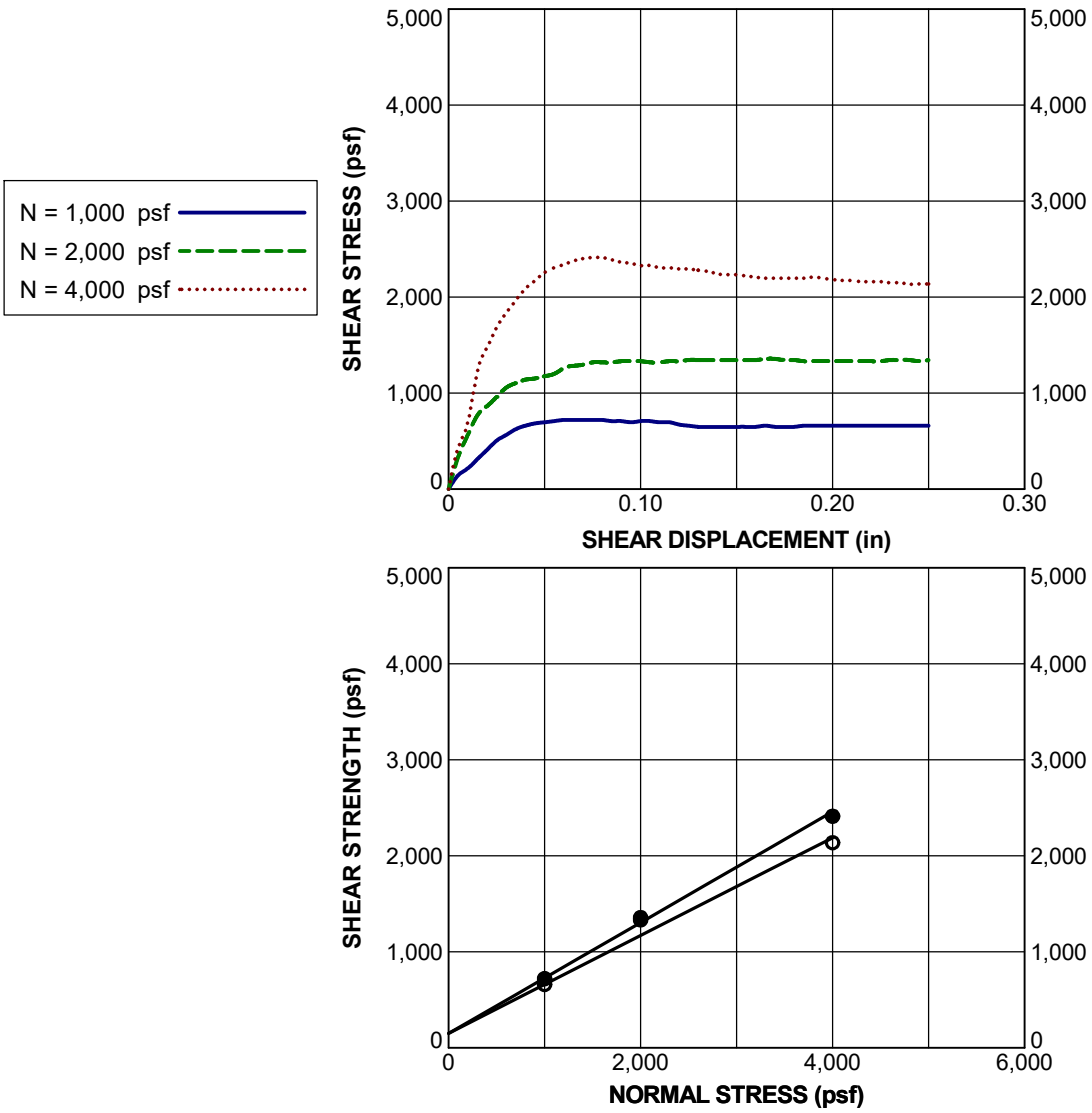

| | | | | | |
|---|---|---|---|---|---|
| **Boring No. H-2** | | **Sample No. B-1** | | **Depth: 5.0 - 9.0 ft** | |
| **Sample Description:** (Qal) Dark yellowish brown clayey SAND | | | | **USCS:** SC | |
| **Liquid Limit:** | 28 | **Plasticity Index:** | 9 | **Percent Passing No. 200 Sieve:** | 36 |
| **Final Moisture Content (%):** | 18.4 | **Final Dry Density (pcf):** | 116.5 | **Degree of Saturation (%):** | 100 |
| **Sample Type:** | Remolded to 90% | **Rate of Shear (in./min.):** | 0.05 | | |

| SHEAR STRENGTH PARAMETERS | | |
|---|---|---|
| **Parameter** | **Peak ●** | **Ultimate ○** |
| **Cohesion (psf)** | 600 | 200 |
| **Friction Angle (degrees)** | 26.5 | 26.0 |

## DIRECT SHEAR TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.




| | | |
|---|---|---|
| **Boring No. H-2** | **Sample No. D-2** | **Depth: 10.0 ft** |
| **Sample Description:** (Qal) Light olive brown sandy SILT | | **USCS:** ML |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 73 |
| **Final Moisture Content (%):** 34.9 | **Final Dry Density (pcf):** 92.0 | **Degree of Saturation (%):** 100 |
| **Sample Type:** Undisturbed | **Rate of Shear (in./min.):** 0.005 | |

**SHEAR STRENGTH PARAMETERS**

| Parameter | Peak ● | Ultimate ○ |
|---|---|---|
| Cohesion (psf) | 150 | 150 |
| Friction Angle (degrees) | 30.0 | 27.0 |

# DIRECT SHEAR TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.

| Sample | *Compacted Moisture (%)* | *Compacted Dry Density (pcf)* | *Final Moisture (%)* | *Volumetric Swell (%)* | *Expansion Index[1] Value/Method* | | *Expansive Classification[2]* | *Soluble Sulfate (%)* | *Sulfate Exposure[3]* |
|---|---|---|---|---|---|---|---|---|---|
| H-2<br>B-1<br>5-9' | 10.0 | 110.5 | 16.5 | 1.18 | 12 | A | Very Low | 0.05 | S0 |
| H-4<br>B-1<br>3-6' | 10.0 | 110.8 | 14.1 | -0.14 | 0 | A | Very Low | 0.05 | S0 |
| | | | | | | | | | |
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*Test Method:*
ASTM D4829

HACH SF-1 (Turbidimetric)

*Notes:*
1. Expansion Index (EI) method of determination*:*
   **[A]** E.I. determined by adjusting water content to achieve a 50 ±2% degree of saturation
   **[B]** E.I. calculated based on measured saturation within the range of 40% and 60%
2. ASTM D4829 *(Classification of Expansive Soil)*
3. ACI-318-14 Table 19.3.1.1 *(Requirement for Concrete Exposed to Sulfate-Containing Solutions)*

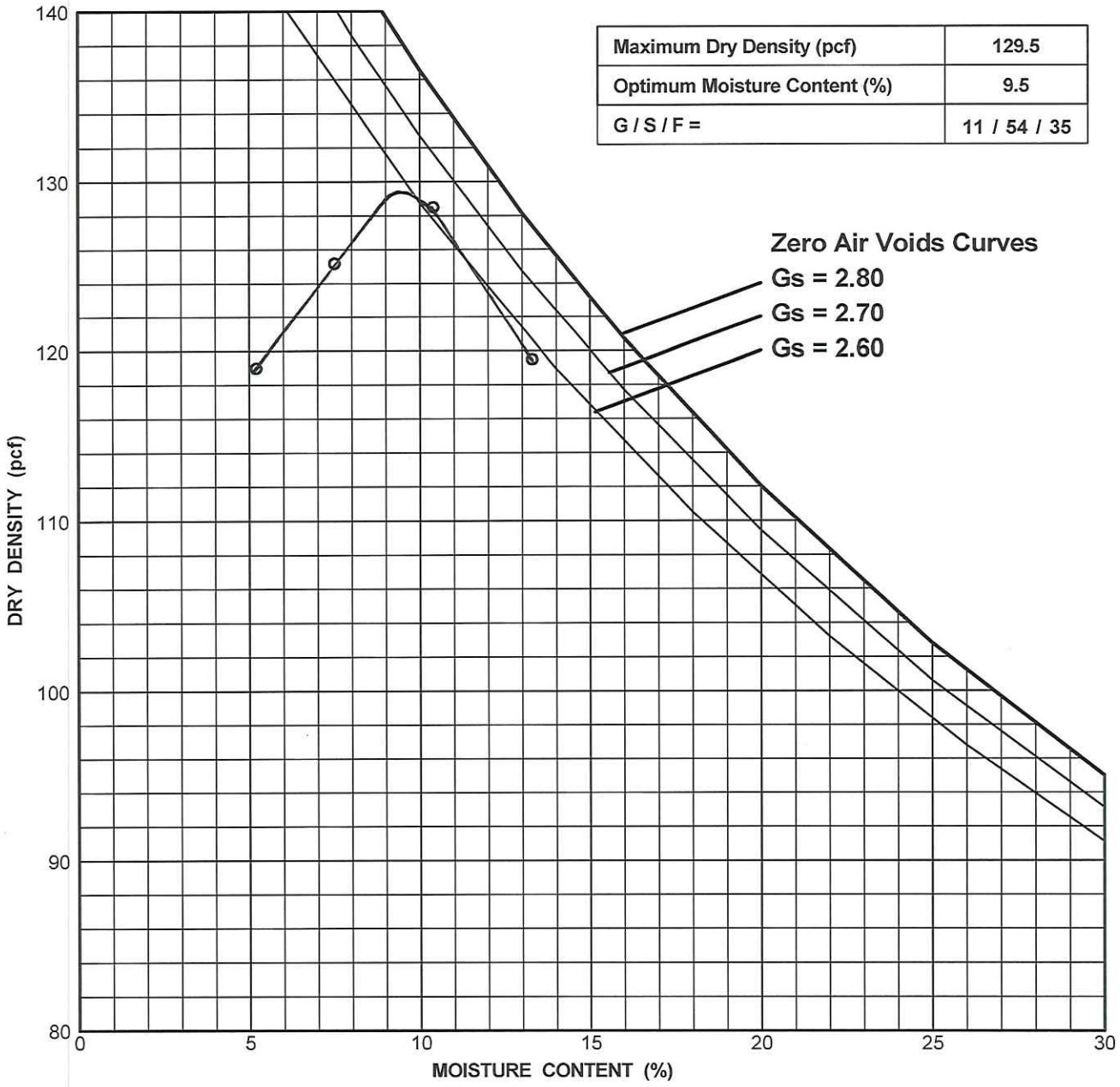
# Expansion Index and Soluble Sulfate Test Results

(FRM001 Rev.5)

Project No. 23007-01

Project Name: COI/ Gateway

NMG



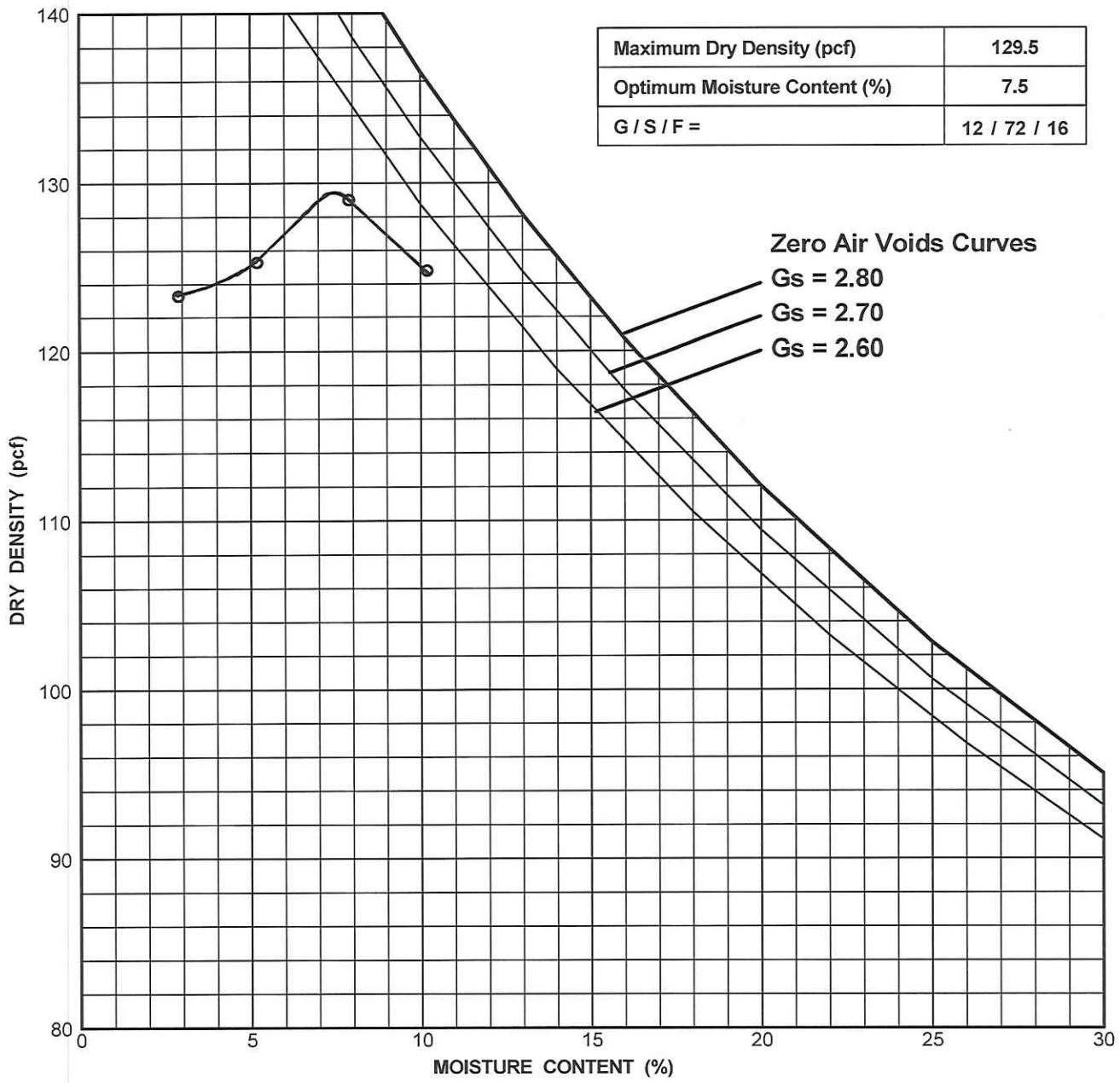

| | |
|---|---|
| Maximum Dry Density (pcf) | 129.5 |
| Optimum Moisture Content (%) | 9.5 |
| G / S / F = | 11 / 54 / 35 |

| | | |
|---|---|---|
| **Boring No.** H-2 | **Sample No.** B-1 | **Depth:** 5.0 - 9.0 ft |
| **Sample Description:** (Qal) Dark yellowish brown clayey SAND | | **USCS:** SC |
| **Liquid Limit:** 28 | **Plasticity Index:** 9 | **Percent Passing No. 200 Sieve:** 36 |
| **Comments:** 1557C | | |

## COMPACTION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.



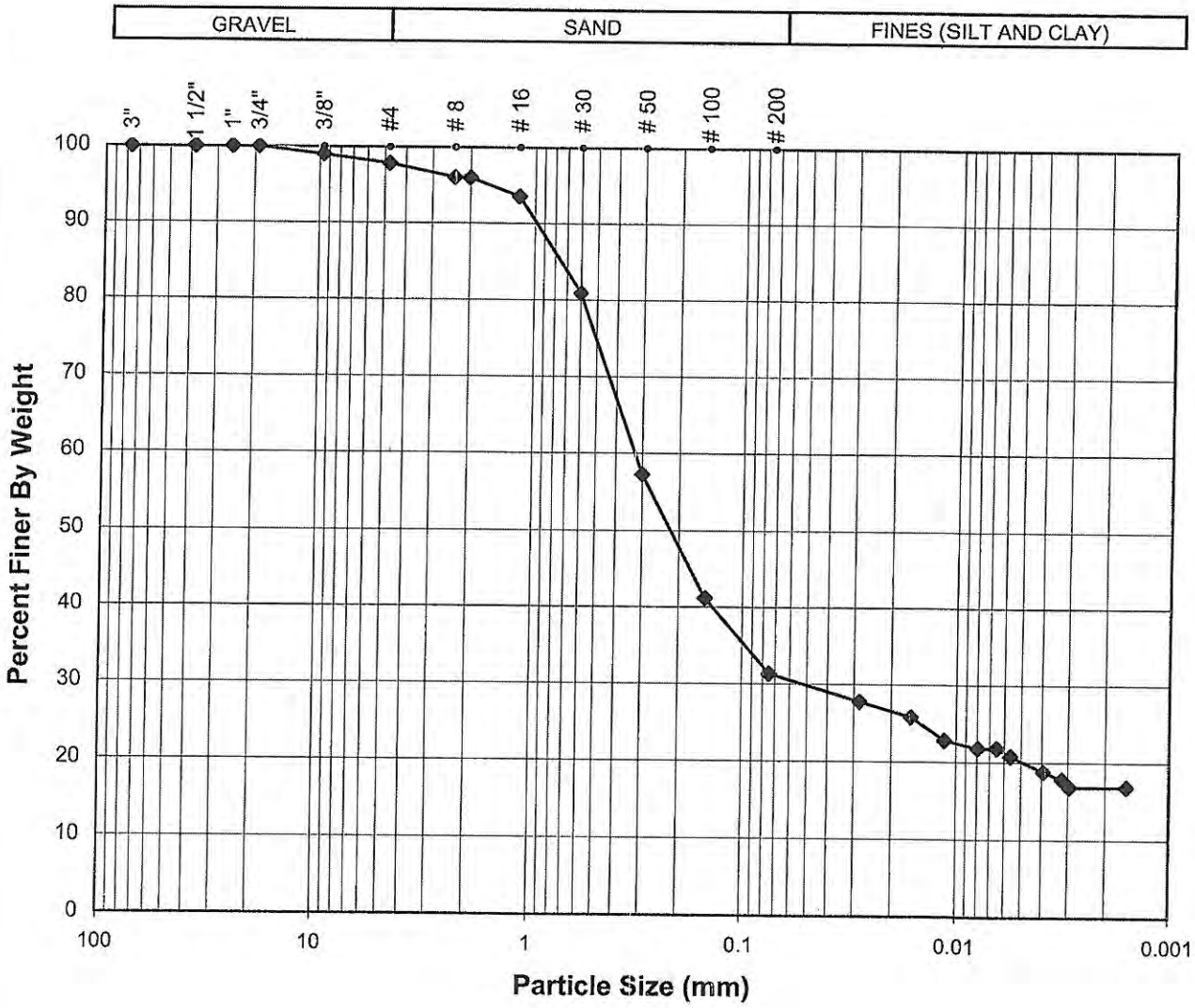

| | |
|---|---|
| Maximum Dry Density (pcf) | 129.5 |
| Optimum Moisture Content (%) | 7.5 |
| G / S / F = | 12 / 72 / 16 |

| | | |
|---|---|---|
| **Boring No. H-4** | **Sample No. B-1** | **Depth: 3.0 - 6.0 ft** |
| **Sample Description:** (Qal) Yellowish brown silty SAND | | **USCS:** SM |
| **Liquid Limit:** | **Plasticity Index:** | **Percent Passing No. 200 Sieve:** 16 |
| **Comments:** 1557B | | |

## COMPACTION TEST RESULTS

**COI/Gateway**
**Irvine, CA**
**PROJECT NO. 23007-01**

NMG Geotechnical, Inc.




| Location: | Sample No.: | Depth (ft.) | Soil Type | Gravel (%) | Sand (%) | Fines (%) |
|---|---|---|---|---|---|---|
| **LGC-1** | **B-1** | **1'- 4'** | **SC** | **2** | **67** | **31** |

Sample Description: Red Brown clayey SAND

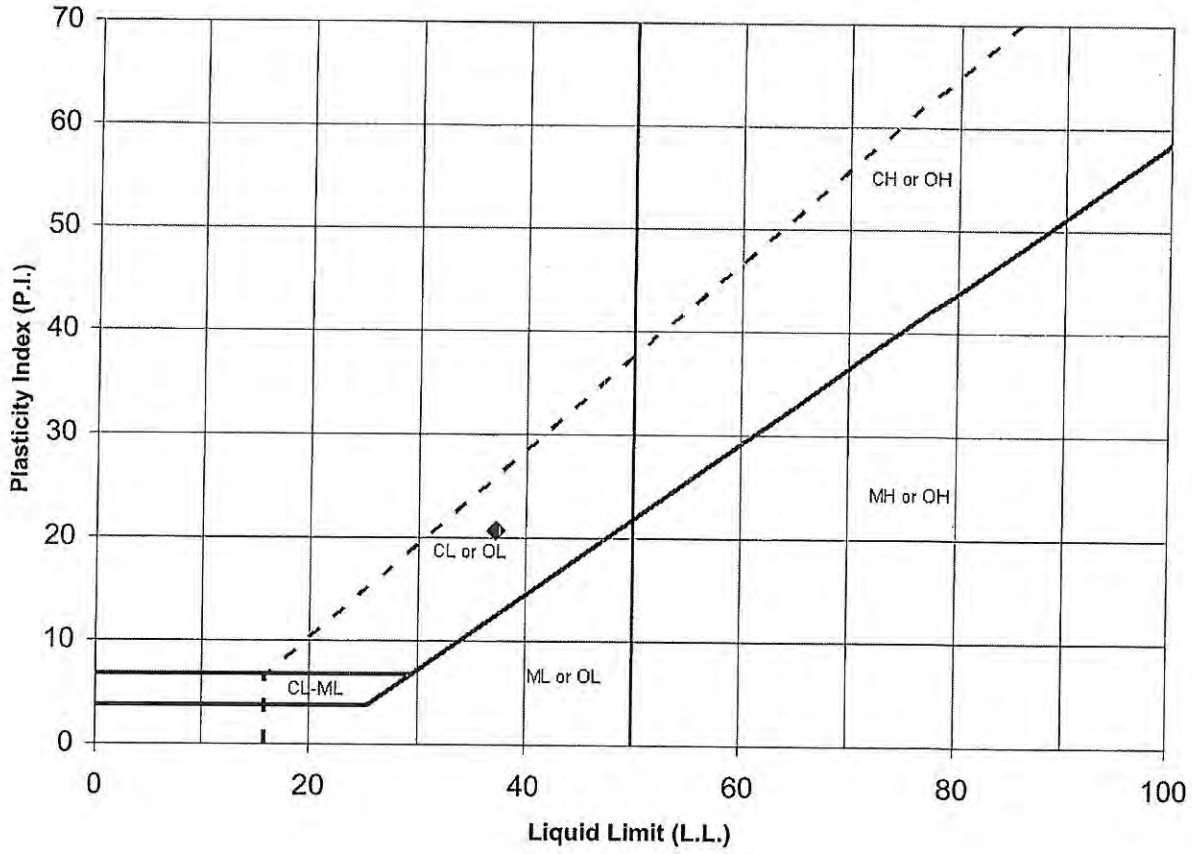
LGC Geotechnical, Inc.

**PARTICLE SIZE ANALYSIS**
(ASTM D 422)

| | |
|---|---|
| **Project Number:** | 11046-01 |
| **Date:** | Mar-11 |

**Stantec - Bee Canyon Pump Station**

PLASTICITY CHART - CLASSIFICATION OF FINE-GRAINED SOILS




| Symbol | Location.: | Sample No.: | Depth (ft) | Passing No. 200 Sieve (%) | Liquid Limit (%) LL | Plastic Limit (%) PL | Plasticity Index (%) PI | USCS |
|---|---|---|---|---|---|---|---|---|
| ◆ | **LGC-1** | **B-1** | **1-4'** | **31** | **37** | **17** | **21** | **CL** |

LGC Geotechnical, Inc.

**ATTERBERG LIMITS**
(ASTM D 4318)

**Project Number:** 11046-01
**Date:** Mar-11

**Stantec- Bee Canyon Pump Station**

| Location | Sample No. | Depth (ft) | Molding Moisture Content (%) | Initial Dry Density (pcf) | Final Moisture Content (%) | Expansion Index | Expansion Classification[1] |
|---|---|---|---|---|---|---|---|
| LGC-1 | B-1 | 1-4' | 9.1 | 107.6 | 20.8 | 38 | Low |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

[1] Per ASTM D4829-08a

LGC Geotechnical, Inc.

**EXPANSION INDEX**
(ASTM D 4829)

**Project Number:** 11046-01
**Date:** Mar-11

**Stantec - Bee Canyon Pump Station**

# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## MOISTURE AND DENSITY TEST RESULTS

Client: Leighton Consulting, Inc.
Project Name: Jeffrey Rd./Portola Pkwy Imp.
Project Number: 601564-001

Laboratory No.: 26-1039
Date: 10/18/06

| Boring No. | Sample No. | Sample Depth (ft) | Moisture Content (%) | Dry Density (pcf) |
|---|---|---|---|---|
| B-1 | R-1 | 2.5 | 11.5 | 114.8 |
| B-1 | R-3 | 10 | 5.9 | 109.0 |
| B-1 | R-4 | 20 | 6.6 | 108.8 |
| B-1 | R-5 | 30 | 16.0 | 117.0 |
| B-2 | R-1 | 2.5 | 12.8 | 114.9 |
| B-2 | R-2 | 5 | 12.8 | 116.3 |
| B-2 | R-3 | 10 | 9.3 | 87.3 |
| B-2 | R-4 | 20 | 10.3 | 103.0 |
| B-2 | R-5 | 30 | 15.0 | 115.9 |
| B-3 | R-1 | 2.5 | 13.3 | 115.3 |
| B-3 | R-2 | 5 | 10.7 | 114.0 |
| B-3 | R-3 | 15 | 19.9 | 102.3 |
| B-3 | R-4 | 25 | 11.9 | 114.3 |
| B-4 | R-1 | 2.5 | 12.8 | 120.1 |
| B-4 | R-2 | 5 | 10.9 | 117.5 |
| B-4 | R-3 | 10 | 15.3 | 113.1 |
| B-4 | R-4 | 20 | 13.2 | 106.8 |
| B-4 | R-5 | 30 | 13.6 | 113.6 |
| B-5 | R-1 | 2.5 | 11.6 | 106.9 |
| B-5 | R-2 | 5 | 12.7 | 120.6 |
| B-5 | R-4 | 25 | 13.4 | 109.5 |
| B-5 | R-5 | 35 | 3.1 | 114.5 |
| B-6 | R-1 | 2.5 | 15.2 | 104.1 |
| B-6 | R-2 | 5 | 27.1 | 89.0 |
| B-6 | R-3 | 10 | 16.7 | 103.4 |
| B-6 | R-4 | 20 | 15.1 | 88.2 |
| B-6 | R-5 | 30 | 4.6 | 104.6 |
| B-7 | R-1 | 2.5 | 9.4 | 113.7 |
| B-7 | R-2 | 5 | 15.0 | 101.5 |
| B-7 | R-3 | 15 | 9.5 | 115.9 |
| B-7 | R-4 | 25 | 1.8 | 104.5 |
| B-7 | R-5 | 35 | 1.6 | 114.9 |
| B-8 | R-1 | 2.5 | 18.7 | 108.1 |
| B-8 | R-2 | 5 | 19.1 | 106.6 |
| B-8 | R-3 | 10 | 17.5 | 108.5 |
| B-8 | R-4 | 20 | 19.2 | 108.8 |
| B-8 | R-5 | 30 | 11.8 | 94.9 |
| | | | | |

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## AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

# MOISTURE AND DENSITY TEST RESULTS

Client: Leighton Consulting, Inc.
Project Name: Jeffrey Rd./Portola Pkwy Imp.
Project Number: 601564-001

Laboratory No.: 26-1039
Date: 10/18/06

| Boring No. | Sample No. | Sample Depth (ft) | Moisture Content (%) | Dry Density (pcf) |
|---|---|---|---|---|
| B-9 | R-1 | 2.5 | 14.1 | 89.1 |
| B-9 | R-2 | 5 | 11.4 | 100.3 |
| B-9 | R-3 | 10 | 6.2 | 112.4 |
| B-9 | R-4 | 20 | 20.9 | 103.8 |
| B-9 | R-5 | 30 | 15.3 | 113.0 |
| B-10 | R-1 | 2.5 | 7.6 | 104.9 |
| B-10 | R-2 | 5 | 11.2 | 104.9 |
| B-10 | R-4 | 25 | 12.8 | 118.1 |
| B-10 | R-5 | 35 | 16.1 | 100.1 |
| B-11 | R-1 | 2.5 | 13.0 | 102.3 |
| B-11 | R-2 | 5 | 15.8 | 107.6 |
| B-11 | R-3 | 7.5 | 15.4 | 113.9 |
| B-11 | R-4 | 10 | 12.4 | 108.1 |
| B-12 | R-1 | 2.5 | 13.6 | 112.7 |
| B-12 | R-2 | 5 | 16.9 | 113.3 |
| B-12 | R-4 | 20 | 6.3 | 101.3 |
| B-13 | R-1 | 2.5 | 12.0 | 116.7 |
| B-13 | R-2 | 5 | 12.1 | 118.9 |
| B-13 | R-3 | 7.5 | 12.8 | 116.7 |
| B-13 | R-4 | 10 | 10.1 | 125.9 |
| B-14 | R-1 | 2.5 | 4.1 | 125.7 |
| B-14 | R-2 | 5 | 12.0 | 112.7 |
| B-14 | R-3 | 7.5 | 11.1 | 110.8 |
| B-15 | R-1 | 2.5 | 7.1 | 116.4 |
| B-15 | R-2 | 5 | 12.8 | 114.5 |
| B-15 | R-4 | 10 | 14.8 | 115.4 |
| B-16 | R-1 | 2.5 | 7.1 | 107.9 |
| B-16 | R-2 | 5 | 12.3 | 108.5 |
| B-16 | R-4 | 20 | 17.8 | 110.2 |
| B-16 | R-5 | 30 | 16.9 | 113.1 |
| B-17 | R-1 | 2.5 | 8.5 | 101.8 |
| B-17 | R-2 | 5 | 8.4 | 106.6 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

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Geotechnical Testing Laboratory

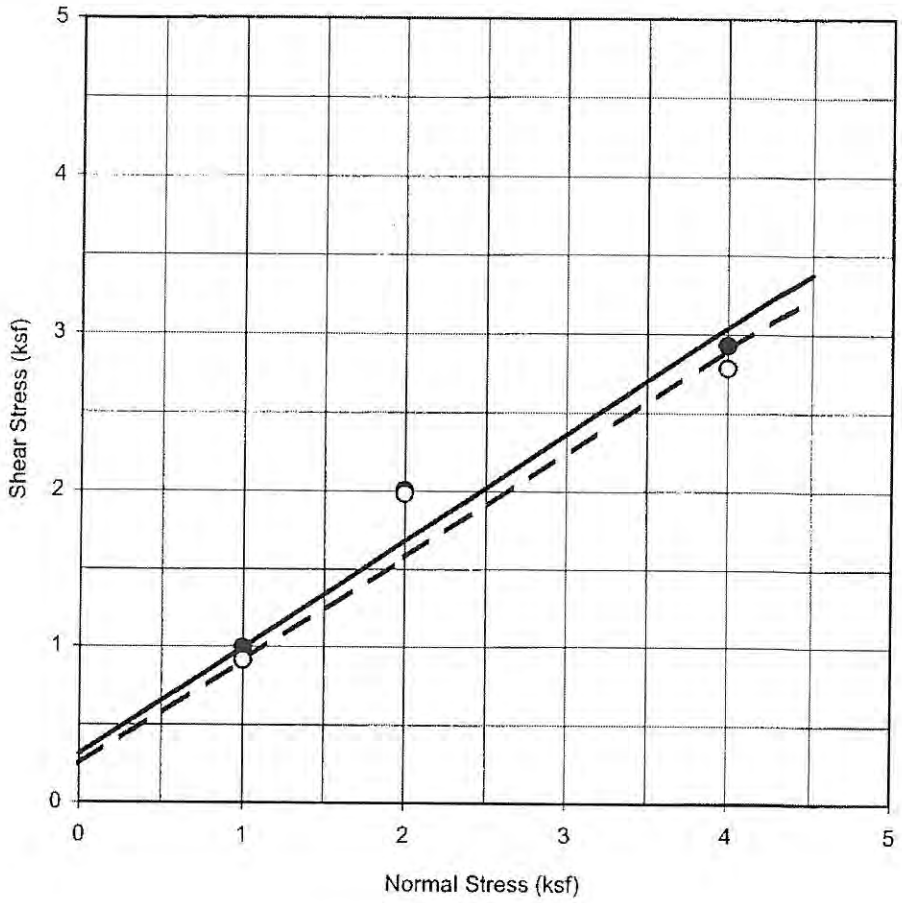
# PERCENT PASSING NO. 200 SIEVE

Client: Leighton Consulting, Inc.
Project Name: Jeffrey Rd./Portola Pkwy Imp.
Project Number: 601564-001

Laboratory No.: 26-1121
Date: 11/07/06

| Boring No. | Sample No. | Sample Depth (ft) | Percent Fine (%) |
|---|---|---|---|
| B-4 | R-5 | 30 | 41.9 |
| B-6 | R-4 | 20 | 51.4 |
| B-7 | S-3 | 30 | 8.9 |
| B-8 | R-1 | 2.5 | 68.5 |

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| | | |
|---|---|---|
| Project Name: | : | Jeffrey Rd./Portola Pkwy Imp. |
| Project No. | : | 601564-001 |
| Boring No. | : | B-10 |
| Sample No. | : | R3 |
| Depth (ft) | : | 15 |
| Sample Type | : | Mod. Cal |
| Soil Type | : | Light Yellowish Brown Poorly-Graded Sand |
| Test Condition | : | Saturated |
| Initial Dry Density | : | 109.1 pcf |
| Moisture Content (before) | : | 2.7 % |
| Moisture Content (after) | : | 19.2 % |

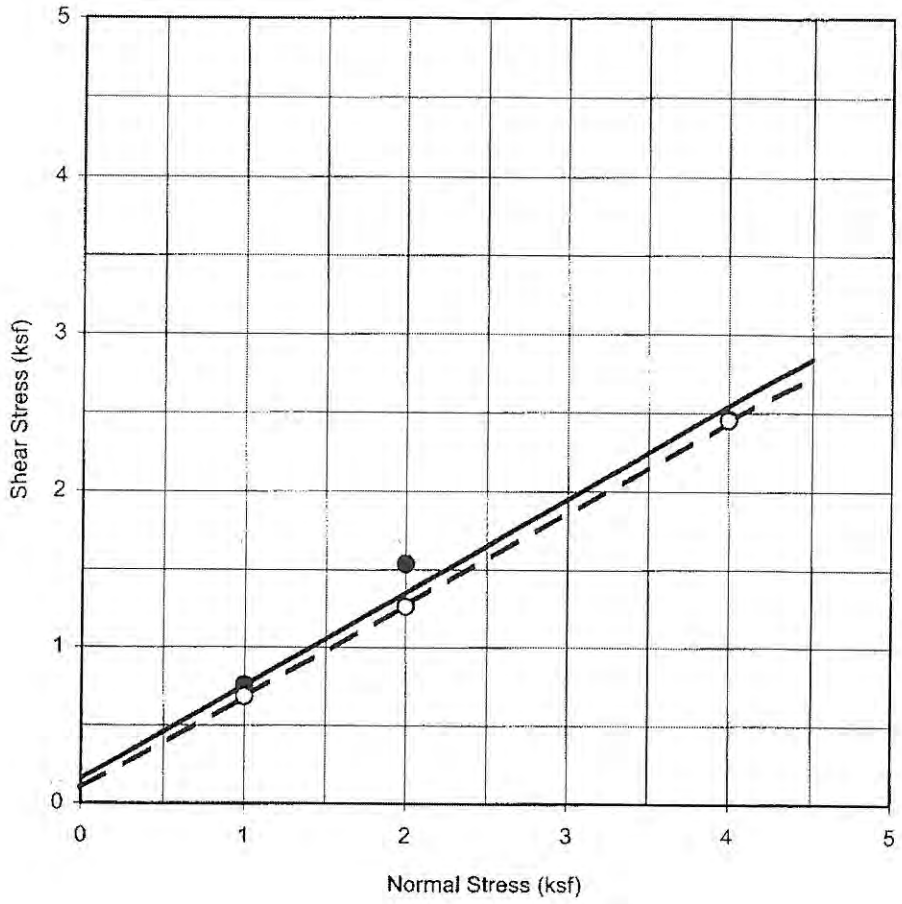
**INTERPRETED STRENGTH DATA**

| | Peak | Ultimate |
|---|---|---|
| COHESION (PSF) : | 300 | 250 |
| FRICTION ANGLE : | 34 ° | 34 ° |

**AP ENGINEERING AND TESTING, INC.**

DIRECT SHEAR
TEST RESULTS
(ASTM D 3080)

Jan-07 Figure No.




| | | | |
|---|---|---|---|
| Project Name: | : | Jeffrey Rd./Portola Pkwy Imp. | |
| Project No. | : | 601564-001 | |
| Boring No. | : | B-12 | |
| Sample No. | : | R-3 | |
| Depth (ft) | : | 10 | |
| Sample Type | : | Mod. Cal | |
| Soil Type | : | Brown Silty Sand | |
| Test Condition | : | Saturated | |
| Initial Dry Density | : | 103.2 | pcf |
| Moisture Content (before) | : | 12.3 | % |
| Moisture Content (after) | : | 22.8 | % |

**INTERPRETED STRENGTH DATA**

| | Peak | Ultimate |
|---|---|---|
| COHESION (PSF) : | 150 | 100 |
| FRICTION ANGLE : | 31 ° | 30 ° |

**AP ENGINEERING AND TESTING, INC.**

DIRECT SHEAR
TEST RESULTS
(ASTM D 3080)

Jan-07 Figure No.

# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## CAL 217

### SAND EQUIVALENT TEST

Client Name: Leighton Consulting, Inc.
Project Name: Jeffrey Rd./Portola Pkwy Imp.
Project No.: 601564-001

AP Job No.: 26-1039
Date 10/18/06

| Boring No. | Sample No. | Depth (ft) | Soil Description | Clay Reading | Sand Reading | Corrected Sand Reading | Sand Equivalent |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| B-1 | S-1 | 15 | Sand | 5.2 | 12.9 | 3 | 56 |
| B-7 | S-2 | 20 | Poorly-Graded Sand | 4.7 | 12.9 | 3 | 62 |
| B-10 | S-1 | 10 | Silty Sand | 10.6 | 11.6 | 2 | 15 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## CORROSION TEST RESULTS

Client Name: Leighton Consulting, Inc.
Project Name: Jeffrey Rd./Portola Pkwy Imp.
Project No.: 601564-001

AP Job No.: 26-1039
Date 10/24/06

| Boring No. | Sample No. | Depth (ft) | Soil Type | Minimum Resistivity (ohm-cm) | pH | Sulfate Content (%) | Chloride Content (%) |
|---|---|---|---|---|---|---|---|
| B-2 | Bag-1 | 0-5 | SC | 1900 | 8.0 | 0.0016 | 0.0068 |
| B-5 | Bag-1 | 0-5 | ML | 1100 | 8.1 | 0.0031 | 0.0067 |
| B-7 | Bag-1 | 0-5 | ML | 1000 | 9.3 | 0.0169 | 0.0130 |
| B-11 | Bag-1 | 0-5 | SP | 1500 | 8.4 | 0.0021 | 0.0067 |
| B-15 | Bag-1 | 0-5 | SP | 1300 | 9.4 | 0.0056 | 0.0066 |

NOTES: Resistivity Test and pH: California Test Methods 532 and 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

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# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## R-VALUE TEST DATA

ASTM D2844

Project Name: Jeffrey Rd./Portola Pkwy Imp. Tested By: SM Date: 10/25/06

Project No.: 601564-001 Checked By: AP Date: 11/13/06

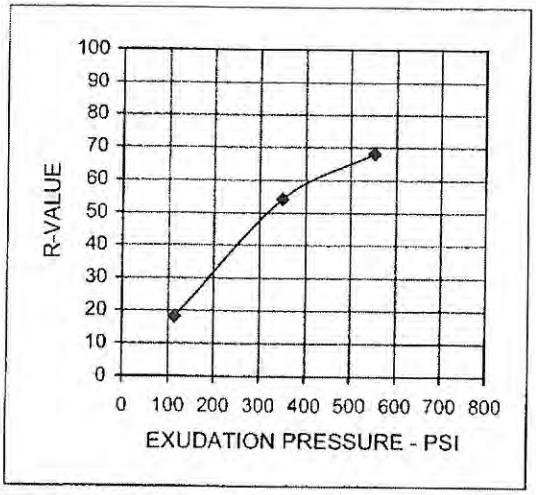
Boring No.: B-8

Sample No.: Bag-1 Depth: 0-5'

Location: -

Soil Description: Brown Sandy Silt

| Mold Number | 7 | 8 | 9 | | |
|---|---|---|---|---|---|
| Water Added, g | 90 | 60 | 49 | | |
| Actual Test, Water, (%) | 14.5 | 11.8 | 10.8 | | |
| Compaction Gage Pressure, psi | 45 | 130 | 245 | | |
| Exudation Pressure, psi | 114 | 350 | 552 | | |
| Sample Height, Inches | 2.58 | 2.56 | 2.57 | | |
| Gross Weight Mold, g | 3103 | 3125 | 2962 | | |
| Tare Weight Mold, g | 1968 | 1964 | 1789 | | |
| Net Sample Weight, g | 1135 | 1161 | 1173 | | |
| Expansion, inches$\times 10^{-4}$ | 0 | 7 | 8 | | |
| Stability 2,000 (160 psi) | 45/118 | 23/60 | 17/40 | | |
| Turns Displacement | 4.28 | 3.67 | 3.62 | | |
| R-Value Uncorrected | 17 | 53 | 67 | | |
| R-Value Corrected | 18 | 54 | 68 | | |
| Dry Density, pcf | 116.5 | 122.9 | 124.8 | | |
| Traffic Index | 8.0 | 8.0 | 8.0 | | |
| G.E. by Stability | 1.68 | 0.94 | 0.66 | | |
| G.E. by Expansion | 0.00 | 0.23 | 0.27 | | |




R-Value by Exudation = 49

R-Value by Expansion = NA

Equilibrium R- Value = (by Exudation) **49**

Remarks: $G_f = 1.25$

1.6% Reatined on ¾" sieve

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# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## R-VALUE TEST DATA

ASTM D2844

Project Name: Jeffrey Rd./Portola Pkwy Imp. Tested By: SM Date: 10/25/06

Project No.: 601564-001 Checked By: AP Date: 11/13/06

Boring No.: B-10

Sample No.: Bag-1 Depth: 0-5'

Location: -

Soil Description: Brown Sand to Silty Sand

| Mold Number | 16 | 17 | 18 | | |
|---|---|---|---|---|---|
| Water Added, g | 61 | 81 | 51 | | |
| Actual Test, Water, (%) | 11.1 | 12.9 | 10.2 | | |
| Compaction Gage Pressure, psi | 230 | 100 | 350 | | |
| Exudation Pressure, psi | 375 | 145 | 551 | | |
| Sample Height, Inches | 2.63 | 2.57 | 2.56 | | |
| Gross Weight Mold, g | 3102 | 3064 | 3102 | | |
| Tare Weight Mold, g | 1957 | 1951 | 1967 | | |
| Net Sample Weight, g | 1145 | 1113 | 1135 | | |
| Expansion, inchesx$10^{-4}$ | 0 | 0 | 14 | | |
| Stability 2,000 (160 psi) | 18/36 | 25/49 | 13/26 | | |
| Turns Displacement | 5.02 | 5.83 | 4.77 | | |
| R-Value Uncorrected | 63 | 49 | 73 | | |
| R-Value Corrected | 66 | 51 | 74 | | |
| Dry Density, pcf | 118.7 | 116.3 | 121.9 | | |
| Traffic Index | 8.0 | 8.0 | 8.0 | | |
| G.E. by Stability | 0.70 | 1.00 | 0.53 | | |
| G.E. by Expansion | 0.00 | 0.00 | 0.47 | | |

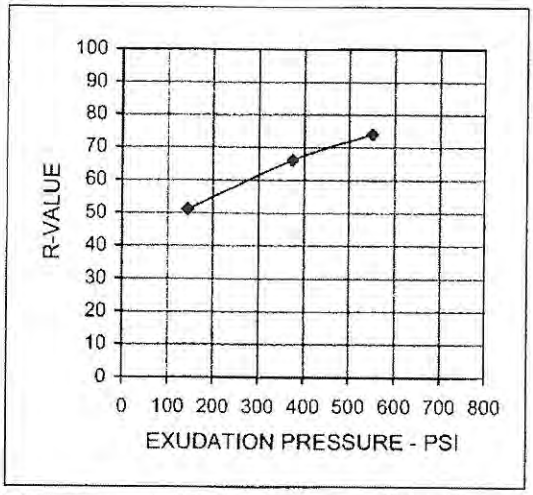
R-Value by Exudation = 62

R-Value by Expansion = NA

Equilibrium R- Value = (by Exudation) **62**

Remarks: $G_f$ = 1.25

0.9% Reatined on ¾" sieve




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# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## R-VALUE TEST DATA

ASTM D2844

Project Name: Jeffrey Rd./Portola Pkwy Imp. Tested By: SM Date: 10/25/06

Project No.: 601564-001 Checked By: AP Date: 11/13/06

Boring No.: B-11

Sample No.: Bag-1 Depth: 0-5'

Location: -

Soil Description: Brown Gravelly Clayey Sand

| Mold Number | 7 | 8 | 9 | | |
|---|---|---|---|---|---|
| Water Added, g | 100 | 63 | 56 | | |
| Actual Test, Water, (%) | 11.5 | 8.3 | 7.7 | | |
| Compaction Gage Pressure, psi | 40 | 125 | 175 | | |
| Exudation Pressure, psi | 149 | 447 | 693 | | |
| Sample Height, Inches | 2.61 | 2.54 | 2.48 | | |
| Gross Weight Mold, g | 3174 | 3187 | 2999 | | |
| Tare Weight Mold, g | 1968 | 1964 | 1789 | | |
| Net Sample Weight, g | 1206 | 1223 | 1210 | | |
| Expansion, inchesx$10^{-4}$ | 0 | 8 | 26 | | |
| Stability 2,000 (160 psi) | 58/138 | 29/68 | 20/45 | | |
| Turns Displacement | 3.74 | 3.48 | 3.43 | | |
| R-Value Uncorrected | 10 | 49 | 65 | | |
| R-Value Corrected | 11 | 49 | 65 | | |
| Dry Density, pcf | 125.6 | 134.7 | 137.2 | | |
| Traffic Index | 8.0 | 8.0 | 8.0 | | |
| G.E. by Stability | 1.82 | 1.04 | 0.72 | | |
| G.E. by Expansion | 0.00 | 0.27 | 0.87 | | |

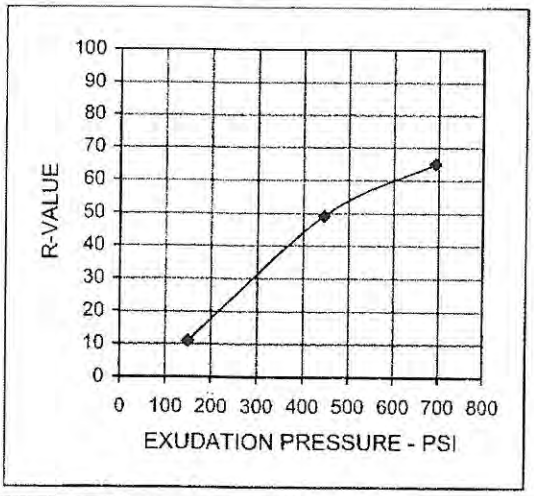
R-Value by Exudation = 34

R-Value by Expansion = NA

Equilibrium R- Value = (by Exudation) **34**

Remarks: $G_f$ = 1.25

0.9% Reatined on ¾" sieve




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# AP Engineering and Testing, Inc.

Geotechnical Testing Laboratory

## R-VALUE TEST DATA

ASTM D2844

Project Name: Jeffrey Rd./Portola Pkwy Imp. Tested By: SM Date: 10/25/06

Project No.: 601564-001 Checked By: AP Date: 11/13/06

Boring No.: B-12

Sample No.: Bag-1 Depth: 0-5'

Location: -

Soil Description: Brown Gravelly Sand

| Mold Number | 7 | 8 | 9 | | |
|---|---|---|---|---|---|
| Water Added, g | 100 | 63 | 56 | | |
| Actual Test, Water, (%) | 11.5 | 8.3 | 7.7 | | |
| Compaction Gage Pressure, psi | 40 | 125 | 175 | | |
| Exudation Pressure, psi | 149 | 447 | 693 | | |
| Sample Height, Inches | 2.61 | 2.54 | 2.48 | | |
| Gross Weight Mold, g | 3174 | 3187 | 2999 | | |
| Tare Weight Mold, g | 1968 | 1964 | 1789 | | |
| Net Sample Weight, g | 1206 | 1223 | 1210 | | |
| Expansion, inches$\times 10^{-4}$ | 0 | 8 | 26 | | |
| Stability 2,000 (160 psi) | 58/138 | 29/68 | 20/45 | | |
| Turns Displacement | 3.74 | 3.48 | 3.43 | | |
| R-Value Uncorrected | 10 | 49 | 65 | | |
| R-Value Corrected | 11 | 49 | 65 | | |
| Dry Density, pcf | 125.6 | 134.7 | 137.2 | | |
| Traffic Index | 8.0 | 8.0 | 8.0 | | |
| G.E. by Stability | 1.82 | 1.04 | 0.72 | | |
| G.E. by Expansion | 0.00 | 0.27 | 0.87 | | |

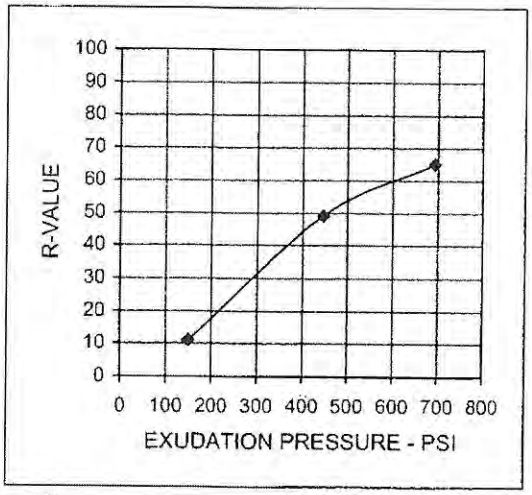
R-Value by Exudation = 34

R-Value by Expansion = NA

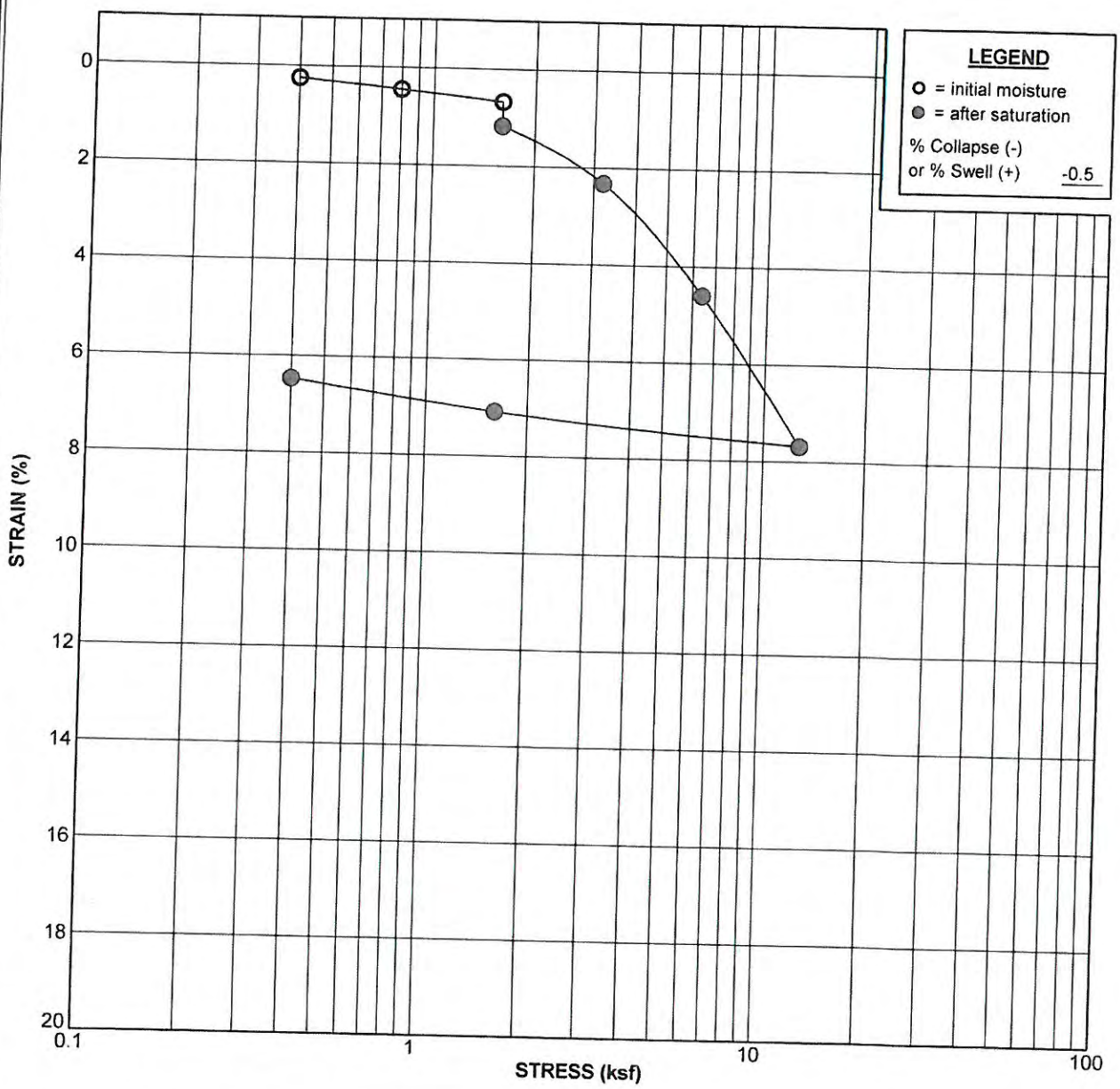
Equilibrium R- Value = (by Exudation) **34**

Remarks: $G_f = 1.25$

0.9% Reatined on ¾" sieve




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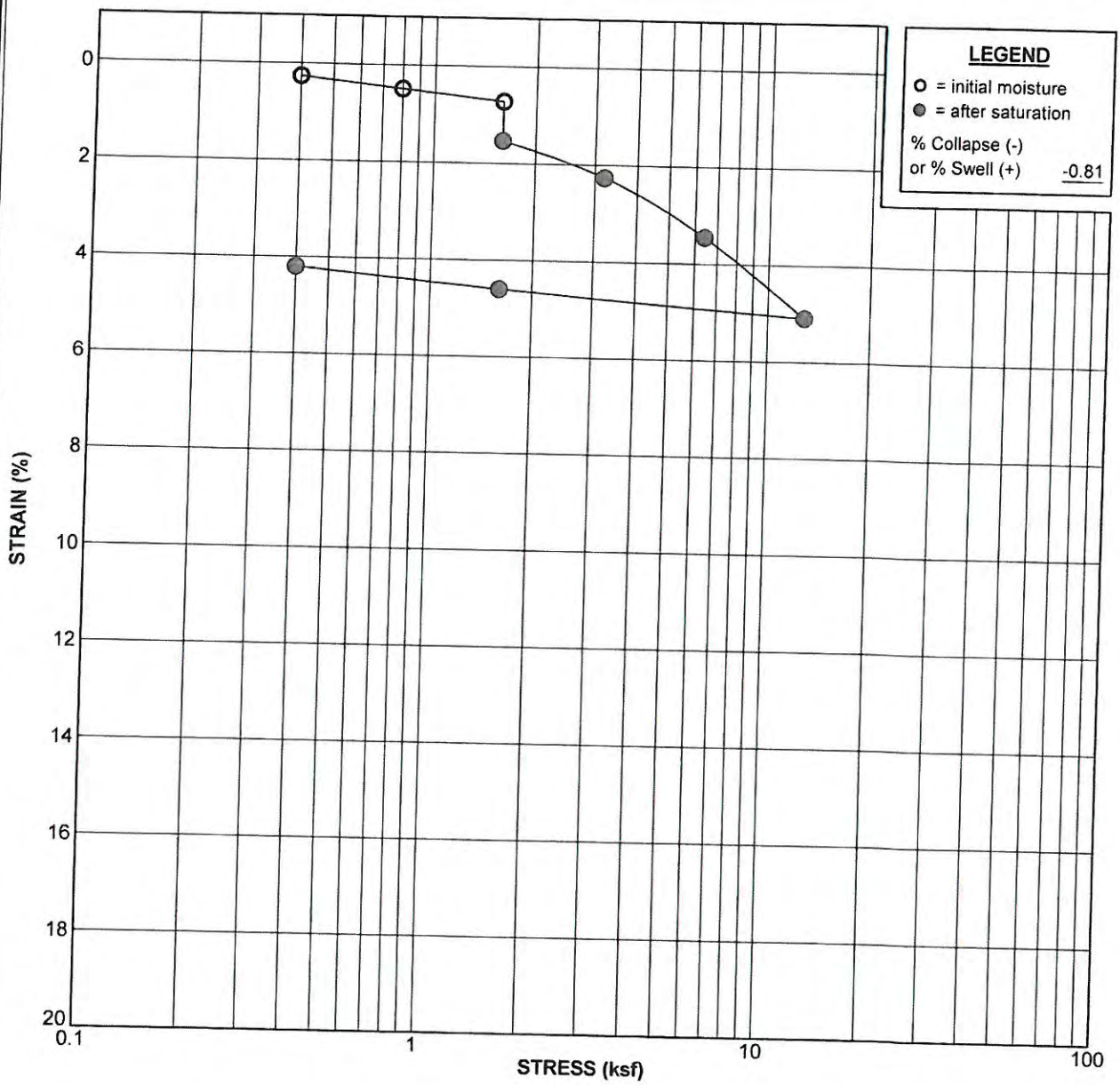

| Boring No. H-77 | Sample No. D-3 | Depth: 7.5 ft |
|---|---|---|
| Sample Description: (Qsw) Yellowish brown sandy SILT | | USCS: ML |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 8.1 | 100.7 | 32.5 | 0.673 |
| Final | 18.5 | 107.2 | 87.4 | 0.572 |

## CONSOLIDATION TEST RESULTS

ICDC/PA1 N4
Irvine, California
PROJECT NO. 98037-73

NMG Geotechnical, Inc.




| Boring No. H-80 | Sample No. D-2 | Depth: 5.0 ft |
|---|---|---|
| Sample Description: (Qal) Yellow brown silty SAND | | USCS: SM |
| Liquid Limit: | Plasticity Index: | Percent Passing No. 200 Sieve: |

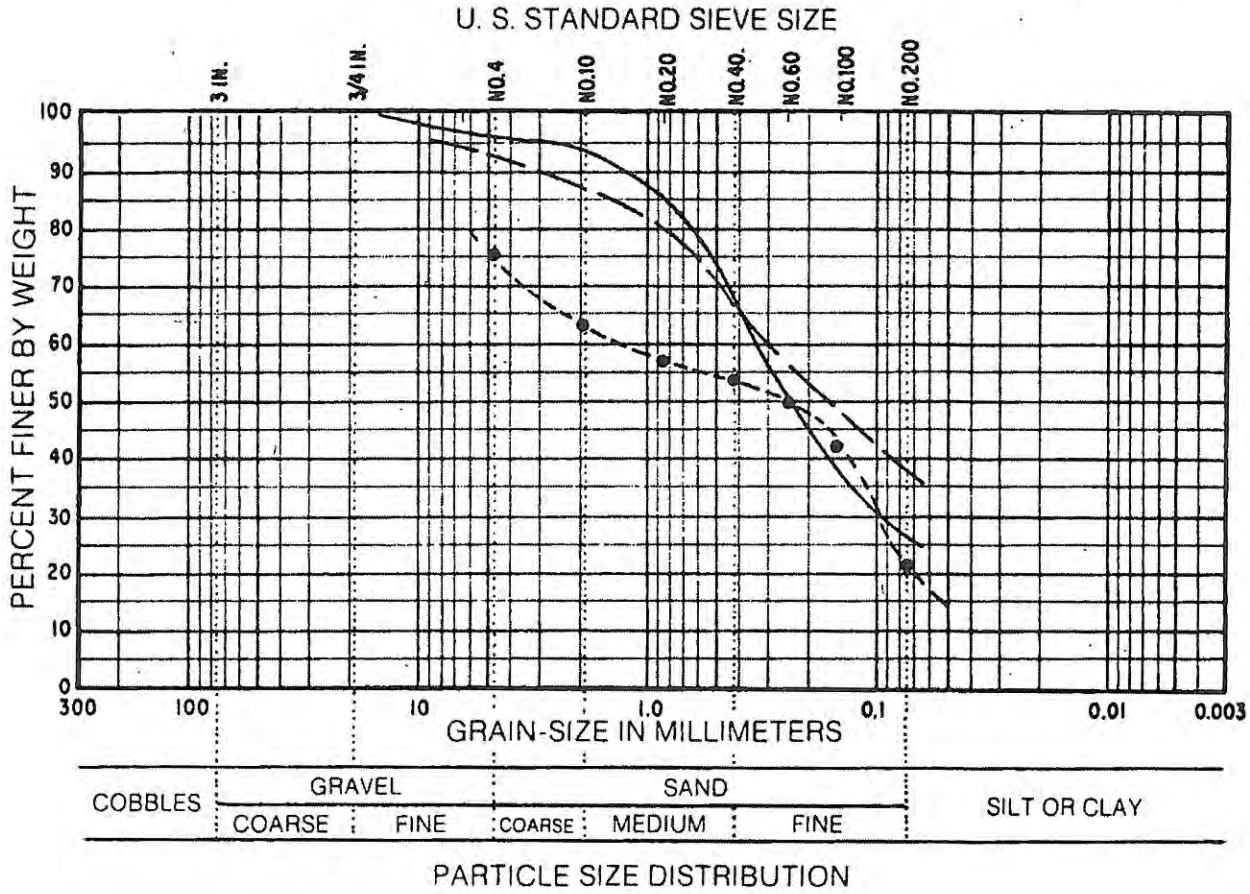
| Test Stage | Moisture Content (%) | Dry Density (pcf) | Degree of Saturation (%) | Void Ratio |
|---|---|---|---|---|
| Initial | 4.7 | 101.2 | 19.1 | 0.665 |
| Final | 19.5 | 105.5 | 88.2 | 0.597 |

## CONSOLIDATION TEST RESULTS

**ICDC/PA1 N4**
**Irvine, California**
**PROJECT NO. 98037-73**

NMG Geotechnical, Inc.

# GRAIN-SIZE DISTRIBUTION DATA



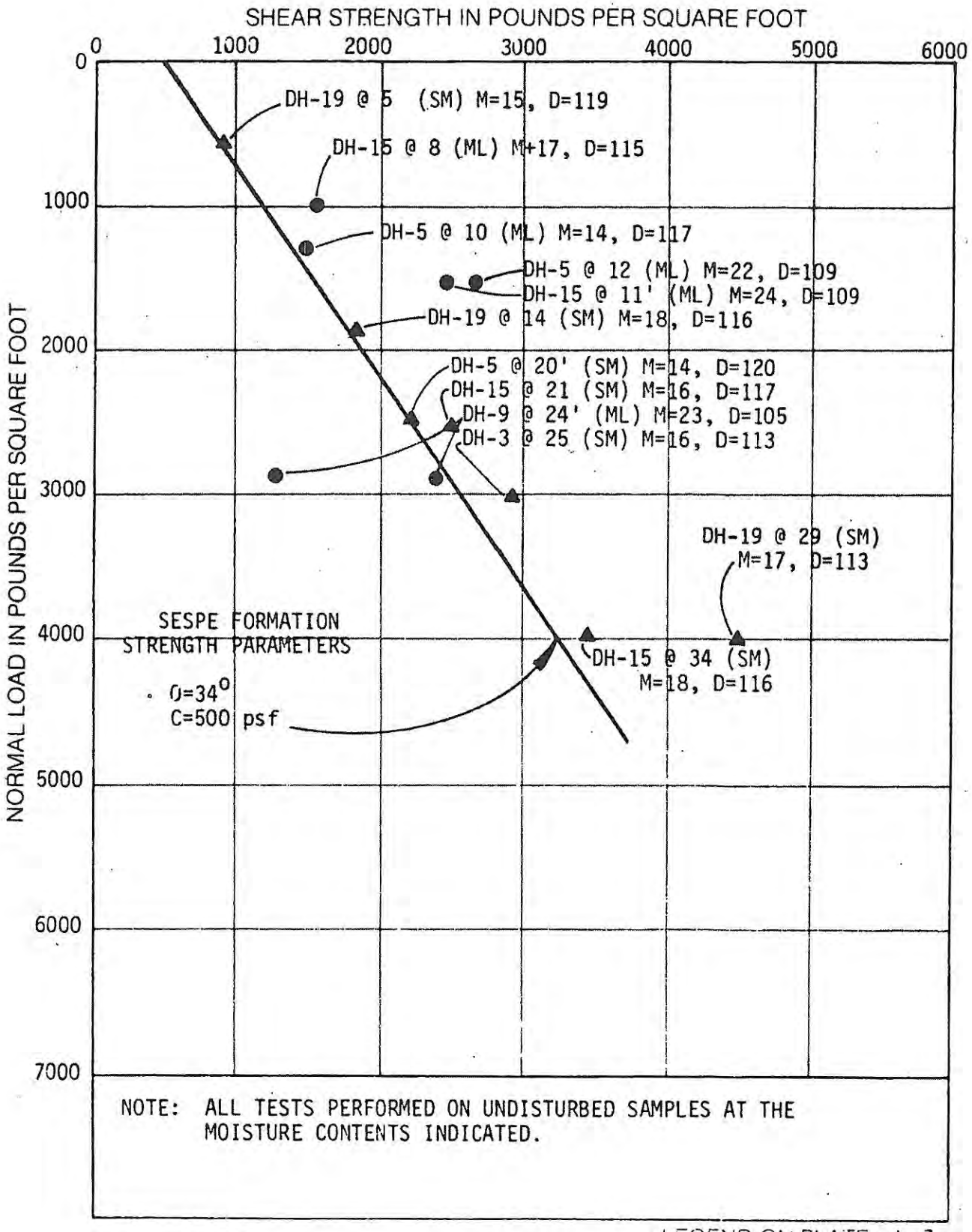

PARTICLE SIZE DISTRIBUTION

| LINE SYMBOL | SAMPLE LOCATION | REPRESENTATIVE FOR | LIQUID LIMIT | PLASTIC INDEX | CLASSIFICATION |
|---|---|---|---|---|---|
| ——— | DH-5 @ 20' to 23' | SESPE FORMATION (Ts) | | | SILTY SAND (SM) |
| — — — | DH-6 @ 32' to 34' | VAQUEROUS FORMATION (Tv) | | | SILTY SAND (SM) |
| - - - - - | DH-10 @ 12' to 14' | VAQUEROS SESPE FORMATION (Tvs) | | | GRAVELLY SAND (SP) |
| ..... | | | | | |

S81031

PLATE A-3.1

# SHEAR TEST DATA



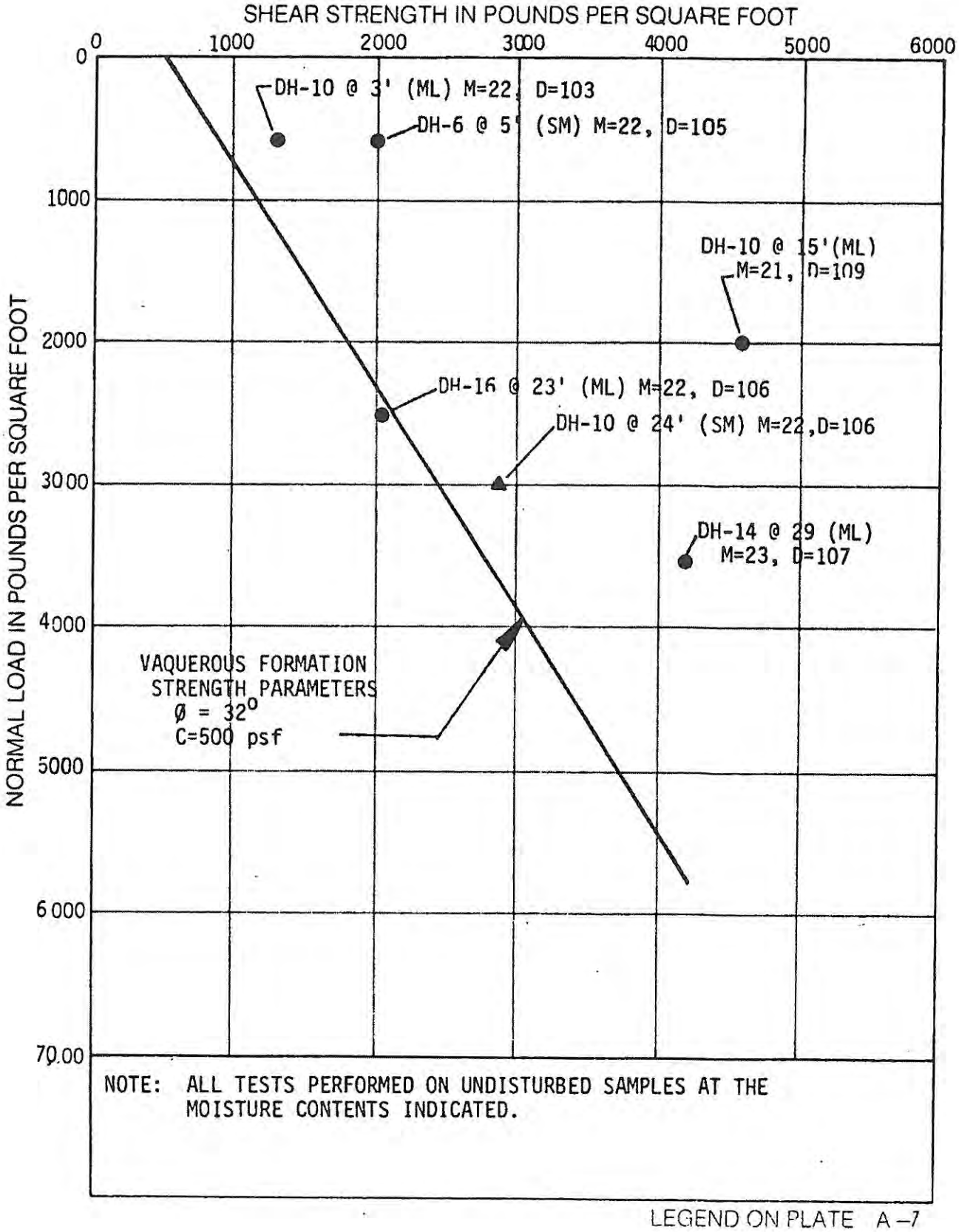

NOTE: ALL TESTS PERFORMED ON UNDISTURBED SAMPLES AT THE MOISTURE CONTENTS INDICATED.

LEGEND ON PLATE A-7

S81031

PLATE A-3.2

# SHEAR TEST DATA

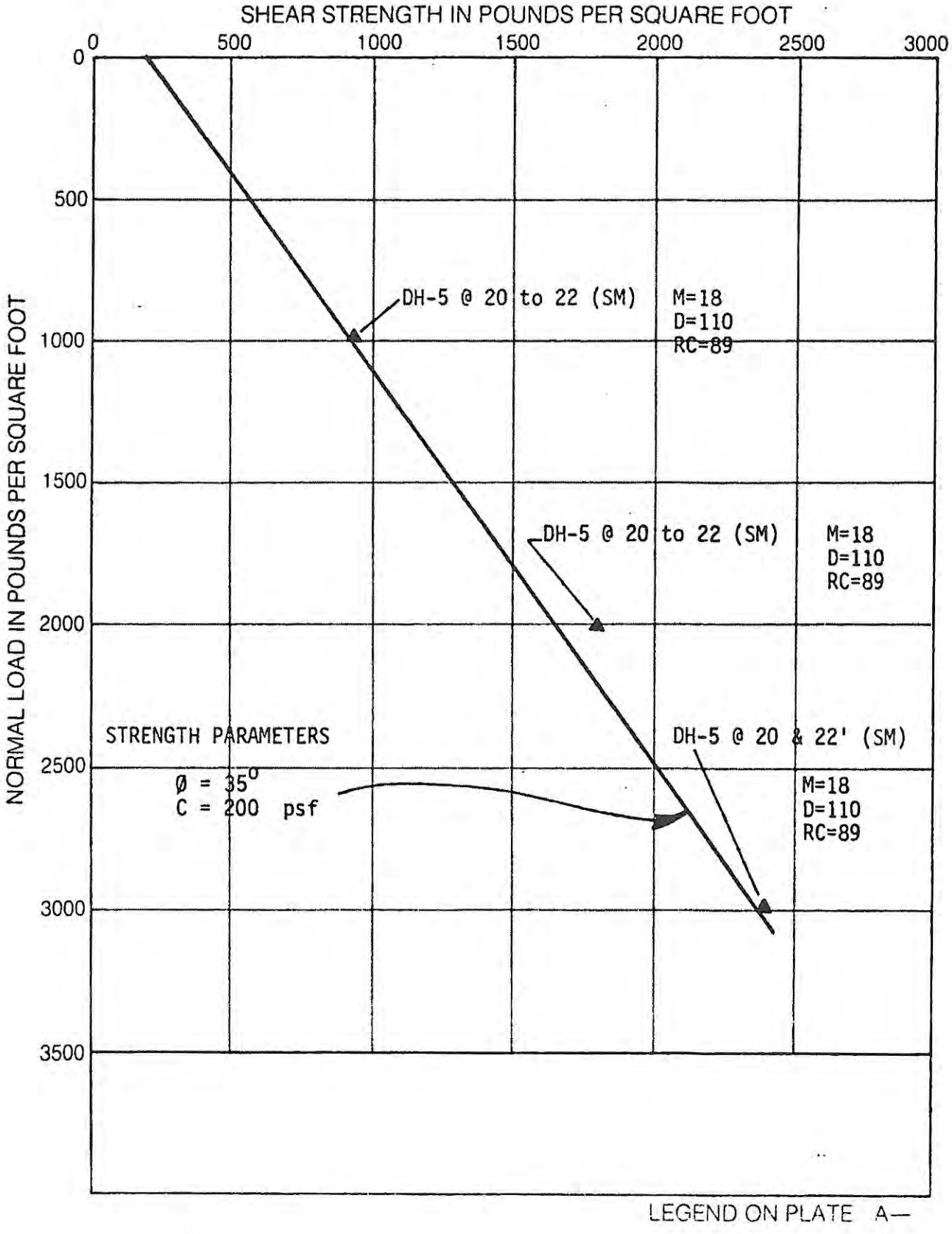



LEGEND ON PLATE A-7

S81031

Plate A-3.4

# SHEAR TEST DATA

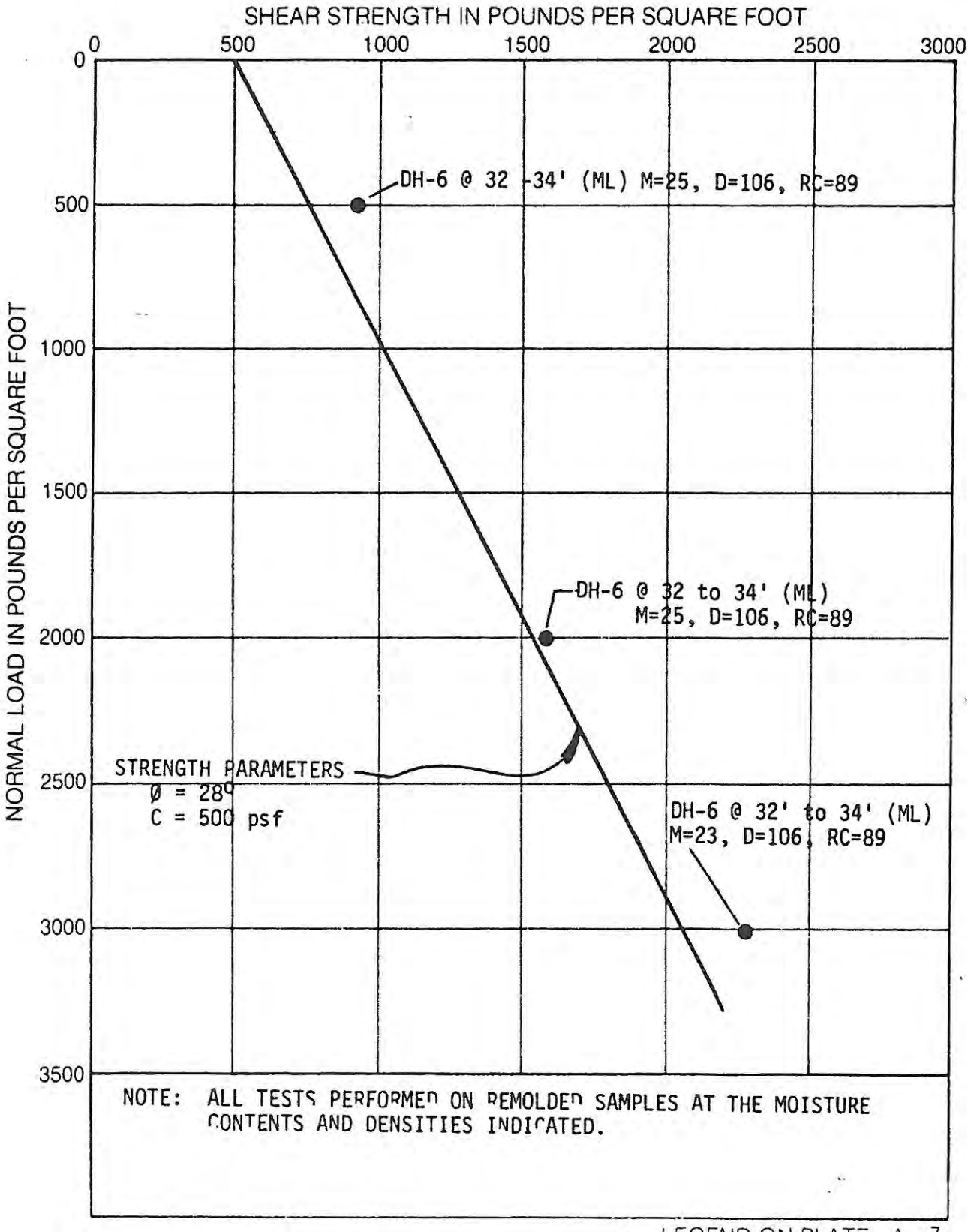



LEGEND ON PLATE A—

S81031

PLATE A-3.5

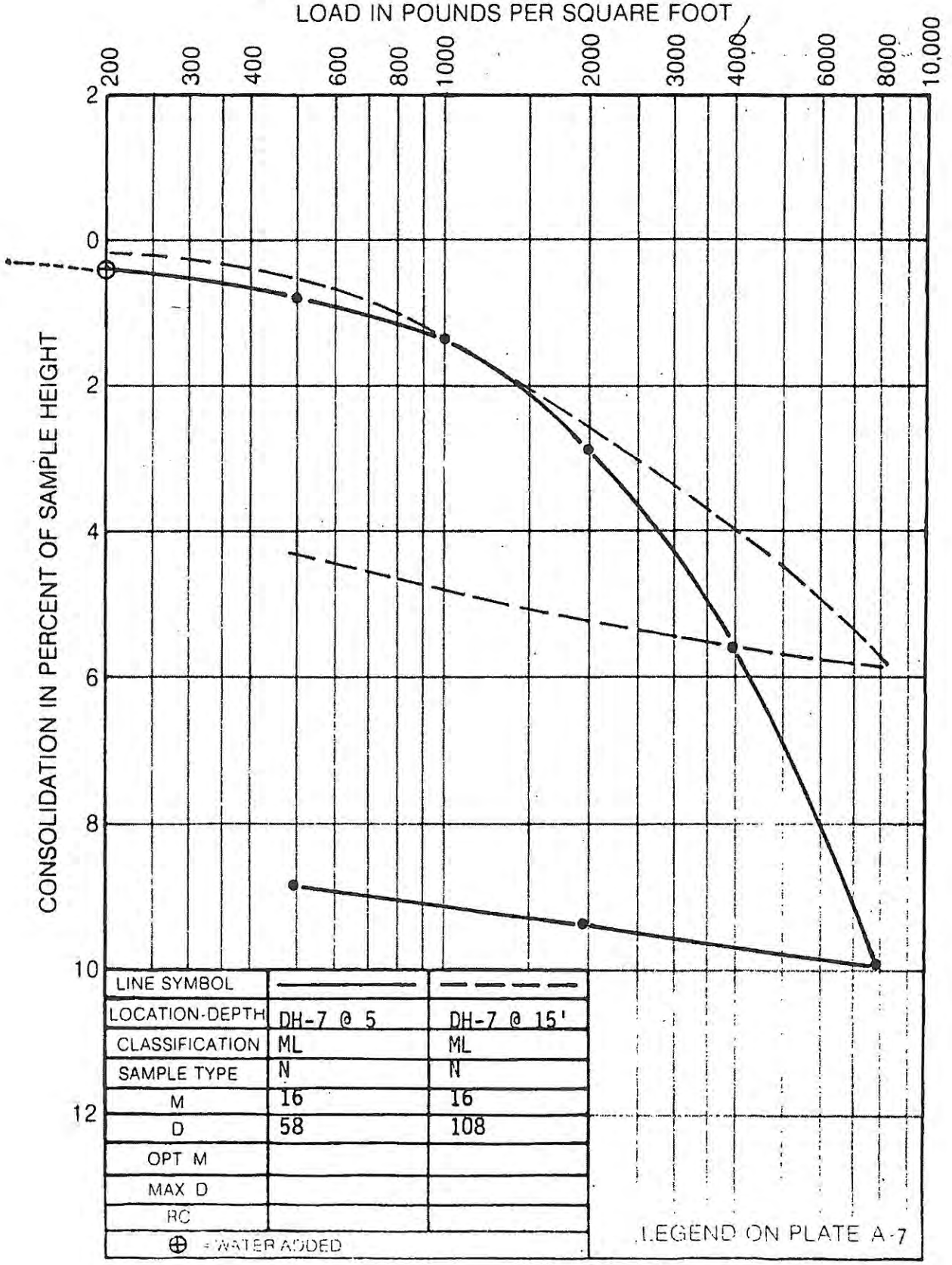
# SHEAR TEST DATA




LEGEND ON PLATE A—7

PLATE A-4.1

# CONSOLIDATION TEST DATA

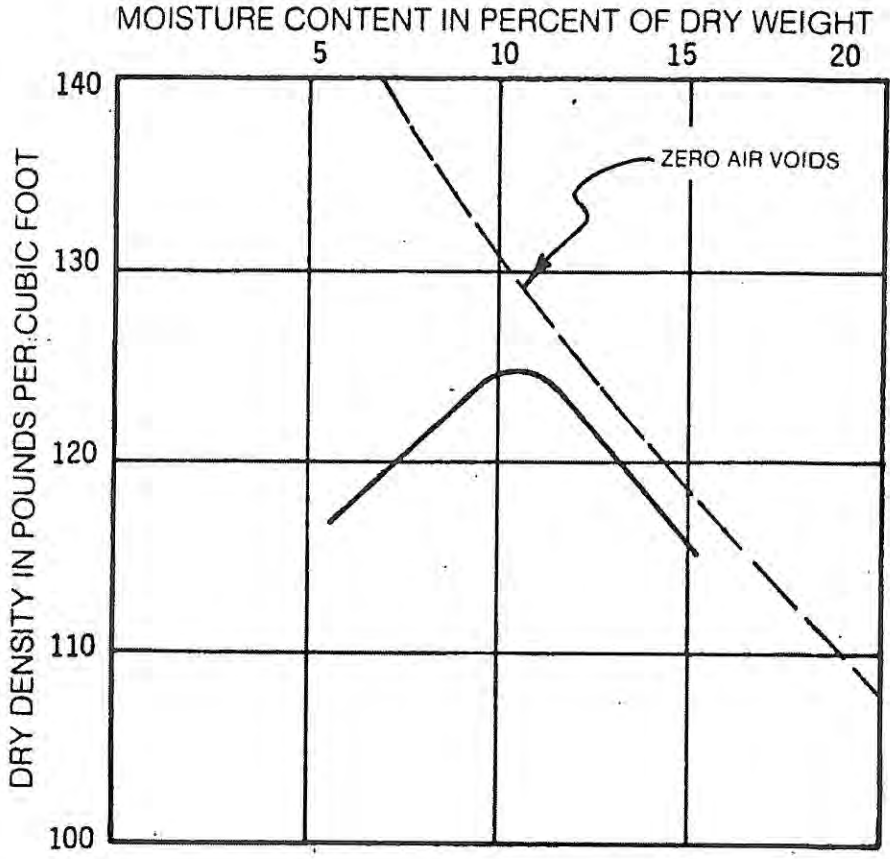



| LINE SYMBOL | ——— | - - - - |
|---|---|---|
| LOCATION-DEPTH | DH-7 @ 5 | DH-7 @ 15' |
| CLASSIFICATION | ML | ML |
| SAMPLE TYPE | N | N |
| M | 16 | 16 |
| D | 58 | 108 |
| OPT M | | |
| MAX D | | |
| RC | | |

⊕ = WATER ADDED

LEGEND ON PLATE A-7

# COMPACTION TEST DATA




## LOCATION

BORING OR TEST PIT: DH-5
DEPTH, IN FEET: 20 to 22
REPRESENTATIVE FOR: SESPE FORMATION (Ts)

## SOIL CLASSIFICATION

GRAIN SIZES IN PERCENT OF DRY WEIGHT
- SAND (RETAINED ON No. 200 SIEVE): 70
- FINES (PASSING No. 200 SIEVE): 25

ATTERBERG LIMITS, IN PERCENT OF DRY WEIGHT
- LIQUID LIMIT
- PLASTICITY INDEX

SOIL TYPE AND DESCRIPTION: SILTY SAND (SM)

## COMPACTION PROPERTIES

METHOD OF COMPACTION

ASTM STANDARD TEST METHOD D-1557 EQUIVALENT TO A.A.S.H.O. SOIL COMPACTION TEST T180 (1/30 CUBIC FOOT MOLD, 10 POUND HAMMER FALLING 18 INCHES, 25 BLOWS PER LAYER)

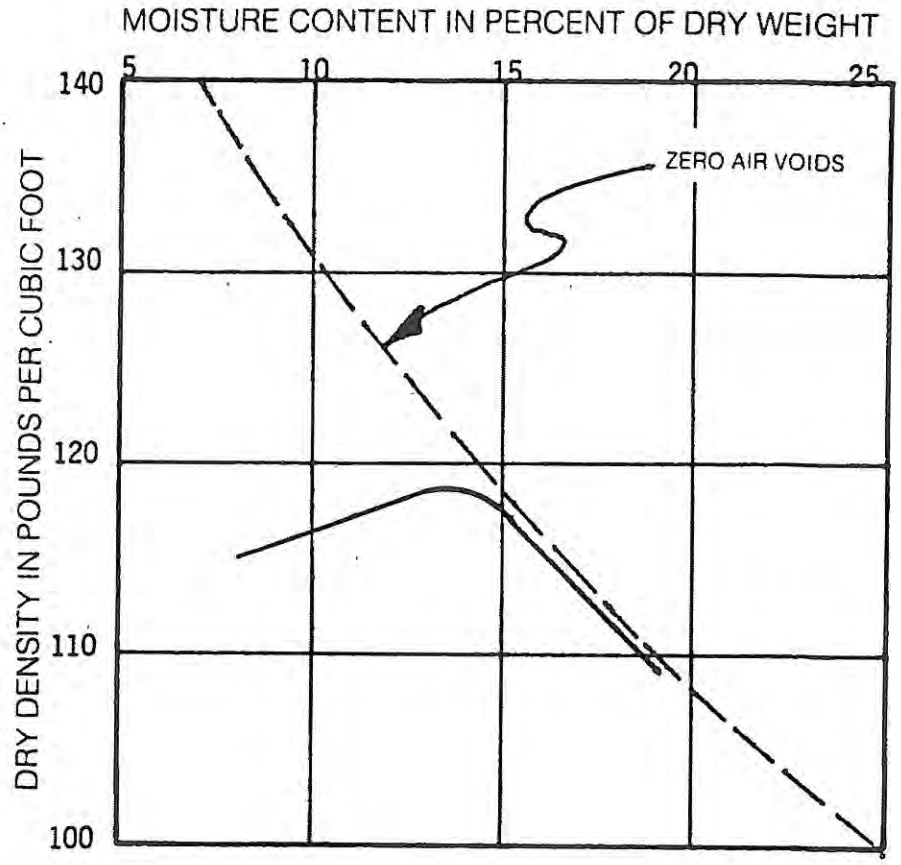
OPTIMUM MOISTURE CONTENT, IN PERCENT OF DRY WEIGHT: 10
MAXIMUM DRY DENSITY, IN POUNDS PER CUBIC FOOT: 124

S81031

PLATE A-6.2

GTC

# COMPACTION TEST DATA




## LOCATION

BORING OR TEST PIT DH-6
DEPTH, IN FEET 32 to 34
REPRESENTATIVE FOR VAQUEROS FORMATION (Tv)

## SOIL CLASSIFICATION

GRAIN SIZES IN PERCENT OF DRY WEIGHT
SAND (RETAINED ON No. 200 SIEVE) 56
FINES (PASSING No 200 SIEVE) 37
ATTERBERG LIMITS, IN PERCENT OF DRY WEIGHT
LIQUID LIMIT
PLASTICITY INDEX
SOIL TYPE AND DESCRIPTION SILTY SAND (SM)

## COMPACTION PROPERTIES

METHOD OF COMPACTION
ASTM STANDARD TEST METHOD D-1557 EQUIVALENT TO A.A.S.H.O. SOIL COMPACTION TEST T180
(1/30 CUBIC FOOT MOLD, 10 POUND HAMMER FALLING 18 INCHES, 25 BLOWS PER LAYER)

OPTIMUM MOISTURE CONTENT, IN PERCENT OF DRY WEIGHT 14
MAXIMUM DRY DENSITY IN POUNDS PER CUBIC FOOT 119

# *Appendix D*
# *Infiltration Test Data*

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-1

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 30 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read)

Boring Depth - (5 x Boring Radius) 28.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 6:23 | 6:48 | 25.0 | 24.26 | 24.32 | 0.06 | No |
| 2 | 6:49 | 7:14 | 25.0 | 24.10 | 24.19 | 0.09 | No |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 7:16 | 7:47 | 31.0 | 23.96 | 24.11 | 0.15 | 0.09 |
| 2 | 7:49 | 8:19 | 30.0 | 23.86 | 24.00 | 0.14 | 0.09 |
| 3 | 8:21 | 8:51 | 30.0 | 23.85 | 23.99 | 0.14 | 0.09 |
| 4 | 8:53 | 9:23 | 30.0 | 23.76 | 23.92 | 0.16 | 0.10 |
| 5 | 9:25 | 9:55 | 30.0 | 23.47 | 23.67 | 0.20 | 0.12 |
| 6 | 9:57 | 10:27 | 30.0 | 23.37 | 23.54 | 0.17 | 0.10 |
| 7 | 10:29 | 10:59 | 30.0 | 23.25 | 23.35 | 0.10 | 0.06 |
| 8 | 11:01 | 11:31 | 30.0 | 23.25 | 23.33 | 0.08 | 0.05 |
| 9 | 11:33 | 12:03 | 30.0 | 23.22 | 23.31 | 0.09 | 0.05 |
| 10 | 12:06 | 12:36 | 30.0 | 23.20 | 23.31 | 0.11 | 0.06 |
| 11 | 12:39 | 13:09 | 30.0 | 23.17 | 23.26 | 0.09 | 0.05 |
| 12 | 13:12 | 13:42 | 30.0 | 23.11 | 23.21 | 0.10 | 0.06 |

**Measured Infiltration Rate (No Factor of Safety)** **0.06**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-2

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 5 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read)

Boring Depth - (5 x Boring Radius) 3.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 6:28 | 6:53 | 25.0 | 2.14 | 2.52 | 0.38 | No |
| 2 | 6:54 | 7:19 | 25.0 | 2.17 | 2.52 | 0.35 | No |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 7:22 | 7:52 | 30.0 | 2.17 | 2.60 | 0.43 | 0.62 |
| 2 | 7:54 | 8:24 | 30.0 | 1.84 | 2.26 | 0.42 | 0.54 |
| 3 | 8:26 | 8:56 | 30.0 | 1.86 | 2.27 | 0.41 | 0.53 |
| 4 | 8:58 | 9:28 | 30.0 | 1.86 | 2.29 | 0.43 | 0.56 |
| 5 | 9:30 | 10:00 | 30.0 | 1.86 | 2.31 | 0.45 | 0.58 |
| 6 | 10:03 | 10:33 | 30.0 | 1.87 | 2.32 | 0.45 | 0.59 |
| 7 | 10:36 | 11:06 | 30.0 | 1.88 | 2.34 | 0.46 | 0.60 |
| 8 | 11:11 | 11:41 | 30.0 | 1.87 | 2.31 | 0.44 | 0.57 |
| 9 | 11:41 | 12:11 | 30.0 | 1.89 | 2.29 | 0.40 | 0.52 |
| 10 | 12:11 | 12:41 | 30.0 | 1.89 | 2.30 | 0.41 | 0.53 |
| 11 | 12:42 | 13:12 | 30.0 | 1.87 | 2.35 | 0.48 | 0.63 |
| 12 | 13:17 | 13:47 | 30.0 | 1.88 | 2.29 | 0.41 | 0.53 |

**Measured Infiltration Rate (No Factor of Safety)** **0.53**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-3

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 30 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read)

Boring Depth - (5 x Boring Radius) 28.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 6:34 | 6:59 | 25.0 | 25.22 | 25.48 | 0.26 | No |
| 2 | 7:01 | 7:26 | 25.0 | 25.06 | 25.60 | 0.54 | Yes |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 7:30 | 8:00 | 30.0 | 24.77 | 25.36 | 0.59 | 0.46 |
| 2 | 8:02 | 8:32 | 30.0 | 24.76 | 25.41 | 0.65 | 0.51 |
| 3 | 8:35 | 9:05 | 30.0 | 24.70 | 25.24 | 0.54 | 0.42 |
| 4 | 9:07 | 9:37 | 30.0 | 24.69 | 25.20 | 0.51 | 0.39 |
| 5 | 9:39 | 10:09 | 30.0 | 24.68 | 25.30 | 0.62 | 0.48 |
| 6 | 10:11 | 10:41 | 30.0 | 24.62 | 25.21 | 0.59 | 0.45 |
| 7 | 10:43 | 11:13 | 30.0 | 24.60 | 25.21 | 0.61 | 0.46 |
| 8 | 11:17 | 11:47 | 30.0 | 24.61 | 25.20 | 0.59 | 0.45 |
| 9 | 11:50 | 12:20 | 30.0 | 24.61 | 25.14 | 0.53 | 0.40 |
| 10 | 12:23 | 12:53 | 30.0 | 24.46 | 25.00 | 0.54 | 0.40 |
| 11 | 12:55 | 13:25 | 30.0 | 24.47 | 25.10 | 0.63 | 0.47 |
| 12 | 13:31 | 14:01 | 30.0 | 24.35 | 25.01 | 0.66 | 0.48 |
| 13 | 14:04 | 14:34 | 30.0 | 24.23 | 24.88 | 0.65 | 0.46 |
| | | | | | | **Measured Infiltration Rate (No Factor of Safety)** | **0.46** |

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017

Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-4

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 5 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 3.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 6:38 | 7:03 | 25.0 | 1.67 | 1.88 | 0.21 | No |
| 2 | 7:05 | 7:30 | 25.0 | 1.66 | 1.82 | 0.16 | No |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 7:33 | 8:03 | 30.0 | 1.65 | 1.76 | 0.11 | 0.13 |
| 2 | 8:05 | 8:35 | 30.0 | 1.65 | 1.80 | 0.15 | 0.17 |
| 3 | 8:37 | 9:08 | 31.0 | 1.67 | 1.85 | 0.18 | 0.20 |
| 4 | 9:10 | 9:40 | 30.0 | 1.66 | 1.79 | 0.13 | 0.15 |
| 5 | 9:44 | 10:14 | 30.0 | 1.65 | 1.75 | 0.10 | 0.12 |
| 6 | 10:15 | 10:45 | 30.0 | 1.65 | 1.80 | 0.15 | 0.17 |
| 7 | 10:47 | 11:17 | 30.0 | 1.62 | 1.81 | 0.19 | 0.22 |
| 8 | 11:19 | 11:52 | 33.0 | 1.63 | 1.72 | 0.09 | 0.09 |
| 9 | 11:53 | 12:24 | 31.0 | 1.60 | 1.64 | 0.04 | 0.04 |
| 10 | 12:26 | 12:56 | 30.0 | 1.61 | 1.67 | 0.06 | 0.07 |
| 11 | 12:57 | 13:30 | 33.0 | 1.59 | 1.65 | 0.06 | 0.06 |
| 12 | 13:33 | 14:03 | 30.0 | 1.60 | 1.66 | 0.06 | 0.07 |

**Measured Infiltration Rate (No Factor of Safety)** **0.07**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-5

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 30 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read)

Boring Depth - (5 x Boring Radius) 28.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 12:11 | 12:36 | 25.0 | 25.81 | 29.13 | 3.32 | yes |
| 2 | 12:40 | 13:05 | 25.0 | 25.90 | 29.09 | 3.19 | yes |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 13:12 | 13:22 | 10.0 | 23.70 | 25.60 | 1.90 | 4.13 |
| 2 | 13:24 | 13:34 | 10.0 | 23.52 | 25.24 | 1.72 | 3.57 |
| 3 | 13:38 | 13:48 | 10.0 | 23.45 | 25.28 | 1.83 | 3.79 |
| 4 | 13:50 | 14:00 | 10.0 | 23.50 | 25.22 | 1.72 | 3.55 |
| 5 | 14:04 | 14:14 | 10.0 | 23.50 | 25.34 | 1.84 | 3.84 |
| 6 | 14:19 | 14:29 | 10.0 | 23.47 | 25.24 | 1.77 | 3.65 |
| 7 | 14:33 | 14:43 | 10.0 | 23.45 | 25.20 | 1.75 | 3.59 |
| 8 | 14:47 | 14:57 | 10.0 | 23.44 | 25.20 | 1.76 | 3.61 |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |

**Measured Infiltration Rate (No Factor of Safety)** **3.61**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-6

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 5 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 3.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 6:43 | 7:08 | 25.0 | 1.78 | 2.19 | 0.41 | No |
| 2 | 7:09 | 7:39 | 30.0 | 1.77 | 2.18 | 0.41 | No |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 7:43 | 8:13 | 30.0 | 1.78 | 2.16 | 0.38 | 0.48 |
| 2 | 8:15 | 8:45 | 30.0 | 1.79 | 2.17 | 0.38 | 0.48 |
| 3 | 8:47 | 9:17 | 30.0 | 1.76 | 2.13 | 0.37 | 0.46 |
| 4 | 9:19 | 9:49 | 30.0 | 1.77 | 2.13 | 0.36 | 0.45 |
| 5 | 9:51 | 10:21 | 30.0 | 1.78 | 2.15 | 0.37 | 0.46 |
| 6 | 10:23 | 10:53 | 30.0 | 1.78 | 2.16 | 0.38 | 0.48 |
| 7 | 10:55 | 11:25 | 30.0 | 1.78 | 2.15 | 0.37 | 0.46 |
| 8 | 11:27 | 11:57 | 30.0 | 1.79 | 2.16 | 0.37 | 0.46 |
| 9 | 11:59 | 12:31 | 32.0 | 1.76 | 2.15 | 0.39 | 0.46 |
| 10 | 12:34 | 13:04 | 30.0 | 1.73 | 2.10 | 0.37 | 0.46 |
| 11 | 13:06 | 13:36 | 30.0 | 1.74 | 2.10 | 0.36 | 0.44 |
| 12 | 13:41 | 14:11 | 30.0 | 1.70 | 2.05 | 0.35 | 0.43 |
| | | | | | | **Measured Infiltration Rate (No Factor of Safety)** | **0.43** |

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/27/2024
**Boring Number:** I-7

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 30 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read)

Boring Depth - (5 x Boring Radius) 28.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 6:58 | 7:23 | 25.0 | 26.05 | 26.14 | 0.09 | No |
| 2 | 7:25 | 7:50 | 25.0 | 26.06 | 26.14 | 0.08 | No |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 7:51 | 8:21 | 30.0 | 26.05 | 26.10 | 0.05 | 0.05 |
| 2 | 8:22 | 8:52 | 30.0 | 26.00 | 26.05 | 0.05 | 0.05 |
| 3 | 8:52 | 9:22 | 30.0 | 26.00 | 26.08 | 0.08 | 0.08 |
| 4 | 9:24 | 9:54 | 30.0 | 25.98 | 26.05 | 0.07 | 0.07 |
| 5 | 9:55 | 10:25 | 30.0 | 25.48 | 26.06 | 0.58 | 0.53 |
| 6 | 10:26 | 10:56 | 30.0 | 25.99 | 26.05 | 0.06 | 0.06 |
| 7 | 10:59 | 11:29 | 30.0 | 25.96 | 26.03 | 0.07 | 0.07 |
| 8 | 11:31 | 12:01 | 30.0 | 25.96 | 26.03 | 0.07 | 0.07 |
| 9 | 12:02 | 12:32 | 30.0 | 25.96 | 26.03 | 0.07 | 0.07 |
| 10 | 12:33 | 13:03 | 30.0 | 25.97 | 26.04 | 0.07 | 0.07 |
| 11 | 13:04 | 13:34 | 30.0 | 25.97 | 26.05 | 0.08 | 0.08 |
| 12 | 13:37 | 14:07 | 30.0 | 25.95 | 26.03 | 0.08 | 0.08 |
| | | | | | | **Measured Infiltration Rate (No Factor of Safety)** | **0.08** |

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/30/2024
**Boring Number:** I-8

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 5 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 3.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 7:00 | 7:25 | 25.0 | 2.13 | 2.98 | 0.85 | Yes |
| 2 | 7:27 | 7:52 | 25.0 | 2.10 | 2.83 | 0.73 | Yes |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 10:12 | 10:22 | 10.0 | 2.10 | 2.36 | 0.26 | 1.06 |
| 2 | 10:23 | 10:33 | 10.0 | 2.08 | 2.37 | 0.29 | 1.18 |
| 3 | 10:35 | 10:45 | 10.0 | 2.09 | 2.38 | 0.29 | 1.19 |
| 4 | 10:47 | 10:57 | 10.0 | 2.07 | 2.36 | 0.29 | 1.18 |
| 5 | 11:00 | 11:10 | 10.0 | 2.08 | 2.36 | 0.28 | 1.14 |
| 6 | 11:12 | 11:22 | 10.0 | 2.09 | 2.37 | 0.28 | 1.14 |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |

**Measured Infiltration Rate (No Factor of Safety)** **1.14**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/30/2024
**Boring Number:** I-9

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 30 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read)

Boring Depth - (5 x Boring Radius) 28.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 7:37 | 8:02 | 25.0 | 23.35 | 24.22 | 0.87 | Yes |
| 2 | 8:04 | 8:29 | 25.0 | 23.16 | 24.03 | 0.87 | Yes |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 8:32 | 8:42 | 10.0 | 22.92 | 23.32 | 0.40 | 0.68 |
| 2 | 8:44 | 8:54 | 10.0 | 22.90 | 23.30 | 0.40 | 0.68 |
| 3 | 8:56 | 9:06 | 10.0 | 22.91 | 23.30 | 0.39 | 0.66 |
| 4 | 9:07 | 9:17 | 10.0 | 22.83 | 23.27 | 0.44 | 0.74 |
| 5 | 9:22 | 9:32 | 10.0 | 22.81 | 23.24 | 0.43 | 0.72 |
| 6 | 9:36 | 9:46 | 10.0 | 22.80 | 23.22 | 0.42 | 0.70 |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |

**Measured Infiltration Rate (No Factor of Safety)** **0.70**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

# Infiltration Test Data Sheet

**LGC Geotechnical, Inc**
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

**Project Name:** Brookfield - Gateway Village
**Project Number:** 23203-01
**Date:** 9/30/2024
**Boring Number:** I-10

| Test hole dimensions (if circular) | |
|---|---|
| Boring Depth (feet)*: | 5 |
| Boring Diameter (inches): | 8 |
| Pipe Diameter (inches): | 3 |

*measured at time of test

| Test pit dimensions (if rectangular) | |
|---|---|
| Pit Depth (feet): | |
| Pit Length (feet): | |
| Pit Breadth (feet): | |

Minimum test Head ($D_o$):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 3.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

## *Pre-Test (Sandy Soil Criteria)**

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval (min) | Initial Depth to Water (feet) | Final Depth to Water (feet) | Total Change in Water Level (feet) | Greater Than or Equal to 0.5 feet (yes/no) |
|---|---|---|---|---|---|---|---|
| 1 | 7:05 | 7:30 | 25.0 | 2.20 | 4.05 | 1.85 | Yes |
| 2 | 7:31 | 7:56 | 25.0 | 2.17 | 3.95 | 1.78 | Yes |

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

## *Main Test Data*

| Trial No. | Start Time (24:HR) | Stop Time (24:HR) | Time Interval, Dt (min) | Initial Depth to Water, $D_o$ (feet) | Final Depth to Water, $D_f$ (feet) | Change in Water Level, DD (feet) | Measured Infiltration Rate(in/hr) |
|---|---|---|---|---|---|---|---|
| 1 | 12:07 | 12:17 | 10.0 | 2.13 | 3.34 | 1.21 | 5.97 |
| 2 | 12:18 | 12:28 | 10.0 | 2.18 | 3.36 | 1.18 | 5.91 |
| 3 | 12:30 | 12:40 | 10.0 | 2.17 | 3.37 | 1.20 | 6.01 |
| 4 | 13:07 | 13:17 | 10.0 | 2.17 | 3.45 | 1.28 | 6.52 |
| 5 | 13:18 | 13:28 | 10.0 | 2.18 | 3.47 | 1.29 | 6.61 |
| 6 | 13:32 | 13:42 | 10.0 | 2.18 | 3.47 | 1.29 | 6.61 |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |

**Measured Infiltration Rate (No Factor of Safety)** **6.61**

***Sketch:***

***Notes:***

Based on Guidelines from: South Orange County 9/28/2017
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

## Percolation Data Sheet

Project Name: COI/ Gateway
Project Number: 23007-01
Test Hole Number: P-1
Date Excavated: 4/3/2023
Depth (in): 145.8 Radius (in.): 4.0
Date Presoak: 4/4/2023
Tested By: BF
Date Tested: 4/5/2023

Sandy Soil Criteria

| Trial Number | Time | Time Interval (mins.) | Initial Water Level (in.) | Final Water Level (in.) | Δ in Water Level (in.) |
|---|---|---|---|---|---|
| 1 | 8:36<br>9:01 | 25.0 | 88.8 | 93.4 | 4.6 |
| 2 | 9:01<br>9:26 | 25.0 | 93.4 | 97.7 | 4.3 |

Percolation Data

| Time | Time Interval (mins.) | Total Elapsed Time (mins) | Initial Depth to Water (in.) | Final Depth to Water (in.) | Δ in Water Level (in.) | Percolation Rate (in./hr.) |
|---|---|---|---|---|---|---|
| 9:31<br>10:01 | 30.0 | 30.0 | 88.8 | 92.9 | 4.08 | 8.2 |
| 10:01<br>10:31 | 30.0 | 60.0 | 92.9 | 96.7 | 3.8 | 7.7 |
| 10:31<br>11:01 | 30.0 | 90.0 | 96.7 | 100.6 | 3.8 | 7.7 |
| 11:01<br>11:31 | 30.0 | 120.0 | 100.6 | 104.3 | 3.7 | 7.4 |
| 11:31<br>12:01 | 30.0 | 150.0 | 104.3 | 108.0 | 3.7 | 7.4 |
| 12:01<br>12:31 | 30.0 | 180.0 | 108.0 | 111.7 | 3.7 | 7.4 |
| 12:31<br>13:01 | 30.0 | 210.0 | 111.7 | 115.3 | 3.6 | 7.2 |
| 13:01<br>13:31 | 30.0 | 240.0 | 115.3 | 118.9 | 3.6 | 7.2 |
| 13:31<br>14:01 | 30.0 | 270.0 | 118.9 | 122.5 | 3.6 | 7.2 |
| 14:01<br>14:31 | 30.0 | 300.0 | 122.5 | 126.1 | 3.6 | 7.2 |
| 14:31<br>15:01 | 30.0 | 330.0 | 126.1 | 129.7 | 3.6 | 7.2 |
| 15:01<br>15:31 | 30.0 | 360.0 | 129.7 | 133.3 | 3.6 | 7.2 |

Initial Height of Water (Ho) = 16.1
Final Height of Water (Hf) = 12.5
Change in Height Over Time (ΔH) = 3.6
Average Head Over Time (Havg) = 14.3

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$
$I_t$ = 0.9 in./hr.

## Percolation Data Sheet

Project Name: COI/ Gateway
Project Number: 23007-01
Test Hole Number: P-2
Date Excavated: 4/3/2023
Depth (in): 145.9 Radius (in.): 4.0
Date Presoak: 4/4/2023
Tested By: BF
Date Tested: 4/5/2023

Sandy Soil Criteria

| Trial Number | Time | Time Interval (mins.) | Initial Water Level (in.) | Final Water Level (in.) | Δ in Water Level (in.) |
|---|---|---|---|---|---|
| 1 | 13:01<br>13:06 | 5.0 | 87.6 | 144.0 | 56.4 |
| 2 | 13:10<br>13:15 | 5.0 | 87.6 | 140.9 | 53.3 |

| Time | Time Interval (mins.) | Total Elapsed Time (mins) | Initial Depth to Water (in.) | Final Depth to Water (in.) | Δ in Water Level (in.) | Percolation Rate (in./hr.) |
|---|---|---|---|---|---|---|
| 13:21<br>13:26 | 5.0 | 5.0 | 87.6 | 139.4 | 51.8 | 622.1 |
| 13:29<br>13:34 | 5.0 | 10.0 | 87.6 | 138.0 | 50.4 | 604.8 |
| 13:37<br>13:42 | 5.0 | 15.0 | 87.6 | 137.4 | 49.8 | 597.6 |
| 13:45<br>13:50 | 5.0 | 20.0 | 87.6 | 136.4 | 48.8 | 586.1 |
| 13:53<br>13:58 | 5.0 | 25.0 | 87.6 | 136.3 | 48.7 | 584.6 |
| 14:01<br>14:06 | 5.0 | 30.0 | 87.6 | 133.2 | 45.6 | 547.2 |
| 14:08<br>14:13 | 5.0 | 35.0 | 87.6 | 135.4 | 47.8 | 573.1 |
| 14:16<br>14:21 | 5.0 | 40.0 | 87.6 | 132.1 | 44.5 | 534.2 |
| 14:23<br>14:28 | 5.0 | 45.0 | 87.6 | 133.2 | 45.6 | 547.2 |
| 14:30<br>14:35 | 5.0 | 50.0 | 87.6 | 132.4 | 44.8 | 537.1 |
| 14:38<br>14:43 | 5.0 | 55.0 | 87.6 | 131.4 | 43.8 | 525.6 |
| 14:46<br>14:51 | 5.0 | 60.0 | 87.6 | 130.9 | 43.3 | 519.8 |

Initial Height of Water (Ho) = 58.3
Final Height of Water (Hf) = 15.0
Change in Height Over Time (ΔH) = 43.32
Average Head Over Time (Havg) = 36.6

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$
$I_t$ = 26.9 in./hr.

## Percolation Data Sheet

Project Name: COI/Gateway
Project Number: 23007-01
Test Hole Number: P-3
Date Excavated 11/21/2023
Depth (in): 123.6 Radius (in.): 4.0
Date Presoak: 11/21/2023
Tested By: DDK
Date Tested: 11/22/2023

Sandy Soil Criteria

| Trial Number | Time | Time Interval (mins.) | Initial Water Level (in.) | Final Water Level (in.) | Δ in Water Level (in.) |
|---|---|---|---|---|---|
| 1 | 12:23<br>12:24 | 1.0 | 38.4 | 44.4 | 6 |
| 2 | 12:24<br>12:26 | 2.0 | 44.4 | 50.4 | 6.0 |

Percolation Data

| Time | Time Interval (mins.) | Total Elapsed Time (mins) | Initial Depth to Water (in.) | Final Depth to Water (in.) | Δ in Water Level (in.) | Percolation Rate (in./hr.) |
|---|---|---|---|---|---|---|
| 12:51<br>13:01 | 10.0 | 10.0 | 56.4 | 65.9 | 9.5 | 56.9 |
| 13:01<br>13:11 | 10.0 | 20.0 | 65.9 | 73.4 | 7.6 | 45.4 |
| 13:11<br>13:21 | 10.0 | 30.0 | 73.4 | 82.7 | 9.2 | 55.4 |
| 13:21<br>13:31 | 10.0 | 40.0 | 82.7 | 85.4 | 2.8 | 16.6 |
| 13:31<br>13:41 | 10.0 | 50.0 | 85.4 | 89.4 | 4.0 | 23.8 |
| 13:41<br>13:51 | 10.0 | 60.0 | 89.4 | 92.3 | 2.9 | 17.3 |
| 13:51<br>14:01 | 10.0 | 70.0 | 92.3 | 95.0 | 2.8 | 16.6 |

Initial Height of Water (Ho) = 31.3
Final Height of Water (Hf) = 28.56
Change in Height Over Time (ΔH) = 2.76
Average Head Over Time (Havg) = 29.9

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$

$I_t$ = 1.0 in./hr.

**Percolation Data Sheet**

Project Name: COI/Gateway
Project Number: 23007-01
Test Hole Number: P-4
Date Excavated 11/21/2023
Depth (in): 178.8 Radius (in. 4.0
Date Presoak: 11/21/2023
Tested By: DDK
Date Tested: 11/22/2023

Sandy Soil Criteria

| Trial Number | Time | Time Interval (mins.) | Initial Water Level (in.) | Final Water Level (in.) | Δ in Water Level (in.) |
|---|---|---|---|---|---|
| 1 | 10:02<br>10:03 | 1.0 | 73.2 | 85.2 | 12.0 |
| 2 | 10:05<br>10:07 | 2.0 | 109.2 | 121.2 | 12.0 |

Percolation Data

| Time | Time Interval (mins.) | Total Elapsed Time (mins) | Initial Depth to Water (in.) | Final Depth to Water (in.) | Δ in Water Level (in.) | Percolation Rate (in./hr.) |
|---|---|---|---|---|---|---|
| 10:10<br>10:20 | 10.0 | 10.0 | 133.2 | 157.2 | 24.0 | 144.0 |
| 10:32<br>10:42 | 10.0 | 32.0 | 106.8 | 138.8 | 32.0 | 192.2 |
| 10:42<br>10:52 | 10.0 | 42.0 | 138.8 | 153.7 | 14.9 | 89.3 |
| 10:58<br>11:08 | 10.0 | 58.0 | 109.4 | 137.8 | 28.3 | 169.9 |
| 11:08<br>11:18 | 10.0 | 68.0 | 137.8 | 154.6 | 16.8 | 100.8 |
| 11:25<br>11:35 | 10.0 | 85.0 | 107.9 | 138.7 | 30.8 | 185.0 |
| 11:35<br>11:45 | 10.0 | 95.0 | 138.7 | 153.0 | 14.3 | 85.7 |

Initial Height of Water (Ho) = 40.1

Final Height of Water (Hf) = 25.8

Change in Height Over Time (ΔH) = 14.28

Average Head Over Time (Havg) = 32.9

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$

$I_t$ = 4.9 in./hr.

# *Appendix E*
# *General Earthwork and Grading Specifications for Rough Grading*

# ***General Earthwork and Grading Specifications for Rough Grading***

## *1.0 General*

### *1.1 Intent*

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

### *1.2 The Geotechnical Consultant of Record*

Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

### *1.3 The Earthwork Contractor*

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of “equipment” of work and the estimated quantities of daily earthwork

contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the
Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

## *2.0 Preparation of Areas to be Filled*

### *2.1 Clearing and Grubbing*

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

### *2.2 Processing*

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be over-excavated as specified in the following section. Scarification shall continue until soils are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

### *2.3 Over-excavation*

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by the Geotechnical Consultant during grading.

### *2.4 Benching*

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

### *2.5 Evaluation/Acceptance of Fill Areas*

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

## *3.0 Fill Material*

### *3.1 General*

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

### *3.2 Oversize*

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

### *3.3 Import*

If importing of fill material is required for grading, proposed import material shall meet the requirements of the geotechnical consultant. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

## *4.0 Fill Placement and Compaction*

### *4.1 Fill Layers*

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

### *4.2 Fill Moisture Conditioning*

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

### *4.3 Compaction of Fill*

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

### *4.4 Compaction of Fill Slopes*

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

### *4.5 Compaction Testing*

Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

### *4.6 Frequency of Compaction Testing*

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

### *4.7 Compaction Test Locations*

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than
5 feet apart from potential test locations shall be provided.

## *5.0 Subdrain Installation*

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

## *6.0 Excavation*

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

## *7.0 Trench Backfills*

***7.1*** The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

***7.2*** All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over

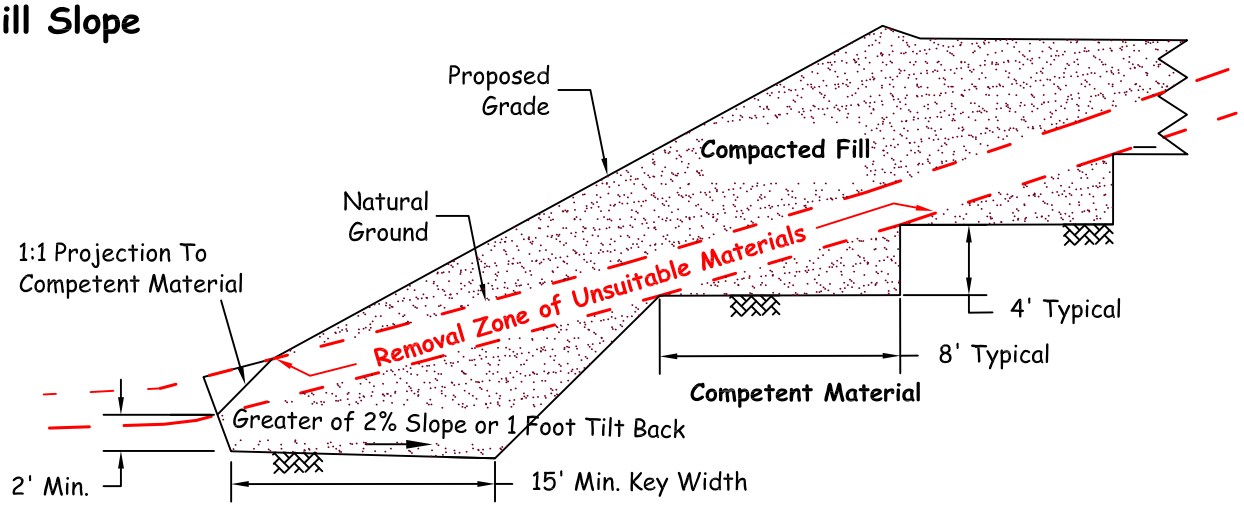
the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

***7.3*** The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

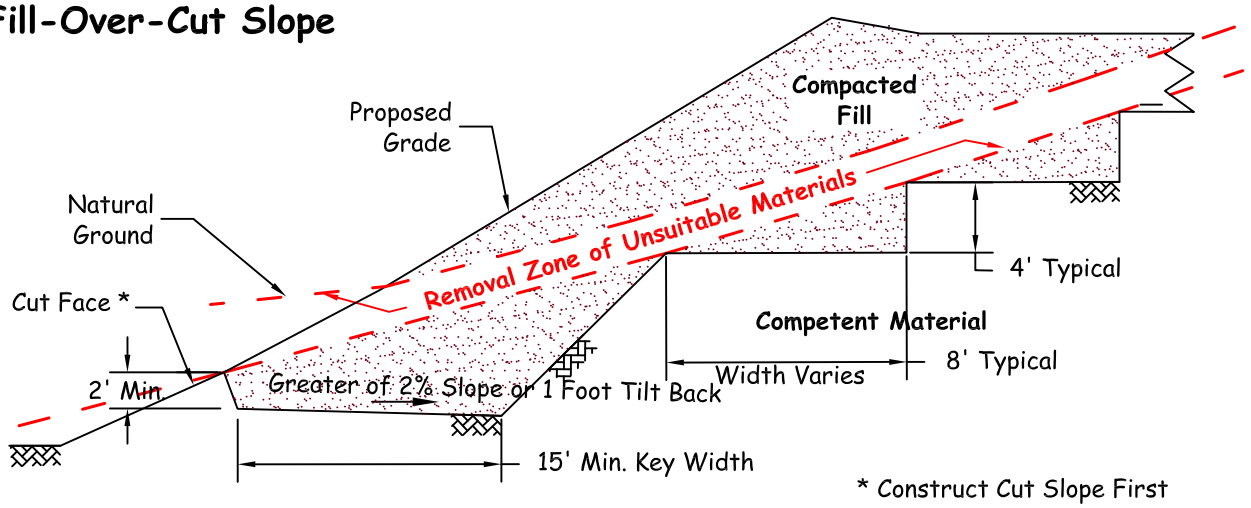
***7.4*** The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

***7.5*** Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

## Fill Slope

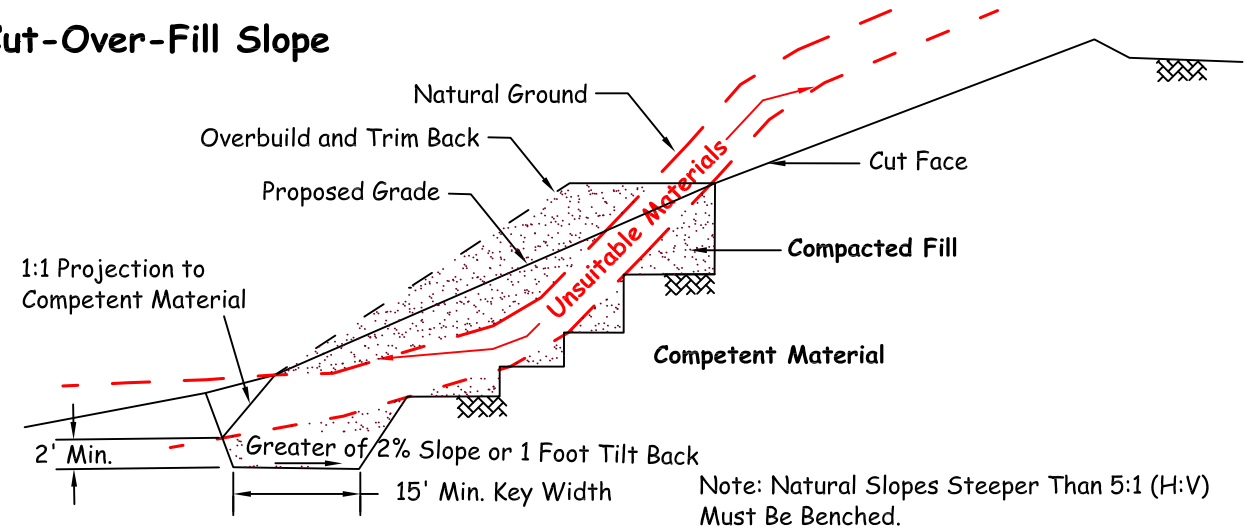



## Fill-Over-Cut Slope




* Construct Cut Slope First

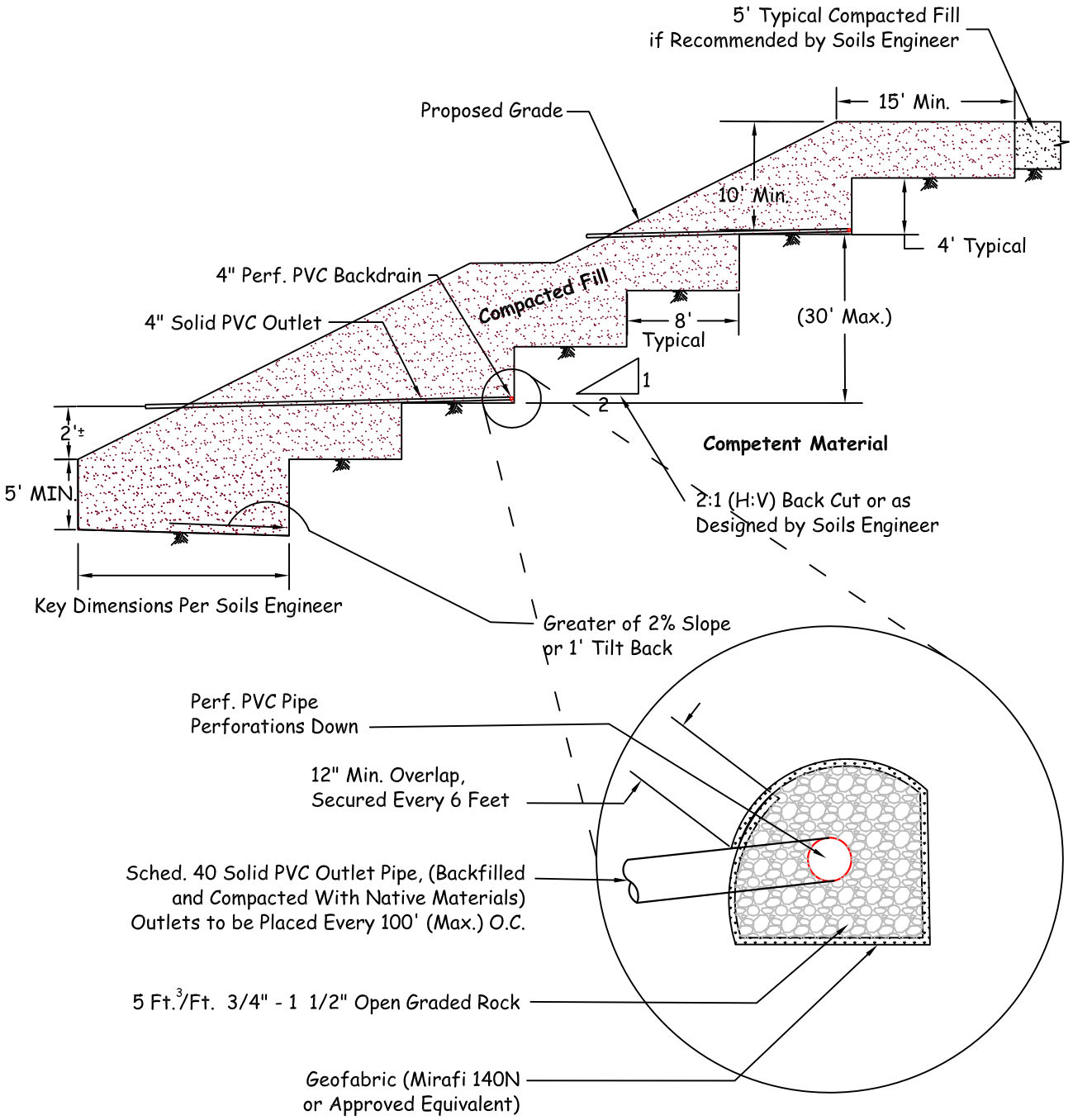
## Cut-Over-Fill Slope




Note: Natural Slopes Steeper Than 5:1 (H:V) Must Be Benched.

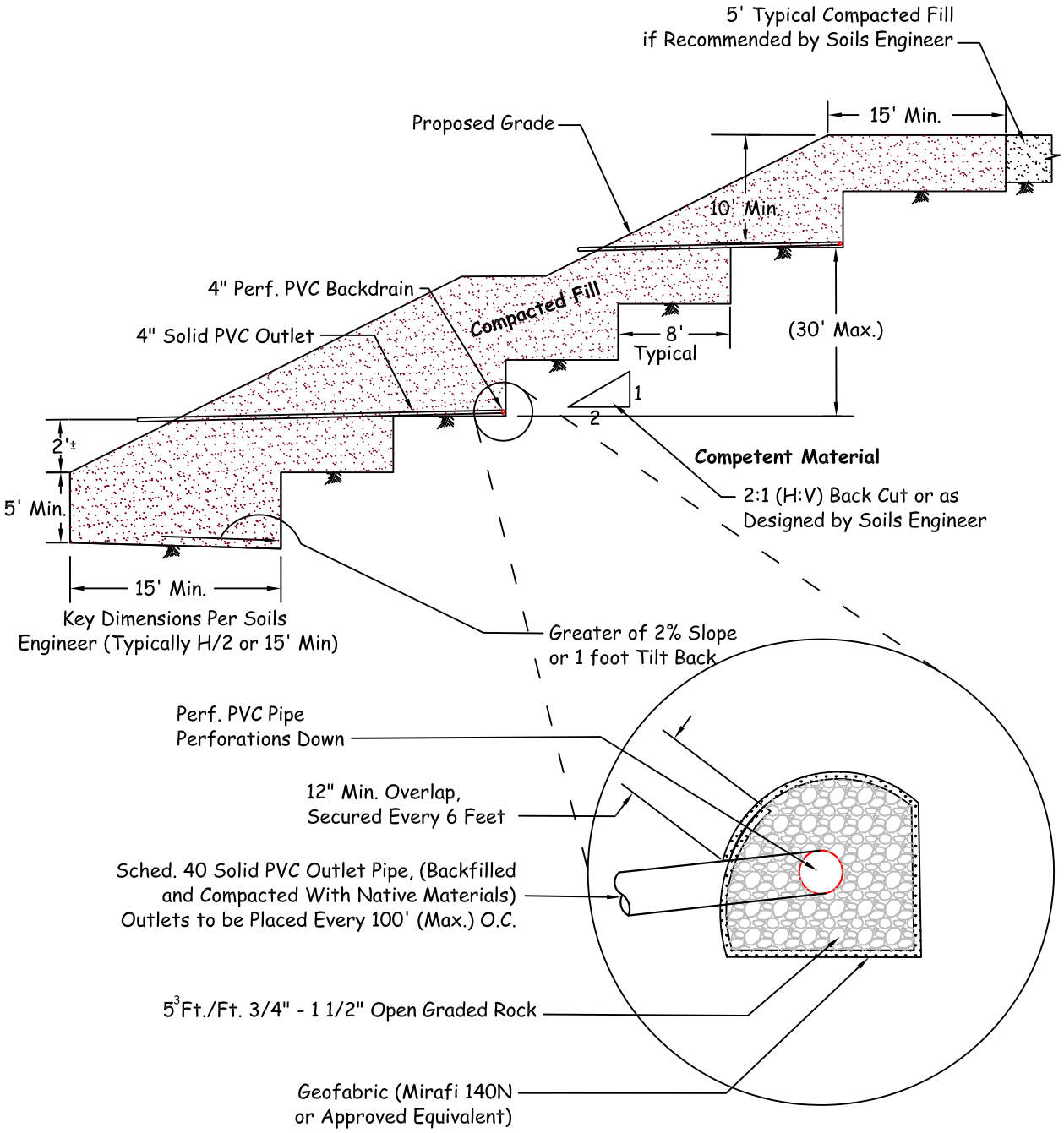
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# KEYING AND BENCHING




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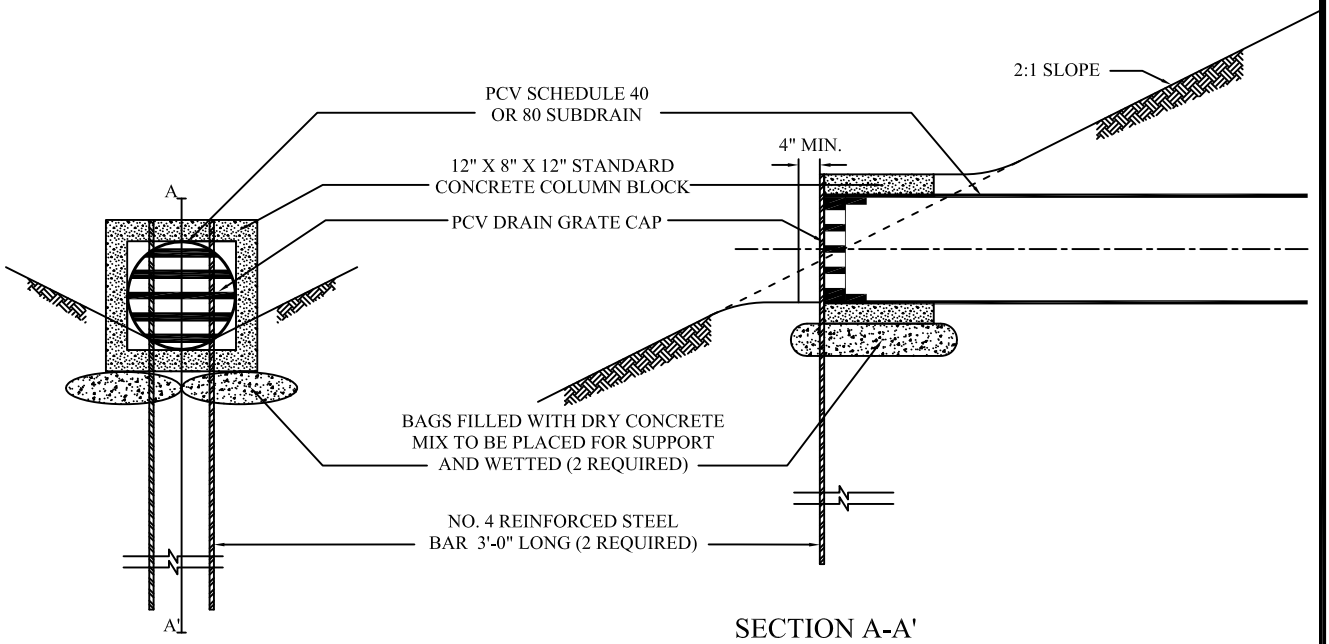
# TYPICAL BUTTRESS DETAIL




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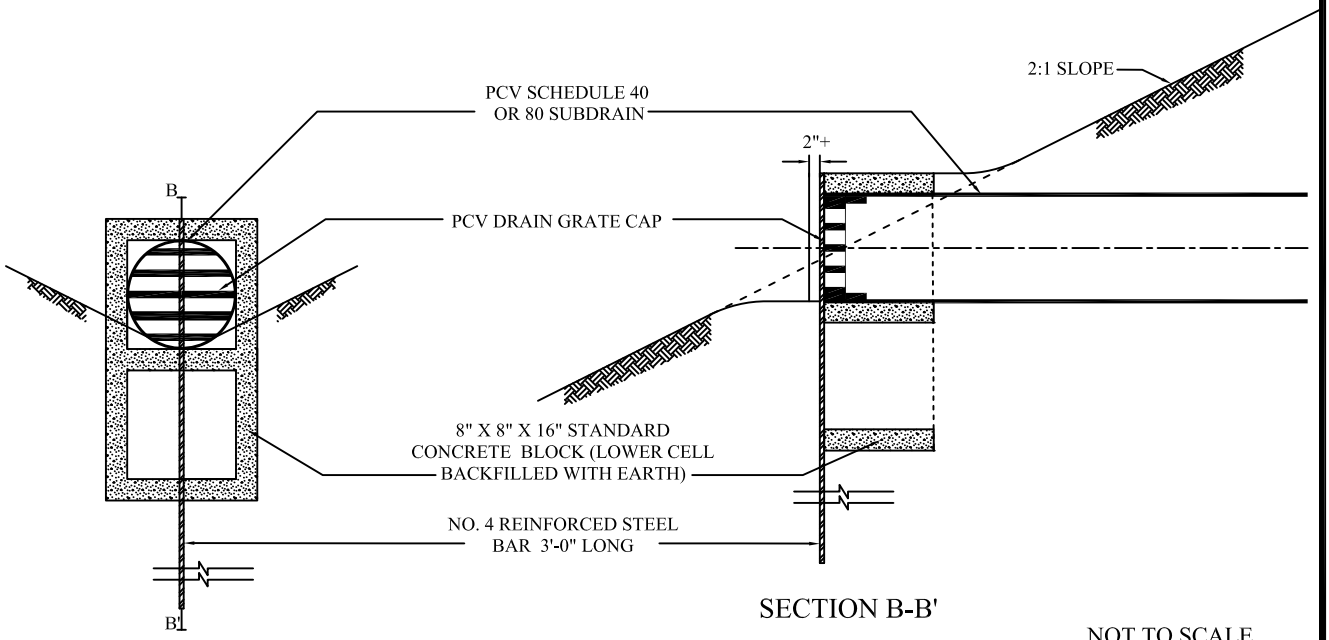
# TYPICAL STABILIZATION FILL DETAIL

# SUBDRAIN OUTLET MARKER -6" & 8" PIPE




SECTION A-A'

# SUBDRAIN OUTLET MARKER -4" PIPE



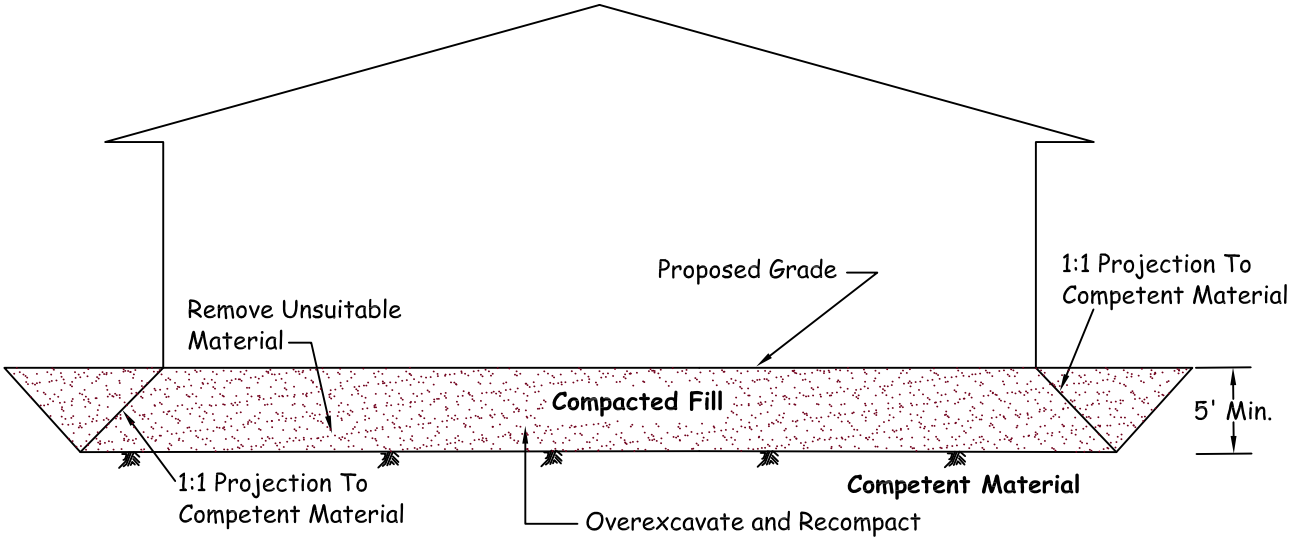

SECTION B-B'

NOT TO SCALE

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**SUBDRAIN OUTLET MARKER DETAIL**

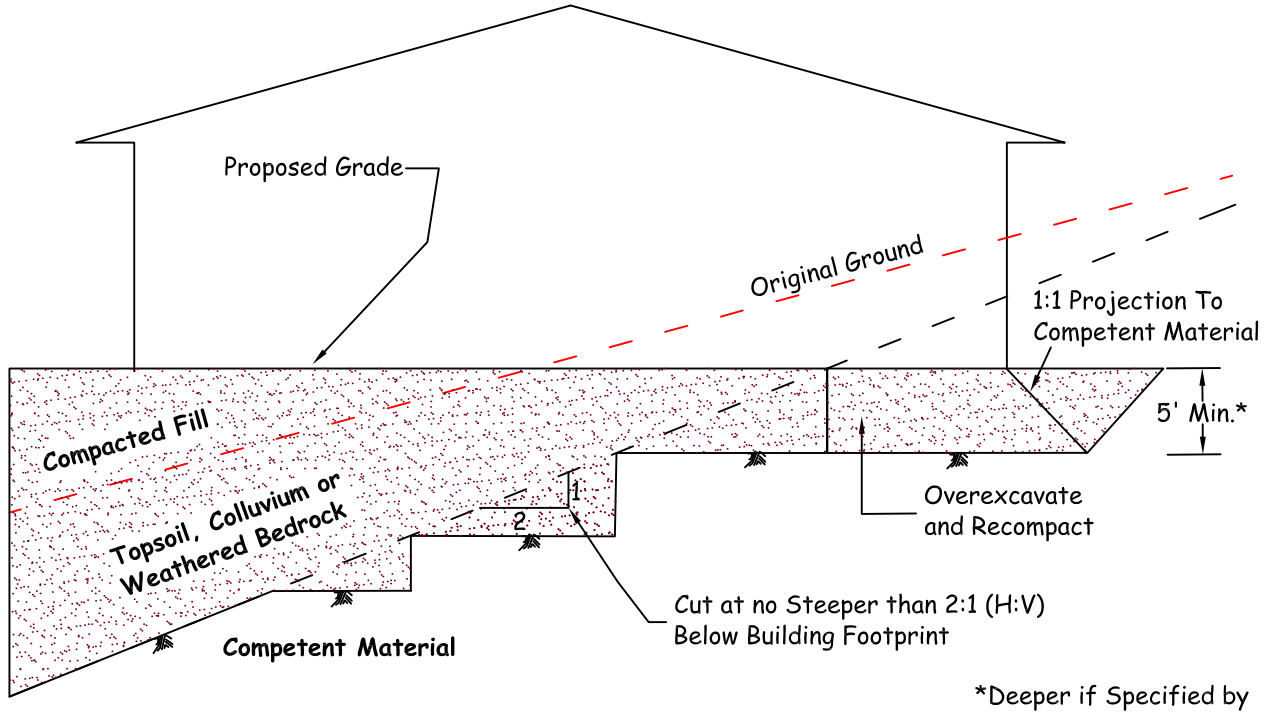
## Cut Lot
## (Exposing Unsuitable Soils at Design Grade)




Note 1: Removal Bottom Should be Graded With Minimum 2% Fall Towards Street or Other Suitable Area (as Determined by Soils Engineer) to Avoid Ponding Below Building

Note 2: Where Design Cut Lots are Excavated Entirely Into Competent Material, Overexcavation May Still be Required for Hard-Rock Conditions or for Materials With Variable Expansion Characteristics.

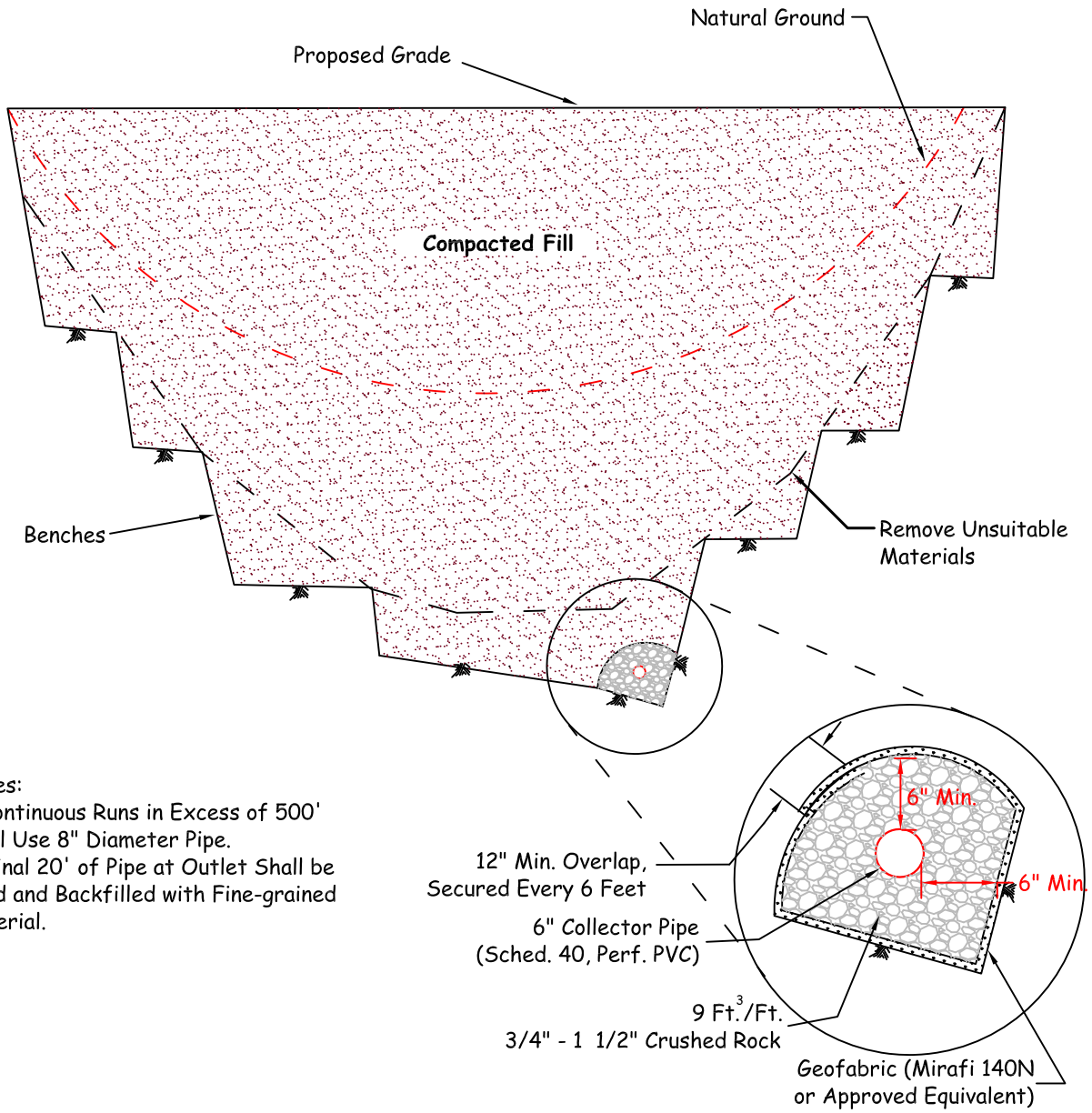
## Cut/Fill Transition Lot




*Deeper if Specified by Soils Engineer

LGC Geotechnical, Inc.

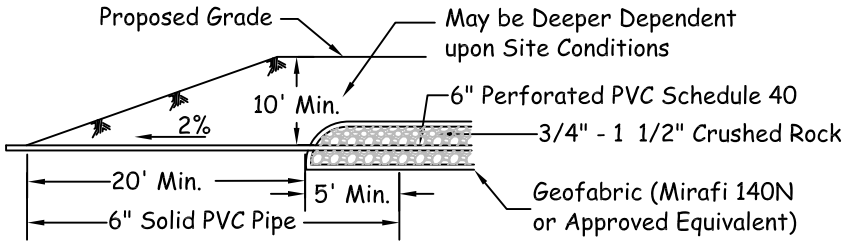
# CUT AND TRANSITION LOT OVEREXCAVATION DETAIL




Notes:
1) Continuous Runs in Excess of 500' Shall Use 8" Diameter Pipe.
2) Final 20' of Pipe at Outlet Shall be Solid and Backfilled with Fine-grained Material.

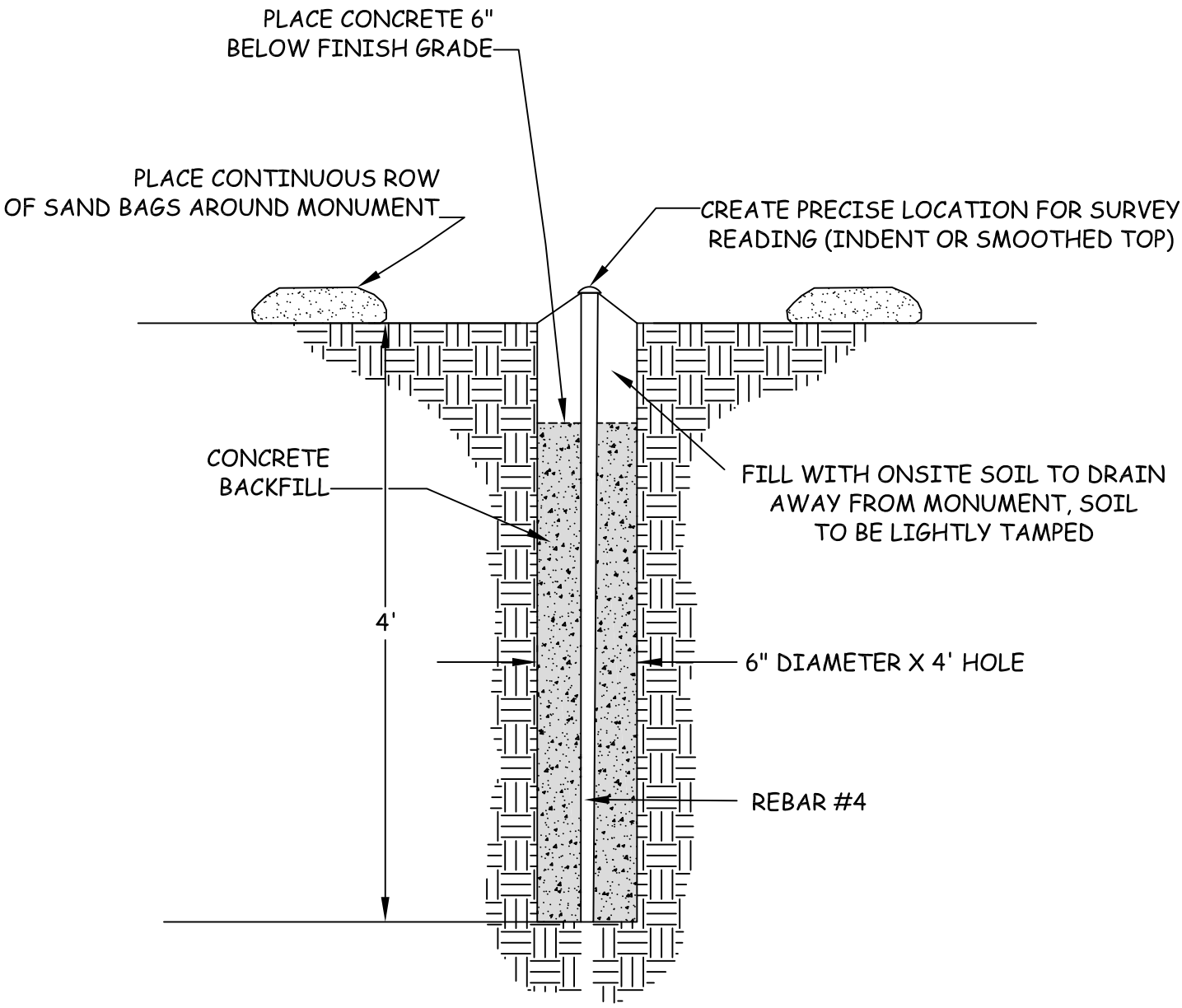



## Proposed Outlet Detail




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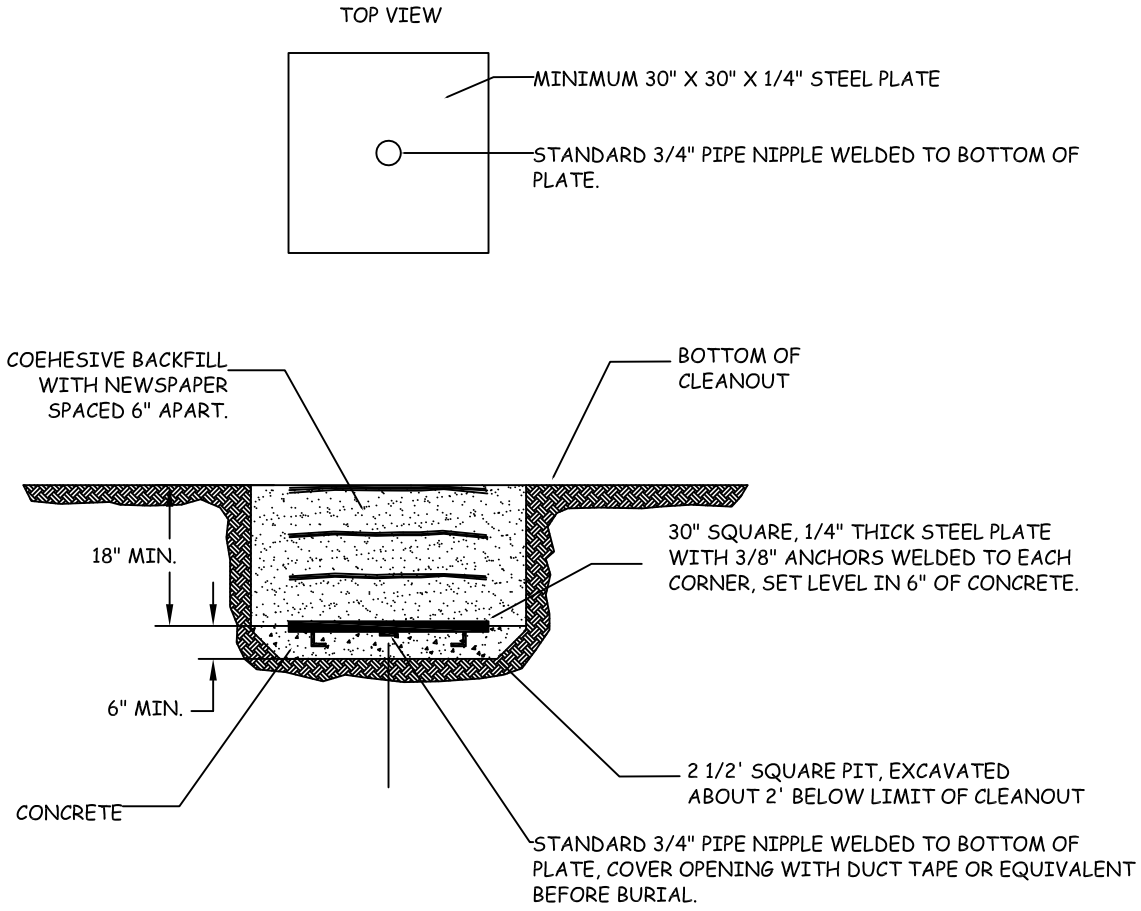
# CANYON SUBDRAINS




NO CONSTRUCTION EQUIPMENT WITHIN 25 FEET
OF ANY INSTALLED SETTLEMENT MONUMENTS

LGC Geotechnical, Inc.

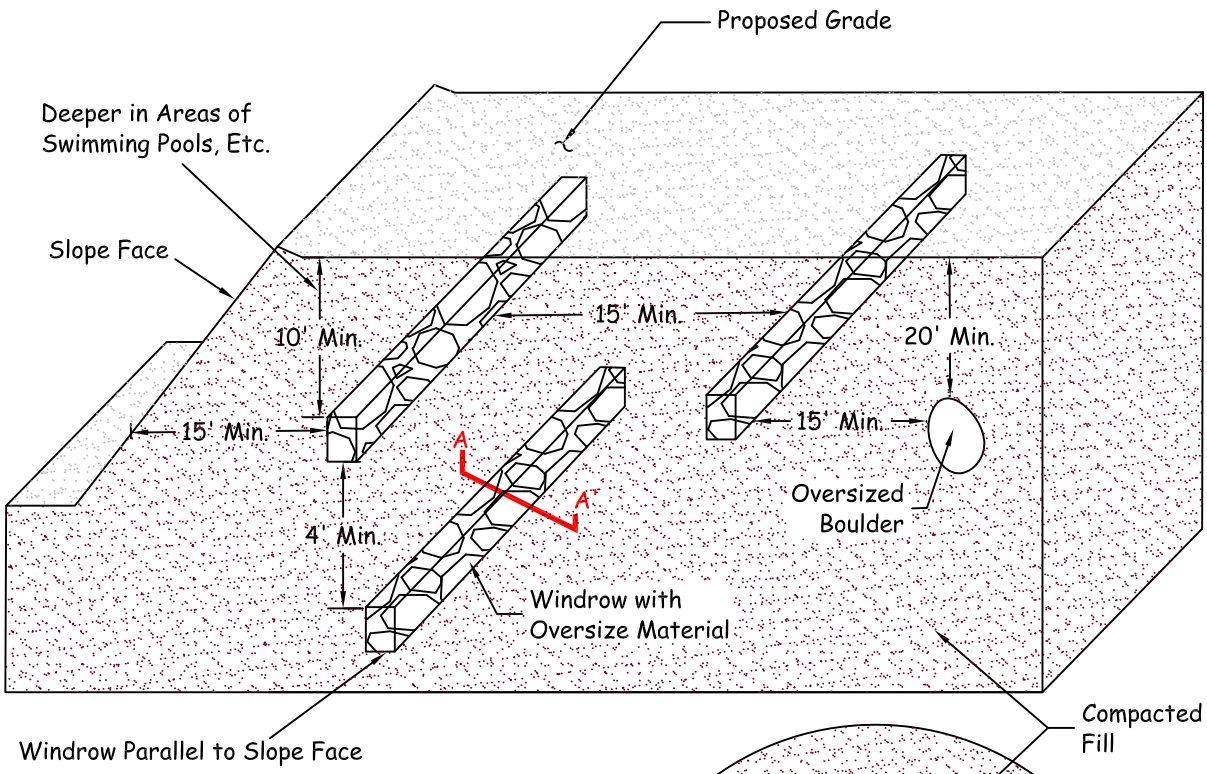
# TYPICAL SURFACE SETTLEMENT MONUMENT

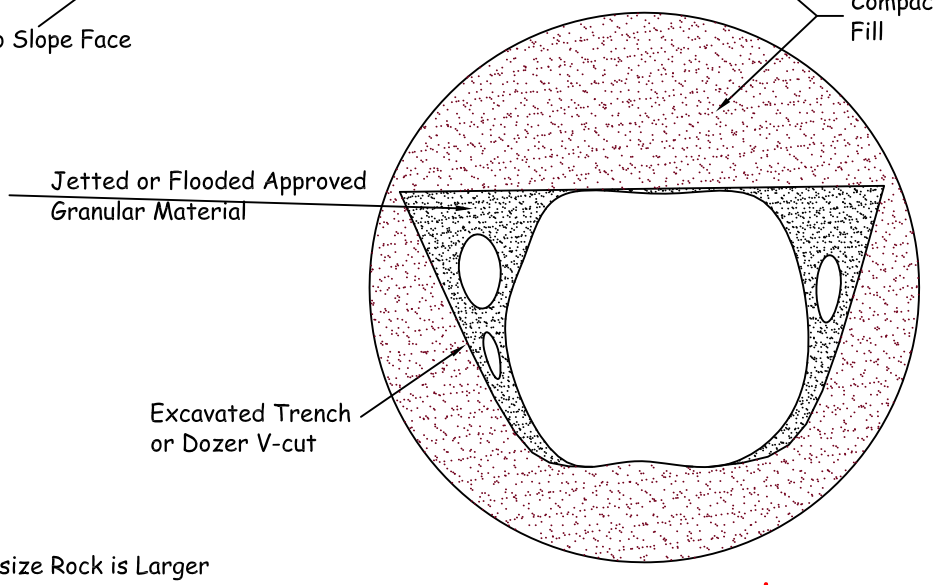



1. SURVEY FOR HORIZONTAL AND VERTICAL LOCATION TO NEAREST .01 INCH PRIOR TO BACKFILL USING KNOW LOCATIONS THAT WILL REMAIN INTACT DURING THE DURATION OF THE MONITORING PROGRAM. KNOW POINTS EXPLICITELY NOT ALLOWED ARE THOSE LOCATED ON FILL OR THAT WILL BE DESTROYED DURING GRADING.
2. IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE DURING GRADING, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.
3. DRILL TO RECOVER AND ATTACH RISER PIPE.

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# TYPICAL SETTLEMENT PLATE AND RISER



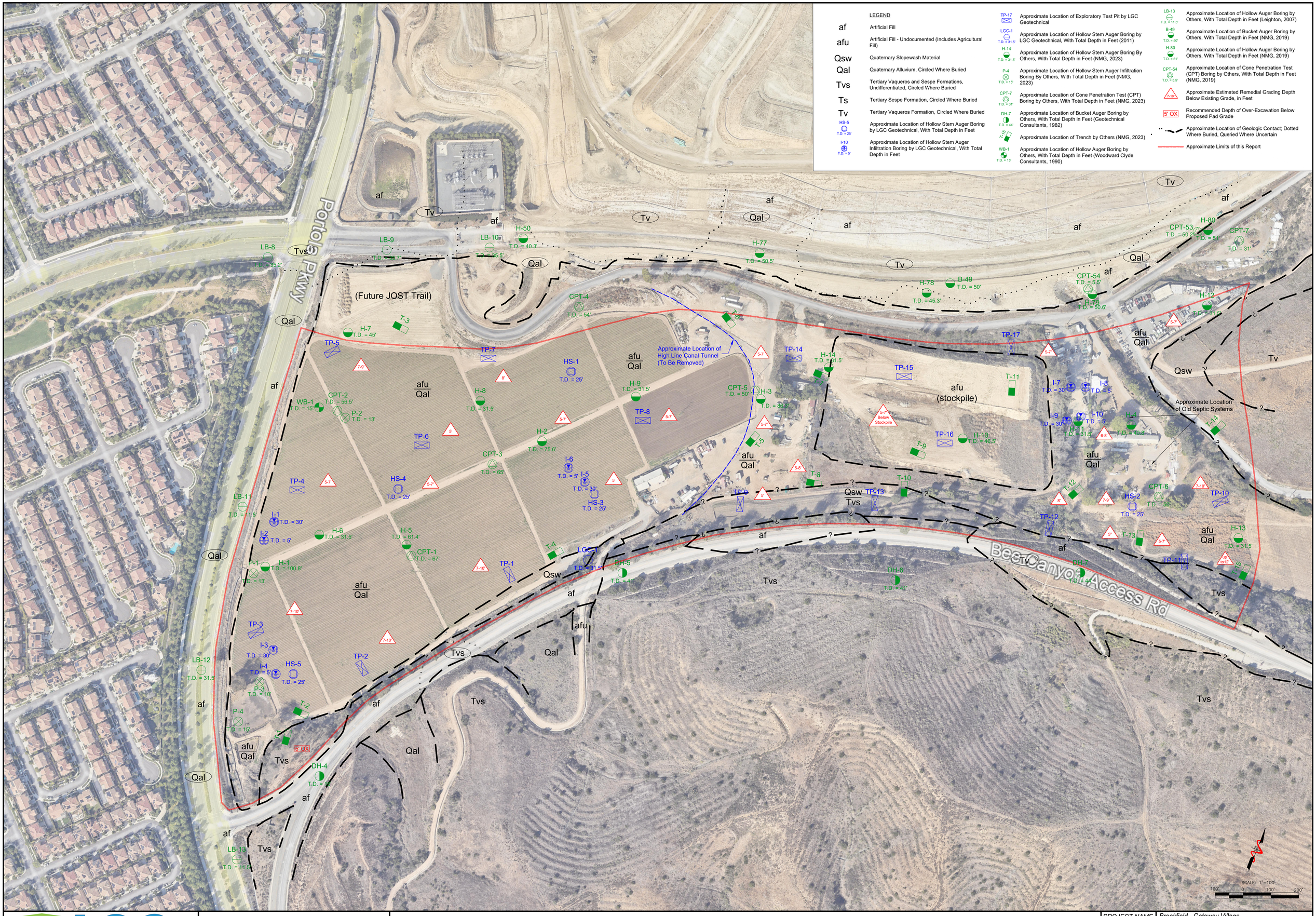




Note: Oversize Rock is Larger
than 8" in Maximum Dimension.

Section A-A'

LGC Geotechnical, Inc.

# OVERSIZE ROCK DISPOSAL DETAIL




**LGC Geotechnical, Inc.**
131 Calle Iglesia, Ste. 200
San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

## Preliminary Geotechnical Map

| | |
|---|---|
| PROJECT NAME | Brookfield - Gateway Village |
| PROJECT NO. | 23203-01 |
| ENG. / GEOL. | DJB / KTM |
| SCALE | 1" = 100' |
| DATE | November 2024 |

**SHEET 1 of 1**

Appendix G

# HYDROLOGY CALCULATIONS

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY VILLAGE EXISTING CONDITION                                      *
* WATERSHED 'C' 2 YEAR HYDROMOD                                           *
* 12/5/24 JZ                                                              *
 **************************************************************************

  FILE NAME: GVCEX2.DAT
  TIME/DATE OF STUDY: 08:59 12/05/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    429.50  DOWNSTREAM(FEET) =    421.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   15.111
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.200
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"               A        0.50      0.40      1.000    28   15.11
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        0.70      0.30      1.000    46   15.11
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.93
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      0.93

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    421.50  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   556.00   CHANNEL SLOPE =  0.0207
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.069
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               A        0.70      0.40      1.000    28
  NATURAL FAIR COVER
  "OPEN BRUSH"               B        2.80      0.30      1.000    46
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.74
  AVERAGE FLOW DEPTH(FEET) =   0.51   TRAVEL TIME(MIN.) =   3.38
  Tc(MIN.) =   18.49
  SUBAREA AREA(ACRES) =     3.50       SUBAREA RUNOFF(CFS) =    2.36
  EFFECTIVE AREA(ACRES) =      4.70     AREA-AVERAGED Fm(INCH/HR) =   0.33
  AREA-AVERAGED Fp(INCH/HR) =   0.33  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        4.7         PEAK FLOW RATE(CFS) =       3.14

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.58   FLOW VELOCITY(FEET/SEC.) =   3.07
  LONGEST FLOWPATH FROM NODE    211.00 TO NODE    213.00 =     886.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.7  TC(MIN.) =     18.49
  EFFECTIVE AREA(ACRES) =      4.70  AREA-AVERAGED Fm(INCH/HR)=  0.33
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       3.14
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY VILLAGE EXISTING CONDITION                                      *
* WATERSHED 'D' 2 YEAR HYDROMOD                                           *
* 12/5/24 JZ                                                              *
 **************************************************************************

  FILE NAME: GVDEX2.DAT
  TIME/DATE OF STUDY: 08:48 12/05/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    425.00  DOWNSTREAM(FEET) =    413.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.153
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.246
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL FAIR COVER
  "OPEN BRUSH"                A        2.10      0.40      1.000    28   14.15
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        3.50      0.25      1.000    59   14.15
  NATURAL FAIR COVER
  "OPEN BRUSH"                D        0.20      0.20      1.000    67   14.15
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      4.92
  TOTAL AREA(ACRES) =      5.80   PEAK FLOW RATE(CFS) =      4.92

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    413.90  DOWNSTREAM(FEET) =    410.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   437.00   CHANNEL SLOPE =  0.0089
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.123
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                A        2.10      0.40      1.000    28
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.50      0.30      1.000    46
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.30      0.25      1.000    59
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.37
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.59
  AVERAGE FLOW DEPTH(FEET) =   0.87   TRAVEL TIME(MIN.) =   2.81
  Tc(MIN.) =   16.97
  SUBAREA AREA(ACRES) =     2.90       SUBAREA RUNOFF(CFS) =    1.97
  EFFECTIVE AREA(ACRES) =      8.70     AREA-AVERAGED Fm(INCH/HR) =   0.32
  AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        8.7         PEAK FLOW RATE(CFS) =       6.25

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.89   FLOW VELOCITY(FEET/SEC.) =   2.63
  LONGEST FLOWPATH FROM NODE    311.00 TO NODE    313.00 =     767.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.7  TC(MIN.) =     16.97
  EFFECTIVE AREA(ACRES) =      8.70  AREA-AVERAGED Fm(INCH/HR)=  0.32
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       6.25
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:
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# EXISTING 2-YEAR FOR WATERSHEDS 'B', 'E', & 'F'

```
 ************************* DESCRIPTION OF STUDY *************************
* GATEWAY VILLAGE                                                      *
* 2-YEAR STORM EVENT - EX. CONDTION                                    *
* 2024-12-05                                                           *
 ************************************************************************

  FILE NAME: GV2EX.DAT
  TIME/DATE OF STUDY: 16:36 12/05/2024
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  ========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   305.00
  ELEVATION DATA: UPSTREAM(FEET) =    361.20  DOWNSTREAM(FEET) =    353.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.800
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   B        0.20      0.30     1.000    64   10.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    353.50  DOWNSTREAM(FEET) =    346.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   228.00   CHANNEL SLOPE =  0.0307
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.327
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   B        0.30      0.30     1.000    64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.02
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.88
  Tc(MIN.) =   12.68
  SUBAREA AREA(ACRES) =     0.30       SUBAREA RUNOFF(CFS) =    0.28
  EFFECTIVE AREA(ACRES) =      0.50     AREA-AVERAGED Fm(INCH/HR) =   0.30
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.26   FLOW VELOCITY(FEET/SEC.) =   2.21
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     533.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   346.50  DOWNSTREAM(FEET) =   344.00
  FLOW LENGTH(FEET) =    29.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.98
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.46
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   12.75
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     562.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    425.70  DOWNSTREAM(FEET) =    420.20

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.323
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.416
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   C        1.10      0.25     1.000    75   11.32
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   A        0.20      0.40     1.000    53   11.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.34
 TOTAL AREA(ACRES) =      1.30   PEAK FLOW RATE(CFS) =      1.34

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    420.20  DOWNSTREAM(FEET) =    396.20
 CHANNEL LENGTH THRU SUBAREA(FEET) =   529.00   CHANNEL SLOPE =  0.0454
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.270
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   C        1.40      0.25     1.000    75
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   A        0.80      0.40     1.000    53
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.30
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.73
 AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   2.36
 Tc(MIN.) =   13.69
 SUBAREA AREA(ACRES) =     2.20       SUBAREA RUNOFF(CFS) =    1.91
 EFFECTIVE AREA(ACRES) =      3.50     AREA-AVERAGED Fm(INCH/HR) =   0.29
 AREA-AVERAGED Fp(INCH/HR) =   0.29  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =        3.5         PEAK FLOW RATE(CFS) =       3.08

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.50   FLOW VELOCITY(FEET/SEC.) =   4.09
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     824.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    396.20  DOWNSTREAM(FEET) =    387.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   454.00   CHANNEL SLOPE =  0.0203
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
```

```
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.165
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   C        5.10      0.25     1.000    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.40
  AVERAGE FLOW DEPTH(FEET) =   0.71   TRAVEL TIME(MIN.) =   2.22
  Tc(MIN.) =   15.91
  SUBAREA AREA(ACRES) =     5.10       SUBAREA RUNOFF(CFS) =    4.20
  EFFECTIVE AREA(ACRES) =      8.60     AREA-AVERAGED Fm(INCH/HR) =   0.27
  AREA-AVERAGED Fp(INCH/HR) =   0.27  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =        8.6         PEAK FLOW RATE(CFS) =       6.95

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.80   FLOW VELOCITY(FEET/SEC.) =   3.65
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =    1278.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    387.00  DOWNSTREAM(FEET) =    361.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1087.00   CHANNEL SLOPE =  0.0237
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.014
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   A        0.50      0.40     1.000    53
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   B        2.50      0.30     1.000    64
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   C        3.50      0.25     1.000    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.10
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.18
  AVERAGE FLOW DEPTH(FEET) =   0.85   TRAVEL TIME(MIN.) =   4.33
  Tc(MIN.) =   20.24
  SUBAREA AREA(ACRES) =     6.50       SUBAREA RUNOFF(CFS) =    4.29
  EFFECTIVE AREA(ACRES) =     15.10     AREA-AVERAGED Fm(INCH/HR) =   0.27
  AREA-AVERAGED Fp(INCH/HR) =   0.27  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       15.1         PEAK FLOW RATE(CFS) =      10.07

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.89   FLOW VELOCITY(FEET/SEC.) =   4.26
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =    2365.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    361.20  DOWNSTREAM(FEET) =    337.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1249.00   CHANNEL SLOPE =  0.0193
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.944
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   B        3.40      0.30     1.000    64
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   C        7.00      0.25     1.000    75
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   A        0.20      0.40     1.000    53
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.72
  AVERAGE FLOW DEPTH(FEET) =   0.93   TRAVEL TIME(MIN.) =   2.70
  Tc(MIN.) =   22.94
  SUBAREA AREA(ACRES) =    10.60       SUBAREA RUNOFF(CFS) =    6.44
  EFFECTIVE AREA(ACRES) =     25.70     AREA-AVERAGED Fm(INCH/HR) =   0.27
  AREA-AVERAGED Fp(INCH/HR) =   0.27  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       25.7         PEAK FLOW RATE(CFS) =      15.56

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.99   FLOW VELOCITY(FEET/SEC.) =   7.99
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     15.00 =    3614.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   298.00
  ELEVATION DATA: UPSTREAM(FEET) =    427.30  DOWNSTREAM(FEET) =    413.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.520
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.564
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   C        1.30      0.25     1.000    75    9.52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.54
  TOTAL AREA(ACRES) =      1.30   PEAK FLOW RATE(CFS) =      1.54

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    413.80  DOWNSTREAM(FEET) =    391.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   800.00   CHANNEL SLOPE =  0.0285
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
```

```
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.301
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   C        5.60      0.25     1.000    75
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   A        0.20      0.40     1.000    53
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.28
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.70
 AVERAGE FLOW DEPTH(FEET) =   0.62   TRAVEL TIME(MIN.) =   3.60
 Tc(MIN.) =   13.12
 SUBAREA AREA(ACRES) =     5.80       SUBAREA RUNOFF(CFS) =    5.46
 EFFECTIVE AREA(ACRES) =      7.10     AREA-AVERAGED Fm(INCH/HR) =   0.25
 AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =        7.1         PEAK FLOW RATE(CFS) =       6.69

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.74   FLOW VELOCITY(FEET/SEC.) =   4.12
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =    1098.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    391.00  DOWNSTREAM(FEET) =    377.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   707.00   CHANNEL SLOPE =  0.0198
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.156
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   C        6.70      0.25     1.000    75
 AGRICULTURAL POOR COVER
 "ROW CROPS,STRAIGHT ROW"   A        0.10      0.40     1.000    53
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.46
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.93
 AVERAGE FLOW DEPTH(FEET) =   0.90   TRAVEL TIME(MIN.) =   3.00
 Tc(MIN.) =   16.12
 SUBAREA AREA(ACRES) =     6.80       SUBAREA RUNOFF(CFS) =    5.53
 EFFECTIVE AREA(ACRES) =     13.90     AREA-AVERAGED Fm(INCH/HR) =   0.25
 AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   1.00
 TOTAL AREA(ACRES) =       13.9         PEAK FLOW RATE(CFS) =      11.30

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.96   FLOW VELOCITY(FEET/SEC.) =   4.12
 LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =    1805.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    377.00  DOWNSTREAM(FEET) =    365.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   469.00   CHANNEL SLOPE =  0.0256
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.094
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   C        6.40      0.25     1.000    75
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.75
  AVERAGE FLOW DEPTH(FEET) =   0.98   TRAVEL TIME(MIN.) =   1.65
  Tc(MIN.) =   17.76
  SUBAREA AREA(ACRES) =     6.40       SUBAREA RUNOFF(CFS) =    4.86
  EFFECTIVE AREA(ACRES) =     20.30     AREA-AVERAGED Fm(INCH/HR) =   0.25
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       20.3         PEAK FLOW RATE(CFS) =      15.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.03   FLOW VELOCITY(FEET/SEC.) =   4.87
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     24.00 =    2274.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     25.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    365.00  DOWNSTREAM(FEET) =    335.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1896.00   CHANNEL SLOPE =  0.0158
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.974
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   C       16.80      0.25     1.000    75
  AGRICULTURAL POOR COVER
  "ROW CROPS,STRAIGHT ROW"   A        1.80      0.40     1.000    53
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.99
  AVERAGE FLOW DEPTH(FEET) =   1.15   TRAVEL TIME(MIN.) =   3.95
  Tc(MIN.) =   21.71
  SUBAREA AREA(ACRES) =    18.60       SUBAREA RUNOFF(CFS) =   11.88
  EFFECTIVE AREA(ACRES) =     38.90     AREA-AVERAGED Fm(INCH/HR) =   0.26
  AREA-AVERAGED Fp(INCH/HR) =   0.26  AREA-AVERAGED Ap =   1.00
  TOTAL AREA(ACRES) =       38.9         PEAK FLOW RATE(CFS) =      25.08

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.23   FLOW VELOCITY(FEET/SEC.) =   8.35
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     25.00 =    4170.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
```

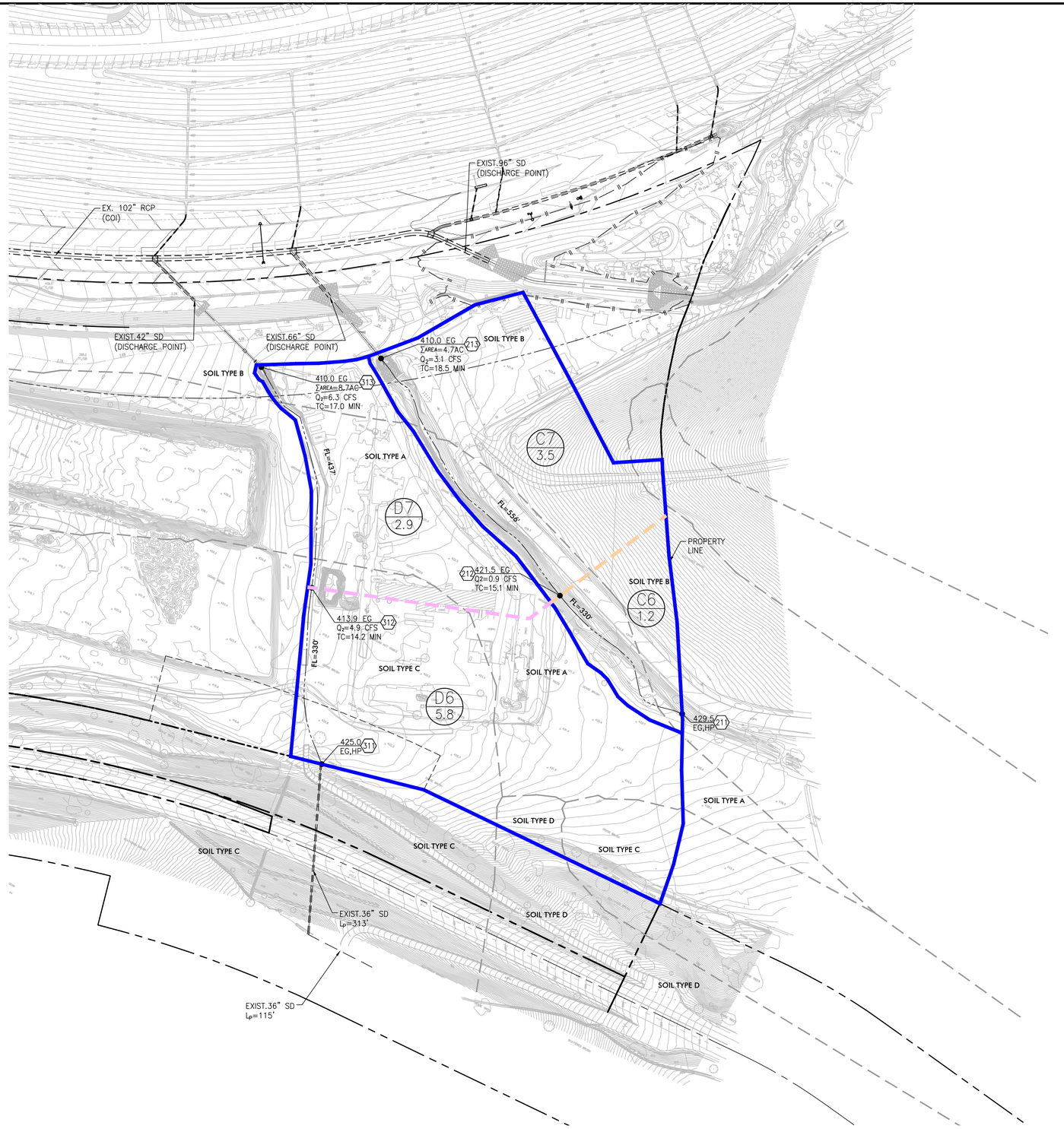
```
  TOTAL AREA(ACRES)      =       38.9  TC(MIN.) =     21.71
  EFFECTIVE AREA(ACRES) =     38.90  AREA-AVERAGED Fm(INCH/HR)=  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.26  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =      25.08
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

HYDROLOGIC SOIL GROUP: "A", "B", "C", & "D"

## LEGEND

- MAJOR DRAINAGE BOUNDARY
- SUB-DRAINAGE BOUNDARY 'C'
- SUB-DRAINAGE BOUNDARY 'D'
- SOIL TYPE BOUNDARY
- DRAINAGE BOUNDARY (PER WILSON MIKAMI REPORT)
- SUB-DRAINAGE BOUNDARY (PER WILSON MIKAMI REPORT)
- FLOWLINE
- A / 1.2 — SUBAREA DESIGNATION / SUBAREA (ACRES)
- 10 — NODE NUMBER
- Q2 — CALCULATED RUNOFF FOR 2 YR FREQ.
- Tc — TIME OF CONCENTRATION
- L — FLOW PATH LENGTH (SURFACE)
- COI — CITY OF IRVINE

**NOTE:**
(*) VALUES SHOWN WERE TAKEN FROM THE JEFFREY ROAD EXTENSION HYDROLOGY/HYDRAULIC REPORT, PREPARED BY WILSON MIKAMI CORPORATION, AND DATED SEPTEMBER 2019.




| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
| | | | | | |


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GATEWAY VILLAGE

EXISTING HYDROMOD MAP FOR WATERSHED 'C' & 'D'

JOB NO. 308-092
DRAWN BY: JZ
SHEET 1 of 1


F:\Projects\308\092_Support Files\Reports\Hydrology\Preliminary Hydrology Maps\308-092-xh-Existing 2 yr Hydromod Map.dwg (12/5/2024 5:26 PM) Plotted by: Brandon Muse

**HYDROLOGIC SOIL GROUP: "A", "B", "C", & "D"**

| EXISTING CONDITION | | | | | |
|---|---|---|---|---|---|
| NODE | SUBAREA | AREA (AC) | $Q_{25}$ (CFS) | $T_{C2}$ (MIN) | 25-YR VOLUME (AC-FT) |
| 3 | B | 0.5 | 1.1 | 13.3 | 4.01 |
| 15 | F | 25.6 | 44.0 | 20.5 | |
| 25 | E | 38.9 | 69.9 | 19.2 | |
| | REMAINING* | 34.9 | | | |
| | TOTAL | 99.9 | 115.0 | - | |

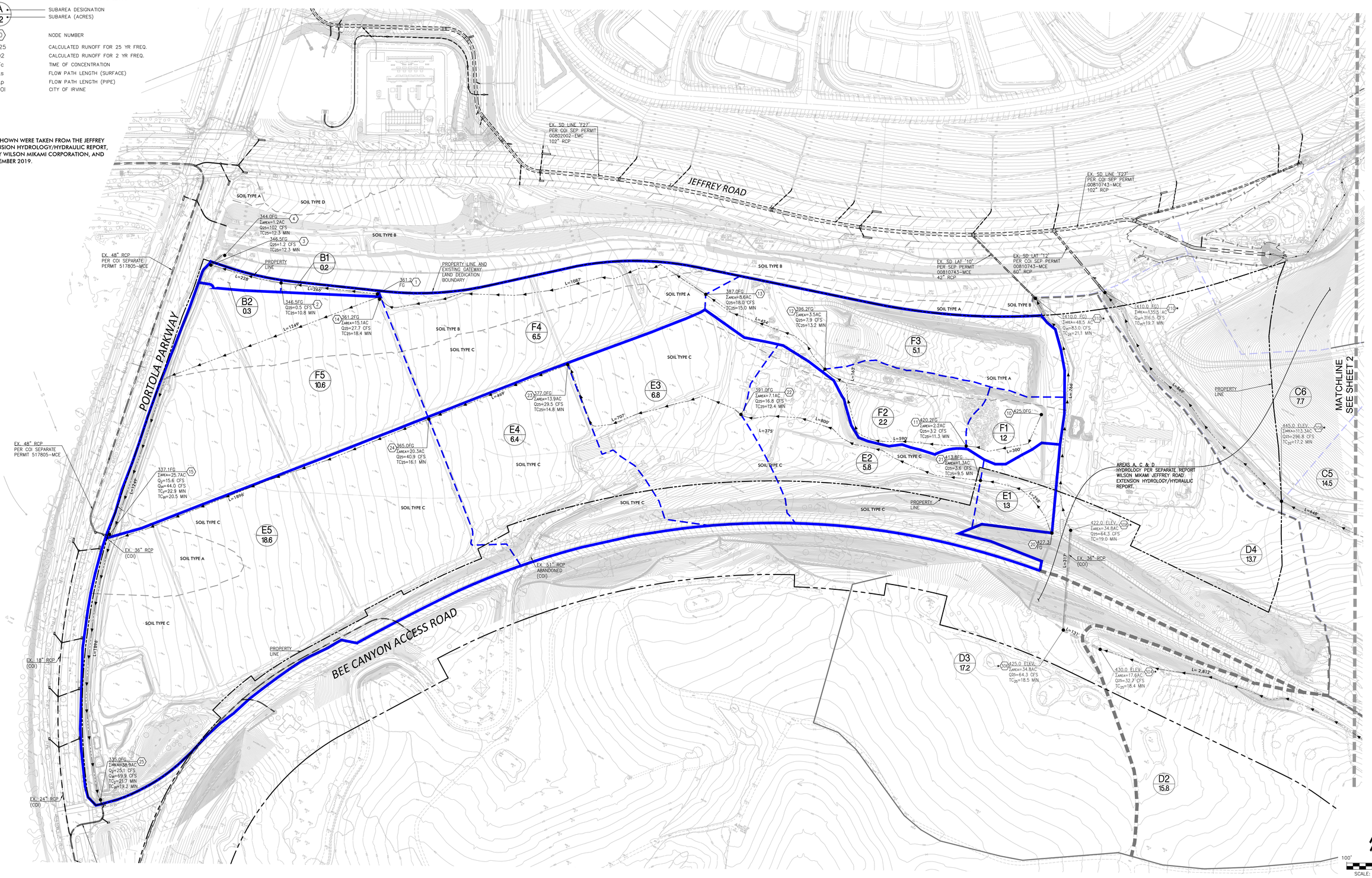
* INCLUDES THE REMAINING AREA WITHIN THE PROPERTY LINE AND OUTSIDE OF THE MAJOR BOUNDARIES.

TOTAL WATERSHED BOUNDARY = 63.3 ACRES

## LEGEND

- MAJOR DRAINAGE BOUNDARY
- SUB-DRAINAGE BOUNDARY
- SOIL TYPE BOUNDARY
- OFFSITE DRAINAGE BOUNDARY (PER TTM 19179)
- OFFSITE SUB-AREA BOUNDARY (PER TTM 19179)
- L=XXX' — FLOWLINE AND FLOWLINE LENGTH
- A / 12 — SUBAREA DESIGNATION / SUBAREA (ACRES)
- 10 — NODE NUMBER
- Q25 — CALCULATED RUNOFF FOR 25 YR FREQ.
- Q2 — CALCULATED RUNOFF FOR 2 YR FREQ.
- Tc — TIME OF CONCENTRATION
- Ls — FLOW PATH LENGTH (SURFACE)
- Lp — FLOW PATH LENGTH (PIPE)
- COI — CITY OF IRVINE

**NOTE:**
(*) VALUES SHOWN WERE TAKEN FROM THE JEFFREY ROAD EXTENSION HYDROLOGY/HYDRAULIC REPORT, PREPARED BY WILSON MIKAMI CORPORATION, AND DATED SEPTEMBER 2019.




| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
| | | | | | |


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GATEWAY VILLAGE

EXISTING HYDROLOGY MAP

JOB NO. 308-092
DRAWN BY: JZ
SHEET 1 of 2


I:\Projects\308-092\...\Hydrology\Preliminary Hydrology\Hydrology Maps\308-092-xx-Existing Hydrology Map.dwg (12/2/2024 3:45 PM) Plotted by: James Zocker

```
******************************************************************************
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                            Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY VILLAGE PROPOSED HYDROLOGY                                      *
* WATERSHED 'C' 2 YEAR STORM                                              *
* 12/5/24 JZ                                                              *
 ***************************************************************************

  FILE NAME: GVCPR2.DAT
  TIME/DATE OF STUDY: 15:03 12/05/2024
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  ========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    437.30  DOWNSTREAM(FEET) =    427.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.287
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.985
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        0.30      0.40      0.100    17    6.29
  COMMERCIAL                  B        0.20      0.30      0.100    36    6.29
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.36
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.88
  TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      0.88

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    213.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  427.80  DOWNSTREAM ELEVATION(FEET) =  421.90
  STREET LENGTH(FEET) =   513.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.39
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.24
    HALFSTREET FLOOD WIDTH(FEET) =    4.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.46
  STREET FLOW TRAVEL TIME(MIN.) =   4.40   Tc(MIN.) =   10.69
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.464
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        0.30      0.40      0.100    17
  COMMERCIAL                  B        0.50      0.30      0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.80      SUBAREA RUNOFF(CFS) =    1.03
  EFFECTIVE AREA(ACRES) =      1.30    AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.35  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       1.67

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =   5.09
  FLOW VELOCITY(FEET/SEC.) =  1.96   DEPTH*VELOCITY(FT*FT/SEC.) =   0.50
  LONGEST FLOWPATH FROM NODE    211.00 TO NODE    213.00 =     843.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    213.00 TO NODE    214.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   413.90  DOWNSTREAM(FEET) =   407.80
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
```

```
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.34
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.67
 PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   10.99
 LONGEST FLOWPATH FROM NODE    211.00 TO NODE    214.00 =     975.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    214.00 TO NODE    214.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.99
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.441
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 PUBLIC PARK                B        0.80      0.30     0.850    36
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
 SUBAREA AREA(ACRES) =    0.80      SUBAREA RUNOFF(CFS) =    0.85
 EFFECTIVE AREA(ACRES) =      2.10   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap =  0.39
 TOTAL AREA(ACRES) =        2.1       PEAK FLOW RATE(CFS) =       2.50

****************************************************************************
 FLOW PROCESS FROM NODE    214.00 TO NODE    215.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   407.80  DOWNSTREAM(FEET) =   398.20
 FLOW LENGTH(FEET) =   134.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.64
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.50
 PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =   11.22
 LONGEST FLOWPATH FROM NODE    211.00 TO NODE    215.00 =    1109.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        2.1  TC(MIN.) =     11.22
 EFFECTIVE AREA(ACRES) =      2.10  AREA-AVERAGED Fm(INCH/HR)=  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap = 0.386
 PEAK FLOW RATE(CFS)   =       2.50
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
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                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY VILLAGE PROPOSED HYDROLOGY                                      *
* WATERSHED 'D' 2 YEAR STORM                                              *
* 12/5/24 JZ                                                              *
 ***************************************************************************

  FILE NAME: GVDPR2.DAT
  TIME/DATE OF STUDY: 14:37 12/05/2024
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   328.00
  ELEVATION DATA: UPSTREAM(FEET) =    449.70  DOWNSTREAM(FEET) =    435.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.798
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.898
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS                A        0.40      0.40      0.350    17    6.80
  CONDOMINIUMS                C        0.70      0.25      0.350    50    6.80
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      1.77
  TOTAL AREA(ACRES) =      1.10   PEAK FLOW RATE(CFS) =      1.77

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    435.00  DOWNSTREAM(FEET) =    415.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   840.00   CHANNEL SLOPE =  0.0232
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.478
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS                A        3.40      0.40      0.350    17
  CONDOMINIUMS                C        3.60      0.25      0.350    50
  CONDOMINIUMS                D        0.20      0.20      0.350    57
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.77
  AVERAGE FLOW DEPTH(FEET) =   0.74   TRAVEL TIME(MIN.) =   3.71
  Tc(MIN.) =   10.51
  SUBAREA AREA(ACRES) =     7.20       SUBAREA RUNOFF(CFS) =    8.85
  EFFECTIVE AREA(ACRES) =      8.30     AREA-AVERAGED Fm(INCH/HR) =   0.11
  AREA-AVERAGED Fp(INCH/HR) =   0.32  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        8.3         PEAK FLOW RATE(CFS) =      10.21

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.90   FLOW VELOCITY(FEET/SEC.) =   4.24
  LONGEST FLOWPATH FROM NODE    311.00 TO NODE    313.00 =    1168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    313.00 TO NODE    314.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   409.00  DOWNSTREAM(FEET) =   406.60
  FLOW LENGTH(FEET) =   172.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.21
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =   10.88
  LONGEST FLOWPATH FROM NODE    311.00 TO NODE    314.00 =    1340.00 FEET.
```

314 TO NODE 315 MITIGATED Q = 4.81 CFS

```
****************************************************************************
  FLOW PROCESS FROM NODE    315.00 TO NODE    316.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   404.00  DOWNSTREAM(FEET) =   400.50
  FLOW LENGTH(FEET) =   350.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.61
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      ~~10.21~~ 4.81
  PIPE TRAVEL TIME(MIN.) =   0.88    Tc(MIN.) =   11.77
  LONGEST FLOWPATH FROM NODE    311.00 TO NODE    316.00 =    1690.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    316.00 TO NODE    316.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =   11.77
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.385
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               A        1.10      0.40      0.350    17
  CONDOMINIUMS               B        1.20      0.30      0.350    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    2.30      SUBAREA RUNOFF(CFS) =    2.62
  EFFECTIVE AREA(ACRES) =     10.60   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.35
  TOTAL AREA(ACRES) =       10.6       PEAK FLOW RATE(CFS) =      ~~12.13~~ 6.73

****************************************************************************
  FLOW PROCESS FROM NODE    316.00 TO NODE    317.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   400.50  DOWNSTREAM(FEET) =   395.20
  FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.13
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   11.94
  LONGEST FLOWPATH FROM NODE    311.00 TO NODE    317.00 =    1816.00 FEET.
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       10.6  TC(MIN.) =     11.94
  EFFECTIVE AREA(ACRES) =     10.60  AREA-AVERAGED Fm(INCH/HR)=  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap = 0.350
  PEAK FLOW RATE(CFS)    =      ~~12.13~~ 6.73
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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                          Analysis prepared by:

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                          15535 Sand Canyon Ave
                                Suite 100
                             Irvine, CA 92618

 ************************* DESCRIPTION OF STUDY *************************
* GATEWAY VILLAGE PROPOSED HYDROLOGY                                    *
* SUBAREA 'E' 2 YEAR STORM                                              *
* 11/25/2024 JZ                                                         *
 ************************************************************************

  FILE NAME: GVEPR2.DAT
  TIME/DATE OF STUDY: 10:36 11/25/2024
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    2.00 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   229.00
  ELEVATION DATA: UPSTREAM(FEET) =    413.00  DOWNSTREAM(FEET) =    404.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.128
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.014
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS                A        1.40      0.40      0.350    17    6.13
  CONDOMINIUMS                B        0.60      0.30      0.350    36    6.13
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.37
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      3.39
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =      3.39

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    404.60  DOWNSTREAM(FEET) =    401.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   241.00   CHANNEL SLOPE =  0.0137
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.788
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS                A        1.20      0.40      0.350    17
  CONDOMINIUMS                B        0.30      0.30      0.350    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.84
  AVERAGE FLOW DEPTH(FEET) =   0.73   TRAVEL TIME(MIN.) =   1.41
  Tc(MIN.) =    7.54
  SUBAREA AREA(ACRES) =     1.50       SUBAREA RUNOFF(CFS) =    2.23
  EFFECTIVE AREA(ACRES) =      3.50     AREA-AVERAGED Fm(INCH/HR) =   0.13
  AREA-AVERAGED Fp(INCH/HR) =   0.37  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        3.5         PEAK FLOW RATE(CFS) =       5.22

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.77   FLOW VELOCITY(FEET/SEC.) =   2.95
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   394.30  DOWNSTREAM(FEET) =   390.90
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.33
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.22
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    7.62
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     525.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 MAINLINE Tc(MIN.) =    7.62
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.777
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 CONDOMINIUMS               C        3.90      0.25     0.350    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =    3.90      SUBAREA RUNOFF(CFS) =    5.93
 EFFECTIVE AREA(ACRES) =      7.40   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap =  0.35
 TOTAL AREA(ACRES) =        7.4       PEAK FLOW RATE(CFS) =      11.11

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   390.90  DOWNSTREAM(FEET) =   389.30
 FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.26
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.11
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    7.72
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     583.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.72
 RAINFALL INTENSITY(INCH/HR) =   1.76
 AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.31
 AREA-AVERAGED Ap =  0.35
 EFFECTIVE STREAM AREA(ACRES) =       7.40
 TOTAL STREAM AREA(ACRES) =       7.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.11

****************************************************************************
 FLOW PROCESS FROM NODE     14.10 TO NODE     14.20 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    459.00  DOWNSTREAM(FEET) =    403.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.258
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.499
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.20      0.25     1.000    59   10.26
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.35
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      1.35

****************************************************************************
  FLOW PROCESS FROM NODE     14.20 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   396.50  DOWNSTREAM(FEET) =   389.30
  FLOW LENGTH(FEET) =   334.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.27
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.35
  PIPE TRAVEL TIME(MIN.) =   1.06    Tc(MIN.) =   11.31
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     14.00 =     664.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.31
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.417
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        1.40      0.40      0.100    17
  COMMERCIAL                 B        0.10      0.30      0.100    36
  COMMERCIAL                 C        0.30      0.25      0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.37
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.80      SUBAREA RUNOFF(CFS) =    2.24
  EFFECTIVE AREA(ACRES) =      3.00   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  0.46
  TOTAL AREA(ACRES) =        3.0       PEAK FLOW RATE(CFS) =       3.50

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.31
  RAINFALL INTENSITY(INCH/HR) =   1.42
  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.27
  AREA-AVERAGED Ap =  0.46
  EFFECTIVE STREAM AREA(ACRES) =       3.00
  TOTAL STREAM AREA(ACRES) =       3.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.50

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
```

```
    1       11.11    7.72    1.764  0.31( 0.11) 0.35       7.4       10.00
    2        3.50   11.31    1.417  0.27( 0.12) 0.46       3.0       14.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       14.14    7.72    1.764  0.30( 0.11) 0.37       9.4       10.00
      2       12.28   11.31    1.417  0.29( 0.11) 0.38      10.4       14.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.14    Tc(MIN.) =     7.72
  EFFECTIVE AREA(ACRES) =       9.45   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.37
  TOTAL AREA(ACRES) =       10.4
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     14.00 =     664.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   389.30  DOWNSTREAM(FEET) =   377.10
  FLOW LENGTH(FEET) =   494.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.27
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.14
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =    8.52
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     15.00 =    1158.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.667
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               A        2.50      0.40     0.350    17
  CONDOMINIUMS               B        0.80      0.30     0.350    36
  CONDOMINIUMS               C        0.40      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.36
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    3.70      SUBAREA RUNOFF(CFS) =    5.13
  EFFECTIVE AREA(ACRES) =     13.15   AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap =  0.37
  TOTAL AREA(ACRES) =       14.1       PEAK FLOW RATE(CFS) =      18.36

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     15.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.667
```

```
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        3.60      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    3.60      SUBAREA RUNOFF(CFS) =    5.12
  EFFECTIVE AREA(ACRES) =     16.75   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =       17.7       PEAK FLOW RATE(CFS) =      23.48

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   377.10  DOWNSTREAM(FEET) =   367.20
  FLOW LENGTH(FEET) =   356.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.13
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.48
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =    9.01
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     16.00 =    1514.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.01
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.615
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        2.70      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    2.70      SUBAREA RUNOFF(CFS) =    3.71
  EFFECTIVE AREA(ACRES) =     19.45   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =       20.4       PEAK FLOW RATE(CFS) =      26.40

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     17.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   367.20  DOWNSTREAM(FEET) =   365.20
  FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.53
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      26.40
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.08
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     17.00 =    1572.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.08
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.607
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.30      0.40      0.100    17
  COMMERCIAL                 B        0.10      0.30      0.100    36
  COMMERCIAL                 C        1.40      0.25      0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.80      SUBAREA RUNOFF(CFS) =    2.56
  EFFECTIVE AREA(ACRES) =     21.25   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  0.34
  TOTAL AREA(ACRES) =       22.2       PEAK FLOW RATE(CFS) =      28.83

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     18.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   365.20  DOWNSTREAM(FEET) =   363.40
  FLOW LENGTH(FEET) =    91.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.21
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.83
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    9.22
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     18.00 =    1663.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.22
  RAINFALL INTENSITY(INCH/HR) =   1.59
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.29
  AREA-AVERAGED Ap =  0.34
  EFFECTIVE STREAM AREA(ACRES) =      21.25
  TOTAL STREAM AREA(ACRES) =      22.20
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.83

****************************************************************************
  FLOW PROCESS FROM NODE     18.10 TO NODE     18.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    391.00  DOWNSTREAM(FEET) =    378.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.059
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.857
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS               A        0.40      0.40      0.350    17    7.06
  CONDOMINIUMS               B        1.00      0.30      0.350    36    7.06
  CONDOMINIUMS               C        1.00      0.25      0.350    50    7.06
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      3.79
  TOTAL AREA(ACRES) =      2.40   PEAK FLOW RATE(CFS) =      3.79

****************************************************************************
  FLOW PROCESS FROM NODE     18.20 TO NODE     18.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    378.60  DOWNSTREAM(FEET) =    374.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   369.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.574
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               B        0.80      0.30      0.350    36
  CONDOMINIUMS               C        1.10      0.25      0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.61
  AVERAGE FLOW DEPTH(FEET) =   0.80   TRAVEL TIME(MIN.) =   2.36
  Tc(MIN.) =    9.42
  SUBAREA AREA(ACRES) =     1.90       SUBAREA RUNOFF(CFS) =    2.53
  EFFECTIVE AREA(ACRES) =      4.30     AREA-AVERAGED Fm(INCH/HR) =   0.10
  AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =       5.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.84   FLOW VELOCITY(FEET/SEC.) =   2.68
  LONGEST FLOWPATH FROM NODE     18.10 TO NODE     18.30 =     699.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.30 TO NODE     18.40 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   367.90  DOWNSTREAM(FEET) =   365.70
  FLOW LENGTH(FEET) =    59.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.67
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.70
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.52
  LONGEST FLOWPATH FROM NODE     18.10 TO NODE     18.40 =     758.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.40 TO NODE     18.40 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    9.52
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.564
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.80      0.30     0.100    36
  COMMERCIAL                C        0.40      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.20      SUBAREA RUNOFF(CFS) =    1.66
  EFFECTIVE AREA(ACRES) =      5.50   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.30
  TOTAL AREA(ACRES) =        5.5       PEAK FLOW RATE(CFS) =       7.33

********************************************************************************
  FLOW PROCESS FROM NODE     18.40 TO NODE     18.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   365.70  DOWNSTREAM(FEET) =   363.40
  FLOW LENGTH(FEET) =    43.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.33
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    9.58
  LONGEST FLOWPATH FROM NODE     18.10 TO NODE     18.00 =     801.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.58
  RAINFALL INTENSITY(INCH/HR) =   1.56
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.28
  AREA-AVERAGED Ap =  0.30
  EFFECTIVE STREAM AREA(ACRES) =       5.50
  TOTAL STREAM AREA(ACRES) =       5.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.33

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       28.83    9.22    1.594  0.29( 0.10) 0.34      21.2      10.00
      1       24.46   12.85    1.317  0.29( 0.10) 0.34      22.2      14.10
      2        7.33    9.58    1.559  0.28( 0.08) 0.30       5.5      18.10

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       36.04    9.22    1.594  0.29( 0.10) 0.33      26.5      10.00
      2       35.71    9.58    1.559  0.29( 0.10) 0.33      26.8      18.10
      3       30.59   12.85    1.317  0.29( 0.10) 0.33      27.7      14.10

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.04    Tc(MIN.) =     9.22
  EFFECTIVE AREA(ACRES) =      26.54   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  0.33
  TOTAL AREA(ACRES) =       27.7
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     18.00 =    1663.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     19.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   363.40  DOWNSTREAM(FEET) =   360.90
  FLOW LENGTH(FEET) =   127.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.96
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.04
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    9.39
  LONGEST FLOWPATH FROM NODE     14.10 TO NODE     19.00 =    1790.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.00 TO NODE     19.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.39
  RAINFALL INTENSITY(INCH/HR) =   1.58
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.29
  AREA-AVERAGED Ap =  0.33
  EFFECTIVE STREAM AREA(ACRES) =      26.54
  TOTAL STREAM AREA(ACRES) =      27.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      36.04

****************************************************************************
  FLOW PROCESS FROM NODE     19.10 TO NODE     19.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    467.50  DOWNSTREAM(FEET) =    458.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.355
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.973
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 C        0.30      0.25      0.100    50    6.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
```

```
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     19.20 TO NODE     19.30 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  458.50  DOWNSTREAM ELEVATION(FEET) =  397.30
  STREET LENGTH(FEET) =  1205.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.08
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    3.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.86
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
  STREET FLOW TRAVEL TIME(MIN.) =   5.21   Tc(MIN.) =   11.56
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.399
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.90      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.90      SUBAREA RUNOFF(CFS) =    1.11
  EFFECTIVE AREA(ACRES) =      1.20    AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       1.48

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.21   HALFSTREET FLOOD WIDTH(FEET) =   4.78
  FLOW VELOCITY(FEET/SEC.) =  3.95   DEPTH*VELOCITY(FT*FT/SEC.) =   0.84
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     19.30 =    1535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.30 TO NODE     19.40 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =    397.30
  DOWNSTREAM NODE ELEVATION(FEET) =    373.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   152.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.387
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
```

```
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"               C        2.40      0.25      1.000    59
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  14.59
  AVERAGE FLOW DEPTH(FEET) =   0.50   FLOOD WIDTH(FEET) =    2.00
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.17   Tc(MIN.) =   11.74
  SUBAREA AREA(ACRES) =    2.40       SUBAREA RUNOFF(CFS) =    2.46
  EFFECTIVE AREA(ACRES) =    3.60     AREA-AVERAGED Fm(INCH/HR) =   0.17
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.70
  TOTAL AREA(ACRES) =        3.6         PEAK FLOW RATE(CFS) =       3.93

         NOTE:TRAVEL TIME ESTIMATES BASED ON NORMAL DEPTH
         IN A FLOWING-FULL GUTTER(NORMAL DEPTH = GUTTER HIKE)


  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.50   FLOOD WIDTH(FEET) =    2.00
  FLOW VELOCITY(FEET/SEC.) =  14.59   DEPTH*VELOCITY(FT*FT/SEC) =   7.30
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     19.40 =    1687.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.40 TO NODE     19.50 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   366.00  DOWNSTREAM(FEET) =   364.20
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.36
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.93
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =   12.31
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     19.50 =    1872.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.50 TO NODE     19.50 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.31
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.349
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        1.00      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    1.00       SUBAREA RUNOFF(CFS) =    1.14
  EFFECTIVE AREA(ACRES) =      4.60   AREA-AVERAGED Fm(INCH/HR) =  0.16
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
  TOTAL AREA(ACRES) =        4.6       PEAK FLOW RATE(CFS) =       4.94

****************************************************************************
  FLOW PROCESS FROM NODE     19.50 TO NODE     19.60 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   364.20  DOWNSTREAM(FEET) =   362.00
  FLOW LENGTH(FEET) =   225.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.69
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.94
  PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =   12.97
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     19.60 =    2097.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.60 TO NODE     19.60 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.97
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.310
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  PUBLIC PARK                C        1.40      0.25     0.850    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA AREA(ACRES) =    1.40      SUBAREA RUNOFF(CFS) =    1.38
  EFFECTIVE AREA(ACRES) =      6.00   AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.68
  TOTAL AREA(ACRES) =        6.0       PEAK FLOW RATE(CFS) =       6.16

****************************************************************************
  FLOW PROCESS FROM NODE     19.60 TO NODE     19.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   362.00  DOWNSTREAM(FEET) =   360.90
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.14
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.16
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   13.07
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     19.00 =    2147.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     19.00 TO NODE     19.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.07
  RAINFALL INTENSITY(INCH/HR) =   1.30
  AREA-AVERAGED Fm(INCH/HR) =  0.17
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.68
  EFFECTIVE STREAM AREA(ACRES) =       6.00
  TOTAL STREAM AREA(ACRES) =       6.00
```

```
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.16

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       36.04    9.39    1.576  0.29( 0.10) 0.33      26.5      10.00
     1       35.71    9.76    1.542  0.29( 0.10) 0.33      26.8      18.10
     1       30.59   13.04    1.306  0.29( 0.10) 0.33      27.7      14.10
     2        6.16   13.07    1.304  0.25( 0.17) 0.68       6.0      19.10

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       41.53    9.39    1.576  0.28( 0.11) 0.38      30.8      10.00
     2       41.28    9.76    1.542  0.28( 0.11) 0.38      31.3      18.10
     3       36.74   13.04    1.306  0.28( 0.11) 0.40      33.7      14.10
     4       36.69   13.07    1.304  0.28( 0.11) 0.40      33.7      19.10

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      41.53    Tc(MIN.) =     9.39
 EFFECTIVE AREA(ACRES) =      30.85   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.38
 TOTAL AREA(ACRES) =       33.7
 LONGEST FLOWPATH FROM NODE     19.10 TO NODE     19.00 =    2147.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     19.00 TO NODE     20.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   360.90  DOWNSTREAM(FEET) =   350.40
 FLOW LENGTH(FEET) =   364.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.36
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      41.53
 PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    9.81
 LONGEST FLOWPATH FROM NODE     19.10 TO NODE     20.00 =    2511.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.81
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.537
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 CONDOMINIUMS               B        3.00      0.30     0.350    36
 CONDOMINIUMS               C        1.20      0.25     0.350    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =    4.20      SUBAREA RUNOFF(CFS) =    5.43
 EFFECTIVE AREA(ACRES) =     35.05   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.38
 TOTAL AREA(ACRES) =       37.9       PEAK FLOW RATE(CFS) =      45.14
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.81
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.537
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        4.60      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    4.60      SUBAREA RUNOFF(CFS) =    6.00
  EFFECTIVE AREA(ACRES) =     39.65   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.37
  TOTAL AREA(ACRES) =       42.5       PEAK FLOW RATE(CFS) =      51.14

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   350.40  DOWNSTREAM(FEET) =   346.90
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.85
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      51.14
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =   10.00
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     21.00 =    2663.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.521
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        1.10      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.10      SUBAREA RUNOFF(CFS) =    1.48
  EFFECTIVE AREA(ACRES) =     40.75   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.37
  TOTAL AREA(ACRES) =       43.6       PEAK FLOW RATE(CFS) =      52.04

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   346.90  DOWNSTREAM(FEET) =   342.10
  FLOW LENGTH(FEET) =    67.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.5 INCHES
```

```
 PIPE-FLOW VELOCITY(FEET/SEC.) =  21.20
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      52.04
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   10.05
 LONGEST FLOWPATH FROM NODE     19.10 TO NODE     22.00 =    2730.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.05
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.516
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 CONDOMINIUMS               B        4.60      0.30     0.350    36
 CONDOMINIUMS               C        0.80      0.25     0.350    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
 SUBAREA AREA(ACRES) =    5.40      SUBAREA RUNOFF(CFS) =    6.87
 EFFECTIVE AREA(ACRES) =     46.15   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.36
 TOTAL AREA(ACRES) =       49.0       PEAK FLOW RATE(CFS) =      58.75

****************************************************************************
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   342.10  DOWNSTREAM(FEET) =   339.90
 FLOW LENGTH(FEET) =   434.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  42.0 INCH PIPE IS  29.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.13
 ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      58.75
 PIPE TRAVEL TIME(MIN.) =   0.89    Tc(MIN.) =   10.94
 LONGEST FLOWPATH FROM NODE     19.10 TO NODE     23.00 =    3164.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.94
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.444
 SUBAREA LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.90      0.25     0.100    50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.90      SUBAREA RUNOFF(CFS) =    1.15
 EFFECTIVE AREA(ACRES) =     47.05   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.36
 TOTAL AREA(ACRES) =       49.9       PEAK FLOW RATE(CFS) =      58.75
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   339.90  DOWNSTREAM(FEET) =   339.50
  FLOW LENGTH(FEET) =    56.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.23
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      58.75
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   11.04
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     24.00 =    3220.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.04
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.437
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               C        4.50      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =    4.50      SUBAREA RUNOFF(CFS) =    5.46
  EFFECTIVE AREA(ACRES) =     51.55   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =       54.4       PEAK FLOW RATE(CFS) =      62.05

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   339.50  DOWNSTREAM(FEET) =   333.30
  FLOW LENGTH(FEET) =   505.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.46
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      62.05
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   11.78
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     25.00 =    3725.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.78
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.385
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS               A        1.40      0.40     0.350    17
  CONDOMINIUMS               C        8.80      0.25     0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA AREA(ACRES) =   10.20      SUBAREA RUNOFF(CFS) =   11.84
```

```
  EFFECTIVE AREA(ACRES) =     61.75   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.36
  TOTAL AREA(ACRES) =       64.6       PEAK FLOW RATE(CFS) =      71.47

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   333.30  DOWNSTREAM(FEET) =   331.50
  FLOW LENGTH(FEET) =   177.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.04
  ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      71.47
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   12.04
  LONGEST FLOWPATH FROM NODE     19.10 TO NODE     26.00 =    3902.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       64.6  TC(MIN.) =     12.04
  EFFECTIVE AREA(ACRES) =     61.75  AREA-AVERAGED Fm(INCH/HR)=  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap = 0.356
  PEAK FLOW RATE(CFS)   =      71.47

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       71.47   12.04    1.367  0.28( 0.10) 0.36      61.7      10.00
      2       70.64   12.41    1.343  0.28( 0.10) 0.36      62.2      18.10
      3       62.80   15.81    1.169  0.27( 0.10) 0.37      64.6      14.10
      4       62.73   15.85    1.168  0.27( 0.10) 0.37      64.6      19.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                              Analysis prepared by:

                             Fuscoe Engineering, Inc.
                              15535 Sand Canyon Ave
                                    Suite 100
                                 Irvine, CA 92618

 ************************** DESCRIPTION OF STUDY **************************
* GATEWAY VILLAGE PROPOSED HYDROLOGY                                      *
* SUBAREA 'F' 2 YEAR STORM                                                *
* 11/25/2024 JZ                                                          *
 **************************************************************************

  FILE NAME: GVFPR2.DAT
  TIME/DATE OF STUDY: 09:51 11/25/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.020/0.020/0.020   0.50    2.00 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    354.60  DOWNSTREAM(FEET) =    347.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.914
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.739
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  CONDOMINIUMS                B        0.40      0.30      0.350    36    7.91
  CONDOMINIUMS                C        3.00      0.25      0.350    50    7.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  SUBAREA RUNOFF(CFS) =      5.05
  TOTAL AREA(ACRES) =      3.40   PEAK FLOW RATE(CFS) =      5.05

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    347.60  DOWNSTREAM(FEET) =    343.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   391.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.500
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  CONDOMINIUMS                B        0.10      0.30      0.350    36
  CONDOMINIUMS                C        2.40      0.25      0.350    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.350
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.79
  AVERAGE FLOW DEPTH(FEET) =   0.89   TRAVEL TIME(MIN.) =   2.33
  Tc(MIN.) =   10.25
  SUBAREA AREA(ACRES) =     2.50       SUBAREA RUNOFF(CFS) =    3.18
  EFFECTIVE AREA(ACRES) =      5.90     AREA-AVERAGED Fm(INCH/HR) =   0.09
  AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.35
  TOTAL AREA(ACRES) =        5.9         PEAK FLOW RATE(CFS) =       7.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =   2.86
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     721.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   337.70  DOWNSTREAM(FEET) =   337.20
  FLOW LENGTH(FEET) =   131.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.39
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.49
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   10.74
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     852.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   10.74
```

```
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.459
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                A        0.50      0.40     0.100    17
  COMMERCIAL                C        0.30      0.25     0.100    50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.80      SUBAREA RUNOFF(CFS) =    1.03
  EFFECTIVE AREA(ACRES) =      6.70   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.26  AREA-AVERAGED Ap =  0.32
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =       8.30

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   337.20  DOWNSTREAM(FEET) =   336.25
  FLOW LENGTH(FEET) =   118.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.89
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.30
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   11.08
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =     970.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.7  TC(MIN.) =     11.08
  EFFECTIVE AREA(ACRES) =      6.70  AREA-AVERAGED Fm(INCH/HR)=  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.26  AREA-AVERAGED Ap = 0.320
  PEAK FLOW RATE(CFS)   =       8.30
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==============================================================================
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                          Analysis prepared by:




******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  GATEWAY VILLAGE PROPOSED HYDROLOGY
  SUBAREA 'D6' 25-YEAR STORM
  12/3/2024 BY CK
==============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.49 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         3.80       35.00            32.       0.400        0.616
         2         4.30       35.00            69.       0.250        0.740
         3         0.20       35.00            75.       0.200        0.775

    TOTAL AREA (Acres) =      8.30

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.111

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.316
==============================================================================
```

```
******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==============================================================================
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                          Analysis prepared by:




******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  GATEWAY VILLAGE PROPOSED HYDROLOGY
  SUBAREA 'D6' 25-YEAR STORM UH
  12/3/2024 BY CK
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    8.30
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.111
    LOW LOSS FRACTION = 0.316
    TIME OF CONCENTRATION(MIN.) = 19.44
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.09
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.02

******************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.12      0.0018      0.35  Q         .         .         .         .
  0.45      0.0112      0.35  Q         .         .         .         .
  0.77      0.0207      0.36  Q         .         .         .         .
  1.10      0.0303      0.36  Q         .         .         .         .
  1.42      0.0401      0.37  Q         .         .         .         .
  1.74      0.0500      0.37  Q         .         .         .         .
  2.07      0.0600      0.38  Q         .         .         .         .
  2.39      0.0702      0.38  Q         .         .         .         .
  2.72      0.0806      0.39  Q         .         .         .         .
  3.04      0.0911      0.39  Q         .         .         .         .
  3.36      0.1017      0.40  Q         .         .         .         .
  3.69      0.1125      0.41  Q         .         .         .         .
  4.01      0.1236      0.42  Q         .         .         .         .
  4.34      0.1348      0.42  Q         .         .         .         .
  4.66      0.1462      0.43  Q         .         .         .         .
  4.98      0.1578      0.44  Q         .         .         .         .
  5.31      0.1696      0.45  Q         .         .         .         .
```

| | | | |
|---|---|---|---|
| 5.63 | 0.1816 | 0.45 | Q |
| 5.96 | 0.1939 | 0.46 | Q |
| 6.28 | 0.2064 | 0.47 | Q |
| 6.60 | 0.2192 | 0.48 | Q |
| 6.93 | 0.2322 | 0.49 | Q |
| 7.25 | 0.2456 | 0.51 | .Q |
| 7.58 | 0.2592 | 0.51 | .Q |
| 7.90 | 0.2732 | 0.53 | .Q |
| 8.22 | 0.2876 | 0.54 | .Q |
| 8.55 | 0.3023 | 0.56 | .Q |
| 8.87 | 0.3174 | 0.57 | .Q |
| 9.20 | 0.3329 | 0.59 | .Q |
| 9.52 | 0.3489 | 0.60 | .Q |
| 9.84 | 0.3654 | 0.63 | .Q |
| 10.17 | 0.3824 | 0.64 | .Q |
| 10.49 | 0.4000 | 0.67 | .Q |
| 10.82 | 0.4183 | 0.69 | .Q |
| 11.14 | 0.4372 | 0.73 | .Q |
| 11.46 | 0.4569 | 0.75 | .Q |
| 11.79 | 0.4775 | 0.79 | .Q |
| 12.11 | 0.4991 | 0.82 | .Q |
| 12.44 | 0.5255 | 1.15 | . Q |
| 12.76 | 0.5568 | 1.19 | . Q |
| 13.08 | 0.5897 | 1.27 | . Q |
| 13.41 | 0.6244 | 1.32 | . Q |
| 13.73 | 0.6612 | 1.43 | . Q |
| 14.06 | 0.7005 | 1.50 | . Q |
| 14.38 | 0.7428 | 1.65 | . Q |
| 14.70 | 0.7886 | 1.77 | . Q |
| 15.03 | 0.8418 | 2.21 | . Q |
| 15.35 | 0.9054 | 2.55 | . Q |
| 15.68 | 0.9815 | 3.14 | . Q |
| 16.00 | 1.0884 | 4.84 | . Q. |
| 16.32 | 1.3658 | 15.88 | . .Q |
| 16.65 | 1.6181 | 2.97 | . Q |
| 16.97 | 1.6840 | 1.95 | . Q |
| 17.30 | 1.7313 | 1.58 | . Q |
| 17.62 | 1.7707 | 1.37 | . Q |
| 17.94 | 1.8055 | 1.23 | . Q |
| 18.27 | 1.8352 | 0.99 | .Q |
| 18.59 | 1.8587 | 0.77 | .Q |
| 18.92 | 1.8785 | 0.71 | .Q |
| 19.24 | 1.8968 | 0.66 | .Q |
| 19.56 | 1.9138 | 0.62 | .Q |
| 19.89 | 1.9298 | 0.58 | .Q |
| 20.21 | 1.9449 | 0.55 | .Q |
| 20.54 | 1.9593 | 0.52 | .Q |
| 20.86 | 1.9729 | 0.50 | Q |
| 21.18 | 1.9860 | 0.48 | Q |
| 21.51 | 1.9985 | 0.46 | Q |
| 21.83 | 2.0105 | 0.44 | Q |
| 22.16 | 2.0221 | 0.43 | Q |
| 22.48 | 2.0334 | 0.41 | Q |
| 22.80 | 2.0442 | 0.40 | Q |
| 23.13 | 2.0547 | 0.39 | Q |
| 23.45 | 2.0649 | 0.37 | Q |
| 23.78 | 2.0748 | 0.36 | Q |
| 24.10 | 2.0844 | 0.35 | Q |
| 24.42 | 2.0892 | 0.00 | Q |

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

| Percentile of Estimated Peak Flow Rate | Duration (minutes) |
|---|---|
| 0% | 1458.0 |
| 10% | 175.0 |
| 20% | 38.9 |
| 30% | 38.9 |
| 40% | 19.4 |
| 50% | 19.4 |
| 60% | 19.4 |
| 70% | 19.4 |
| 80% | 19.4 |
| 90% | 19.4 |

```
******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==============================================================================
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                          Analysis prepared by:




******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  GATEWAY VILLAGE PROPOSED HYDROLOGY
  SUBAREA 'D6' 25-YEAR STORM UH
  12/3/2024 BY CK
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    8.30
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.111
    LOW LOSS FRACTION = 0.316
    TIME OF CONCENTRATION(MIN.) = 19.44
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.09
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.02

******************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.12      0.0018      0.35  Q         .         .         .         .
  0.45      0.0112      0.35  Q         .         .         .         .
  0.77      0.0207      0.36  Q         .         .         .         .
  1.10      0.0303      0.36  Q         .         .         .         .
  1.42      0.0401      0.37  Q         .         .         .         .
  1.74      0.0500      0.37  Q         .         .         .         .
  2.07      0.0600      0.38  Q         .         .         .         .
  2.39      0.0702      0.38  Q         .         .         .         .
  2.72      0.0806      0.39  Q         .         .         .         .
  3.04      0.0911      0.39  Q         .         .         .         .
  3.36      0.1017      0.40  Q         .         .         .         .
  3.69      0.1125      0.41  Q         .         .         .         .
  4.01      0.1236      0.42  Q         .         .         .         .
  4.34      0.1348      0.42  Q         .         .         .         .
  4.66      0.1462      0.43  Q         .         .         .         .
  4.98      0.1578      0.44  Q         .         .         .         .
  5.31      0.1696      0.45  Q         .         .         .         .
```

| | | | |
|---|---|---|---|
| 5.63 | 0.1816 | 0.45 | Q |
| 5.96 | 0.1939 | 0.46 | Q |
| 6.28 | 0.2064 | 0.47 | Q |
| 6.60 | 0.2192 | 0.48 | Q |
| 6.93 | 0.2322 | 0.49 | Q |
| 7.25 | 0.2456 | 0.51 | .Q |
| 7.58 | 0.2592 | 0.51 | .Q |
| 7.90 | 0.2732 | 0.53 | .Q |
| 8.22 | 0.2876 | 0.54 | .Q |
| 8.55 | 0.3023 | 0.56 | .Q |
| 8.87 | 0.3174 | 0.57 | .Q |
| 9.20 | 0.3329 | 0.59 | .Q |
| 9.52 | 0.3489 | 0.60 | .Q |
| 9.84 | 0.3654 | 0.63 | .Q |
| 10.17 | 0.3824 | 0.64 | .Q |
| 10.49 | 0.4000 | 0.67 | .Q |
| 10.82 | 0.4183 | 0.69 | .Q |
| 11.14 | 0.4372 | 0.73 | .Q |
| 11.46 | 0.4569 | 0.75 | .Q |
| 11.79 | 0.4775 | 0.79 | .Q |
| 12.11 | 0.4991 | 0.82 | .Q |
| 12.44 | 0.5255 | 1.15 | . Q |
| 12.76 | 0.5568 | 1.19 | . Q |
| 13.08 | 0.5897 | 1.27 | . Q |
| 13.41 | 0.6244 | 1.32 | . Q |
| 13.73 | 0.6612 | 1.43 | . Q |
| 14.06 | 0.7005 | 1.50 | . Q |
| 14.38 | 0.7428 | 1.65 | . Q |
| 14.70 | 0.7886 | 1.77 | . Q |
| 15.03 | 0.8418 | 2.21 | . Q |
| 15.35 | 0.9054 | 2.55 | . Q |
| 15.68 | 0.9815 | 3.14 | . Q |
| 16.00 | 1.0884 | 4.84 | . Q. |
| 16.32 | 1.3658 | 15.88 | . .Q |
| 16.65 | 1.6181 | 2.97 | . Q |
| 16.97 | 1.6840 | 1.95 | . Q |
| 17.30 | 1.7313 | 1.58 | . Q |
| 17.62 | 1.7707 | 1.37 | . Q |
| 17.94 | 1.8055 | 1.23 | . Q |
| 18.27 | 1.8352 | 0.99 | .Q |
| 18.59 | 1.8587 | 0.77 | .Q |
| 18.92 | 1.8785 | 0.71 | .Q |
| 19.24 | 1.8968 | 0.66 | .Q |
| 19.56 | 1.9138 | 0.62 | .Q |
| 19.89 | 1.9298 | 0.58 | .Q |
| 20.21 | 1.9449 | 0.55 | .Q |
| 20.54 | 1.9593 | 0.52 | .Q |
| 20.86 | 1.9729 | 0.50 | Q |
| 21.18 | 1.9860 | 0.48 | Q |
| 21.51 | 1.9985 | 0.46 | Q |
| 21.83 | 2.0105 | 0.44 | Q |
| 22.16 | 2.0221 | 0.43 | Q |
| 22.48 | 2.0334 | 0.41 | Q |
| 22.80 | 2.0442 | 0.40 | Q |
| 23.13 | 2.0547 | 0.39 | Q |
| 23.45 | 2.0649 | 0.37 | Q |
| 23.78 | 2.0748 | 0.36 | Q |
| 24.10 | 2.0844 | 0.35 | Q |
| 24.42 | 2.0892 | 0.00 | Q |

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

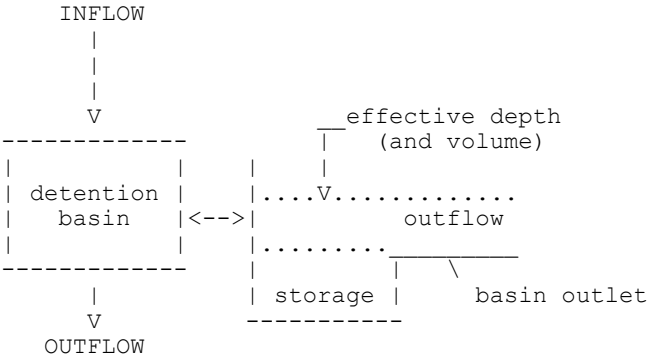
| Percentile of Estimated Peak Flow Rate | Duration (minutes) |
|---|---|
| 0% | 1458.0 |
| 10% | 175.0 |
| 20% | 38.9 |
| 30% | 38.9 |
| 40% | 19.4 |
| 50% | 19.4 |
| 60% | 19.4 |
| 70% | 19.4 |
| 80% | 19.4 |
| 90% | 19.4 |

Problem Descriptions:
GATEWAY VILLAGE PROPOSED HYDROLOGY
SUBAREA 'D6' 25-YEAR STORM UH
12/3/2024 BY CK

==========

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 19.440
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00




DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 20

| *BASIN-DEPTH (FEET) | STORAGE (ACRE-FEET) | OUTFLOW (CFS) ** | **BASIN-DEPTH (FEET) | STORAGE (ACRE-FEET) | OUTFLOW (CFS) * |
|---|---|---|---|---|---|
| 0.000 | 0.000 | 0.000** | 0.370 | 0.021 | 0.390* |
| 0.740 | 0.042 | 1.480** | 1.110 | 0.063 | 2.940* |
| 1.470 | 0.085 | 3.730** | 1.840 | 0.106 | 4.380* |
| 2.210 | 0.127 | 4.950** | 2.580 | 0.148 | 5.450* |
| 2.950 | 0.169 | 5.920** | 3.320 | 0.190 | 6.350* |
| 3.680 | 0.211 | 6.750** | 4.050 | 0.233 | 7.130* |
| 4.420 | 0.254 | 7.490** | 4.790 | 0.275 | 7.830* |
| 5.160 | 0.296 | 8.160** | 5.530 | 0.317 | 8.480* |
| 5.890 | 0.338 | 8.870** | 6.260 | 0.359 | 9.080* |
| 6.630 | 0.381 | 9.360** | 7.000 | 0.402 | 9.640* |

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BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

| INTERVAL NUMBER | DEPTH (FEET) | {S-O*DT/2} (ACRE-FEET) | {S+O*DT/2} (ACRE-FEET) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | 0.00 | 0.00000 | 0.00000 |
| 2 | 0.37 | 0.01588 | 0.02632 |
| 3 | 0.74 | 0.02249 | 0.06211 |
| 4 | 1.11 | 0.02404 | 0.10276 |
| 5 | 1.47 | 0.03466 | 0.13454 |
| 6 | 1.84 | 0.04706 | 0.16434 |
| 7 | 2.21 | 0.06063 | 0.19317 |
| 8 | 2.58 | 0.07503 | 0.22097 |
| 9 | 2.95 | 0.08994 | 0.24846 |
| 10 | 3.32 | 0.10528 | 0.27532 |
| 11 | 3.68 | 0.12103 | 0.30177 |
| 12 | 4.05 | 0.13714 | 0.32806 |
| 13 | 4.42 | 0.15342 | 0.35398 |
| 14 | 4.79 | 0.17007 | 0.37973 |
| 15 | 5.16 | 0.18675 | 0.40525 |
| 16 | 5.53 | 0.20367 | 0.43073 |
| 17 | 5.89 | 0.21954 | 0.45706 |
| 18 | 6.26 | 0.23793 | 0.48107 |
| 19 | 6.63 | 0.25528 | 0.50592 |
| 20 | 7.00 | 0.27264 | 0.53076 |

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

---

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

| TIME (HRS) | DEAD-STORAGE FILLED(AF) | INFLOW (CFS) | EFFECTIVE DEPTH(FT) | OUTFLOW (CFS) | EFFECTIVE VOLUME(AF) |
|---|---|---|---|---|---|
| 0.124 | 0.000 | 0.35 | 0.13 | 0.07 | 0.008 |
| 0.448 | 0.000 | 0.35 | 0.21 | 0.18 | 0.012 |
| 0.772 | 0.000 | 0.36 | 0.26 | 0.25 | 0.015 |
| 1.096 | 0.000 | 0.36 | 0.29 | 0.29 | 0.017 |
| 1.420 | 0.000 | 0.37 | 0.32 | 0.32 | 0.018 |
| 1.744 | 0.000 | 0.37 | 0.33 | 0.34 | 0.019 |
| 2.068 | 0.000 | 0.38 | 0.34 | 0.35 | 0.019 |
| 2.392 | 0.000 | 0.38 | 0.35 | 0.36 | 0.020 |
| 2.716 | 0.000 | 0.39 | 0.36 | 0.37 | 0.020 |
| 3.040 | 0.000 | 0.39 | 0.36 | 0.38 | 0.021 |
| 3.364 | 0.000 | 0.40 | 0.37 | 0.39 | 0.021 |
| 3.688 | 0.000 | 0.41 | 0.37 | 0.40 | 0.021 |
| 4.012 | 0.000 | 0.42 | 0.38 | 0.41 | 0.022 |
| 4.336 | 0.000 | 0.42 | 0.38 | 0.42 | 0.022 |
| 4.660 | 0.000 | 0.43 | 0.38 | 0.42 | 0.022 |
| 4.984 | 0.000 | 0.44 | 0.39 | 0.43 | 0.022 |
| 5.308 | 0.000 | 0.45 | 0.39 | 0.44 | 0.022 |
| 5.632 | 0.000 | 0.45 | 0.39 | 0.45 | 0.022 |
| 5.956 | 0.000 | 0.46 | 0.39 | 0.46 | 0.022 |
| 6.280 | 0.000 | 0.47 | 0.40 | 0.47 | 0.023 |
| 6.604 | 0.000 | 0.48 | 0.40 | 0.48 | 0.023 |
| 6.928 | 0.000 | 0.49 | 0.40 | 0.49 | 0.023 |
| 7.252 | 0.000 | 0.51 | 0.41 | 0.50 | 0.023 |
| 7.576 | 0.000 | 0.51 | 0.41 | 0.51 | 0.023 |
| 7.900 | 0.000 | 0.53 | 0.42 | 0.52 | 0.024 |
| 8.224 | 0.000 | 0.54 | 0.42 | 0.53 | 0.024 |
| 8.548 | 0.000 | 0.56 | 0.43 | 0.55 | 0.024 |
| 8.872 | 0.000 | 0.57 | 0.43 | 0.56 | 0.025 |
| 9.196 | 0.000 | 0.59 | 0.44 | 0.58 | 0.025 |
| 9.520 | 0.000 | 0.60 | 0.44 | 0.59 | 0.025 |
| 9.844 | 0.000 | 0.63 | 0.45 | 0.61 | 0.026 |
| 10.168 | 0.000 | 0.64 | 0.45 | 0.63 | 0.026 |
| 10.492 | 0.000 | 0.67 | 0.46 | 0.65 | 0.026 |
| 10.816 | 0.000 | 0.69 | 0.47 | 0.68 | 0.027 |
| 11.140 | 0.000 | 0.73 | 0.48 | 0.70 | 0.027 |

| | | | | | |
|---|---|---|---|---|---|
| 11.464 | 0.000 | 0.75 | 0.49 | 0.73 | 0.028 |
| 11.788 | 0.000 | 0.79 | 0.50 | 0.76 | 0.029 |
| 12.112 | 0.000 | 0.82 | 0.51 | 0.80 | 0.029 |
| 12.436 | 0.000 | 1.15 | 0.61 | 0.95 | 0.035 |
| 12.760 | 0.000 | 1.19 | 0.63 | 1.13 | 0.036 |
| 13.084 | 0.000 | 1.27 | 0.66 | 1.21 | 0.038 |
| 13.408 | 0.000 | 1.32 | 0.68 | 1.28 | 0.039 |
| 13.732 | 0.000 | 1.43 | 0.72 | 1.36 | 0.041 |
| 14.056 | 0.000 | 1.50 | 0.74 | 1.45 | 0.042 |
| 14.380 | 0.000 | 1.65 | 0.78 | 1.57 | 0.045 |
| 14.704 | 0.000 | 1.77 | 0.81 | 1.71 | 0.046 |
| 15.028 | 0.000 | 2.21 | 0.92 | 1.98 | 0.053 |
| 15.352 | 0.000 | 2.55 | 1.01 | 2.36 | 0.058 |
| 15.676 | 0.000 | 3.14 | 1.16 | 2.80 | 0.067 |
| 16.000 | 0.000 | 4.84 | 1.73 | 3.62 | 0.099 |
| 16.324 | 0.000 | 15.88 | 6.07 | 6.58 | 0.348 |
| 16.648 | 0.000 | 2.97 | 3.77 | 7.90 | 0.216 |
| 16.972 | 0.000 | 1.95 | 2.00 | 5.73 | 0.115 |
| 17.296 | 0.000 | 1.58 | 1.04 | 3.65 | 0.059 |
| 17.620 | 0.000 | 1.37 | 0.72 | 2.05 | 0.041 |
| 17.944 | 0.000 | 1.23 | 0.67 | 1.35 | 0.038 |
| 18.268 | 0.000 | 0.99 | 0.59 | 1.15 | 0.034 |
| 18.592 | 0.000 | 0.77 | 0.52 | 0.93 | 0.029 |
| 18.916 | 0.000 | 0.71 | 0.48 | 0.77 | 0.028 |
| 19.240 | 0.000 | 0.66 | 0.47 | 0.70 | 0.027 |
| 19.564 | 0.000 | 0.62 | 0.45 | 0.65 | 0.026 |
| 19.888 | 0.000 | 0.58 | 0.44 | 0.61 | 0.025 |
| 20.212 | 0.000 | 0.55 | 0.43 | 0.57 | 0.024 |
| 20.536 | 0.000 | 0.52 | 0.42 | 0.54 | 0.024 |
| 20.860 | 0.000 | 0.50 | 0.41 | 0.52 | 0.023 |
| 21.184 | 0.000 | 0.48 | 0.40 | 0.49 | 0.023 |
| 21.508 | 0.000 | 0.46 | 0.39 | 0.47 | 0.023 |
| 21.832 | 0.000 | 0.44 | 0.39 | 0.45 | 0.022 |
| 22.156 | 0.000 | 0.43 | 0.38 | 0.44 | 0.022 |
| 22.480 | 0.000 | 0.41 | 0.38 | 0.42 | 0.022 |
| 22.804 | 0.000 | 0.40 | 0.37 | 0.41 | 0.021 |
| 23.128 | 0.000 | 0.39 | 0.37 | 0.40 | 0.021 |
| 23.452 | 0.000 | 0.37 | 0.36 | 0.39 | 0.021 |
| 23.776 | 0.000 | 0.36 | 0.36 | 0.38 | 0.020 |
| 24.100 | 0.000 | 0.35 | 0.35 | 0.37 | 0.020 |
| 24.424 | 0.000 | 0.00 | 0.21 | 0.29 | 0.012 |
| 24.748 | 0.000 | 0.00 | 0.13 | 0.18 | 0.007 |
| 25.072 | 0.000 | 0.00 | 0.08 | 0.11 | 0.004 |
| 25.396 | 0.000 | 0.00 | 0.05 | 0.06 | 0.003 |
| 25.720 | 0.000 | 0.00 | 0.03 | 0.04 | 0.002 |
| 26.044 | 0.000 | 0.00 | 0.02 | 0.02 | 0.001 |

**********
NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS

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Analysis prepared by:

**********

Problem Descriptions:
GATEWAY VILLAGE PROPOSED HYDROMOD
SUBAREAS D6 & D7 2-YEAR STORM
12/5/2024 BY CK

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

| SOIL-COVER TYPE | AREA (Acres) | PERCENT OF PERVIOUS AREA | SCS CURVE NUMBER | LOSS RATE Fp(in./hr.) | YIELD |
|---|---|---|---|---|---|
| 1 | 3.80 | 35.00 | 32.(AMC II) | 0.400 | 0.578 |
| 2 | 4.30 | 35.00 | 69.(AMC II) | 0.250 | 0.578 |
| 3 | 0.20 | 35.00 | 75.(AMC II) | 0.200 | 0.585 |

TOTAL AREA (Acres) = 8.30

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.111

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.422

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**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:




**************************************************************************
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 Problem Descriptions:
  GATEWAY VILLAGE PROPOSED HYDROMOD
  SUBAREAS D6 & D7 2-YEAR STORM UH
  12/5/2024 BY CK
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    8.30
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.111
    LOW LOSS FRACTION = 0.422
    TIME OF CONCENTRATION(MIN.) = 10.09
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.80
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.61

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.02      0.0000      0.00  Q         .         .         .         .
  0.19      0.0010      0.14  Q         .         .         .         .
  0.36      0.0029      0.14  Q         .         .         .         .
  0.53      0.0048      0.14  Q         .         .         .         .
  0.70      0.0068      0.14  Q         .         .         .         .
  0.86      0.0088      0.14  Q         .         .         .         .
  1.03      0.0107      0.14  Q         .         .         .         .
  1.20      0.0127      0.14  Q         .         .         .         .
  1.37      0.0147      0.15  Q         .         .         .         .
  1.54      0.0168      0.15  Q         .         .         .         .
  1.71      0.0188      0.15  Q         .         .         .         .
  1.87      0.0209      0.15  Q         .         .         .         .
  2.04      0.0229      0.15  Q         .         .         .         .
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2.21 | 0.0250 | 0.15 | Q | . | . | . | . |
| 2.38 | 0.0271 | 0.15 | Q | . | . | . | . |
| 2.55 | 0.0292 | 0.15 | Q | . | . | . | . |
| 2.71 | 0.0314 | 0.15 | Q | . | . | . | . |
| 2.88 | 0.0335 | 0.16 | Q | . | . | . | . |
| 3.05 | 0.0357 | 0.16 | Q | . | . | . | . |
| 3.22 | 0.0379 | 0.16 | Q | . | . | . | . |
| 3.39 | 0.0401 | 0.16 | Q | . | . | . | . |
| 3.56 | 0.0423 | 0.16 | Q | . | . | . | . |
| 3.72 | 0.0445 | 0.16 | Q | . | . | . | . |
| 3.89 | 0.0468 | 0.16 | Q | . | . | . | . |
| 4.06 | 0.0491 | 0.16 | Q | . | . | . | . |
| 4.23 | 0.0514 | 0.17 | Q | . | . | . | . |
| 4.40 | 0.0537 | 0.17 | Q | . | . | . | . |
| 4.56 | 0.0560 | 0.17 | Q | . | . | . | . |
| 4.73 | 0.0584 | 0.17 | Q | . | . | . | . |
| 4.90 | 0.0608 | 0.17 | Q | . | . | . | . |
| 5.07 | 0.0632 | 0.17 | Q | . | . | . | . |
| 5.24 | 0.0656 | 0.18 | Q | . | . | . | . |
| 5.41 | 0.0681 | 0.18 | Q | . | . | . | . |
| 5.57 | 0.0705 | 0.18 | Q | . | . | . | . |
| 5.74 | 0.0730 | 0.18 | Q | . | . | . | . |
| 5.91 | 0.0756 | 0.18 | Q | . | . | . | . |
| 6.08 | 0.0781 | 0.18 | Q | . | . | . | . |
| 6.25 | 0.0807 | 0.19 | Q | . | . | . | . |
| 6.41 | 0.0833 | 0.19 | Q | . | . | . | . |
| 6.58 | 0.0859 | 0.19 | Q | . | . | . | . |
| 6.75 | 0.0886 | 0.19 | Q | . | . | . | . |
| 6.92 | 0.0913 | 0.19 | Q | . | . | . | . |
| 7.09 | 0.0940 | 0.20 | Q | . | . | . | . |
| 7.26 | 0.0968 | 0.20 | Q | . | . | . | . |
| 7.42 | 0.0995 | 0.20 | Q | . | . | . | . |
| 7.59 | 0.1024 | 0.20 | Q | . | . | . | . |
| 7.76 | 0.1052 | 0.21 | Q | . | . | . | . |
| 7.93 | 0.1081 | 0.21 | Q | . | . | . | . |
| 8.10 | 0.1111 | 0.21 | Q | . | . | . | . |
| 8.26 | 0.1140 | 0.21 | Q | . | . | . | . |
| 8.43 | 0.1170 | 0.22 | Q | . | . | . | . |
| 8.60 | 0.1201 | 0.22 | Q | . | . | . | . |
| 8.77 | 0.1232 | 0.22 | Q | . | . | . | . |
| 8.94 | 0.1263 | 0.23 | Q | . | . | . | . |
| 9.11 | 0.1295 | 0.23 | Q | . | . | . | . |
| 9.27 | 0.1327 | 0.23 | Q | . | . | . | . |
| 9.44 | 0.1360 | 0.24 | Q | . | . | . | . |
| 9.61 | 0.1394 | 0.24 | Q | . | . | . | . |
| 9.78 | 0.1427 | 0.25 | Q | . | . | . | . |
| 9.95 | 0.1462 | 0.25 | Q | . | . | . | . |
| 10.11 | 0.1497 | 0.26 | Q | . | . | . | . |
| 10.28 | 0.1533 | 0.26 | Q | . | . | . | . |
| 10.45 | 0.1569 | 0.26 | Q | . | . | . | . |
| 10.62 | 0.1606 | 0.27 | Q | . | . | . | . |
| 10.79 | 0.1644 | 0.27 | Q | . | . | . | . |
| 10.95 | 0.1682 | 0.28 | Q | . | . | . | . |
| 11.12 | 0.1721 | 0.29 | Q | . | . | . | . |
| 11.29 | 0.1761 | 0.29 | Q | . | . | . | . |
| 11.46 | 0.1802 | 0.30 | Q | . | . | . | . |
| 11.63 | 0.1844 | 0.30 | Q | . | . | . | . |
| 11.80 | 0.1887 | 0.31 | Q | . | . | . | . |
| 11.96 | 0.1931 | 0.32 | Q | . | . | . | . |
| 12.13 | 0.1979 | 0.38 | Q | . | . | . | . |
| 12.30 | 0.2034 | 0.41 | Q | . | . | . | . |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.47 | 0.2091 | 0.42 | Q | . | . | . | . |
| 12.64 | 0.2150 | 0.43 | Q | . | . | . | . |
| 12.80 | 0.2211 | 0.44 | Q | . | . | . | . |
| 12.97 | 0.2273 | 0.45 | Q | . | . | . | . |
| 13.14 | 0.2337 | 0.47 | Q | . | . | . | . |
| 13.31 | 0.2403 | 0.48 | Q | . | . | . | . |
| 13.48 | 0.2471 | 0.50 | .Q | . | . | . | . |
| 13.65 | 0.2542 | 0.51 | .Q | . | . | . | . |
| 13.81 | 0.2615 | 0.54 | .Q | . | . | . | . |
| 13.98 | 0.2691 | 0.56 | .Q | . | . | . | . |
| 14.15 | 0.2772 | 0.61 | .Q | . | . | . | . |
| 14.32 | 0.2858 | 0.63 | .Q | . | . | . | . |
| 14.49 | 0.2949 | 0.67 | .Q | . | . | . | . |
| 14.65 | 0.3044 | 0.70 | .Q | . | . | . | . |
| 14.82 | 0.3146 | 0.76 | .Q | . | . | . | . |
| 14.99 | 0.3254 | 0.80 | .Q | . | . | . | . |
| 15.16 | 0.3372 | 0.89 | .Q | . | . | . | . |
| 15.33 | 0.3501 | 0.96 | .Q | . | . | . | . |
| 15.50 | 0.3635 | 0.98 | .Q | . | . | . | . |
| 15.66 | 0.3780 | 1.10 | . Q | . | . | . | . |
| 15.83 | 0.3991 | 1.93 | .  Q | . | . | . | . |
| 16.00 | 0.4329 | 2.94 | .    Q | . | . | . | . |
| 16.17 | 0.5261 | 10.47 | . | . | Q | . | . |
| 16.34 | 0.6085 | 1.38 | . Q | . | . | . | . |
| 16.50 | 0.6252 | 1.03 | . Q | . | . | . | . |
| 16.67 | 0.6383 | 0.84 | .Q | . | . | . | . |
| 16.84 | 0.6492 | 0.73 | .Q | . | . | . | . |
| 17.01 | 0.6588 | 0.65 | .Q | . | . | . | . |
| 17.18 | 0.6673 | 0.57 | .Q | . | . | . | . |
| 17.35 | 0.6749 | 0.53 | .Q | . | . | . | . |
| 17.51 | 0.6820 | 0.49 | Q | . | . | . | . |
| 17.68 | 0.6886 | 0.46 | Q | . | . | . | . |
| 17.85 | 0.6948 | 0.44 | Q | . | . | . | . |
| 18.02 | 0.7007 | 0.41 | Q | . | . | . | . |
| 18.19 | 0.7058 | 0.32 | Q | . | . | . | . |
| 18.35 | 0.7102 | 0.31 | Q | . | . | . | . |
| 18.52 | 0.7144 | 0.29 | Q | . | . | . | . |
| 18.69 | 0.7184 | 0.28 | Q | . | . | . | . |
| 18.86 | 0.7223 | 0.27 | Q | . | . | . | . |
| 19.03 | 0.7260 | 0.26 | Q | . | . | . | . |
| 19.20 | 0.7295 | 0.25 | Q | . | . | . | . |
| 19.36 | 0.7330 | 0.24 | Q | . | . | . | . |
| 19.53 | 0.7363 | 0.24 | Q | . | . | . | . |
| 19.70 | 0.7395 | 0.23 | Q | . | . | . | . |
| 19.87 | 0.7427 | 0.22 | Q | . | . | . | . |
| 20.04 | 0.7457 | 0.22 | Q | . | . | . | . |
| 20.20 | 0.7487 | 0.21 | Q | . | . | . | . |
| 20.37 | 0.7516 | 0.21 | Q | . | . | . | . |
| 20.54 | 0.7544 | 0.20 | Q | . | . | . | . |
| 20.71 | 0.7572 | 0.20 | Q | . | . | . | . |
| 20.88 | 0.7599 | 0.19 | Q | . | . | . | . |
| 21.05 | 0.7625 | 0.19 | Q | . | . | . | . |
| 21.21 | 0.7651 | 0.18 | Q | . | . | . | . |
| 21.38 | 0.7676 | 0.18 | Q | . | . | . | . |
| 21.55 | 0.7701 | 0.18 | Q | . | . | . | . |
| 21.72 | 0.7725 | 0.17 | Q | . | . | . | . |
| 21.89 | 0.7749 | 0.17 | Q | . | . | . | . |
| 22.05 | 0.7772 | 0.17 | Q | . | . | . | . |
| 22.22 | 0.7795 | 0.16 | Q | . | . | . | . |
| 22.39 | 0.7818 | 0.16 | Q | . | . | . | . |
| 22.56 | 0.7840 | 0.16 | Q | . | . | . | . |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22.73 | 0.7862 | 0.16 | Q | . | . | . | . |
| 22.89 | 0.7884 | 0.15 | Q | . | . | . | . |
| 23.06 | 0.7905 | 0.15 | Q | . | . | . | . |
| 23.23 | 0.7926 | 0.15 | Q | . | . | . | . |
| 23.40 | 0.7946 | 0.15 | Q | . | . | . | . |
| 23.57 | 0.7966 | 0.14 | Q | . | . | . | . |
| 23.74 | 0.7986 | 0.14 | Q | . | . | . | . |
| 23.90 | 0.8006 | 0.14 | Q | . | . | . | . |
| 24.07 | 0.8025 | 0.14 | Q | . | . | . | . |
| 24.24 | 0.8035 | 0.00 | Q | . | . | . | . |

---

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

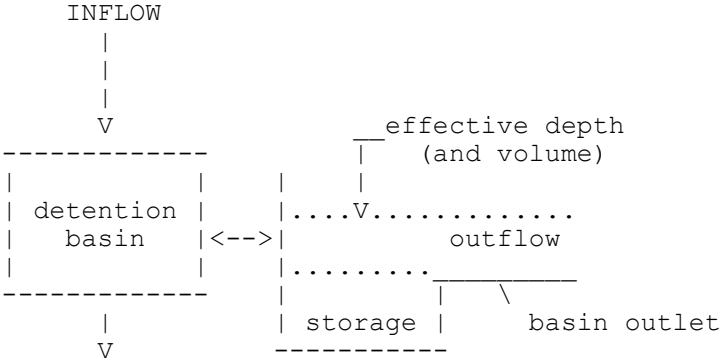
| Percentile of Estimated Peak Flow Rate | Duration (minutes) |
|---|---|
| 0% | 1442.9 |
| 10% | 50.5 |
| 20% | 20.2 |
| 30% | 10.1 |
| 40% | 10.1 |
| 50% | 10.1 |
| 60% | 10.1 |
| 70% | 10.1 |
| 80% | 10.1 |
| 90% | 10.1 |

Problem Descriptions:
GATEWAY VILLAGE PROPOSED HYDROMOD
SUBAREAS D6 & D7 2-YEAR STORM UH DETENTION
12/5/2024 BY CK

==========

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 10.090
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



OUTFLOW

DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 20

| *BASIN-DEPTH (FEET) | STORAGE (ACRE-FEET) | OUTFLOW (CFS) ** | **BASIN-DEPTH (FEET) | STORAGE (ACRE-FEET) | OUTFLOW (CFS) * |
|---|---|---|---|---|---|
| 0.000 | 0.000 | 0.000** | 0.370 | 0.021 | 0.390* |
| 0.740 | 0.042 | 1.480** | 1.110 | 0.063 | 2.940* |
| 1.470 | 0.085 | 3.730** | 1.840 | 0.106 | 4.380* |
| 2.210 | 0.129 | 4.950** | 2.580 | 0.148 | 5.450* |
| 2.950 | 0.169 | 5.920** | 3.320 | 0.190 | 6.350* |
| 3.680 | 0.211 | 6.750** | 4.050 | 0.233 | 7.130* |
| 4.420 | 0.254 | 7.490** | 4.790 | 0.275 | 7.830* |
| 5.160 | 0.296 | 8.160** | 5.530 | 0.317 | 8.480* |
| 5.890 | 0.338 | 8.870** | 6.260 | 0.359 | 9.080* |
| 6.630 | 0.381 | 9.360** | 7.000 | 0.402 | 9.640* |

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

| INTERVAL NUMBER | DEPTH (FEET) | {S-O*DT/2} (ACRE-FEET) | {S+O*DT/2} (ACRE-FEET) |
|---|---|---|---|
| 1 | 0.00 | 0.00000 | 0.00000 |
| 2 | 0.37 | 0.01839 | 0.02381 |
| 3 | 0.74 | 0.03202 | 0.05258 |
| 4 | 1.11 | 0.04297 | 0.08383 |
| 5 | 1.47 | 0.05868 | 0.11052 |
| 6 | 1.84 | 0.07526 | 0.13614 |
| 7 | 2.21 | 0.09450 | 0.16330 |
| 8 | 2.58 | 0.11013 | 0.18587 |
| 9 | 2.95 | 0.12806 | 0.21034 |
| 10 | 3.32 | 0.14617 | 0.23443 |
| 11 | 3.68 | 0.16449 | 0.25831 |
| 12 | 4.05 | 0.18305 | 0.28215 |
| 13 | 4.42 | 0.20165 | 0.30575 |
| 14 | 4.79 | 0.22049 | 0.32931 |
| 15 | 5.16 | 0.23930 | 0.35270 |
| 16 | 5.53 | 0.25827 | 0.37613 |
| 17 | 5.89 | 0.27666 | 0.39994 |
| 18 | 6.26 | 0.29640 | 0.42260 |
| 19 | 6.63 | 0.31556 | 0.44564 |
| 20 | 7.00 | 0.33471 | 0.46869 |

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:
NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

| TIME (HRS) | DEAD-STORAGE FILLED(AF) | INFLOW (CFS) | EFFECTIVE DEPTH(FT) | OUTFLOW (CFS) | EFFECTIVE VOLUME(AF) |
|---|---|---|---|---|---|
| 0.024 | 0.000 | 0.00 | 0.00 | 0.00 | 0.000 |
| 0.192 | 0.000 | 0.14 | 0.03 | 0.02 | 0.002 |
| 0.360 | 0.000 | 0.14 | 0.05 | 0.04 | 0.003 |
| 0.529 | 0.000 | 0.14 | 0.07 | 0.07 | 0.004 |
| 0.697 | 0.000 | 0.14 | 0.09 | 0.08 | 0.005 |
| 0.865 | 0.000 | 0.14 | 0.10 | 0.10 | 0.006 |
| 1.033 | 0.000 | 0.14 | 0.11 | 0.11 | 0.006 |
| 1.201 | 0.000 | 0.14 | 0.11 | 0.12 | 0.006 |
| 1.369 | 0.000 | 0.15 | 0.12 | 0.12 | 0.007 |
| 1.538 | 0.000 | 0.15 | 0.12 | 0.13 | 0.007 |

| | | | | | |
|---|---|---|---|---|---|
| 1.706 | 0.000 | 0.15 | 0.13 | 0.13 | 0.007 |
| 1.874 | 0.000 | 0.15 | 0.13 | 0.14 | 0.007 |
| 2.042 | 0.000 | 0.15 | 0.13 | 0.14 | 0.008 |
| 2.210 | 0.000 | 0.15 | 0.13 | 0.14 | 0.008 |
| 2.378 | 0.000 | 0.15 | 0.14 | 0.14 | 0.008 |
| 2.547 | 0.000 | 0.15 | 0.14 | 0.15 | 0.008 |
| 2.715 | 0.000 | 0.15 | 0.14 | 0.15 | 0.008 |
| 2.883 | 0.000 | 0.16 | 0.14 | 0.15 | 0.008 |
| 3.051 | 0.000 | 0.16 | 0.14 | 0.15 | 0.008 |
| 3.219 | 0.000 | 0.16 | 0.14 | 0.15 | 0.008 |
| 3.387 | 0.000 | 0.16 | 0.15 | 0.15 | 0.008 |
| 3.556 | 0.000 | 0.16 | 0.15 | 0.15 | 0.008 |
| 3.724 | 0.000 | 0.16 | 0.15 | 0.16 | 0.008 |
| 3.892 | 0.000 | 0.16 | 0.15 | 0.16 | 0.009 |
| 4.060 | 0.000 | 0.16 | 0.15 | 0.16 | 0.009 |
| 4.228 | 0.000 | 0.17 | 0.15 | 0.16 | 0.009 |
| 4.396 | 0.000 | 0.17 | 0.15 | 0.16 | 0.009 |
| 4.565 | 0.000 | 0.17 | 0.16 | 0.16 | 0.009 |
| 4.733 | 0.000 | 0.17 | 0.16 | 0.16 | 0.009 |
| 4.901 | 0.000 | 0.17 | 0.16 | 0.17 | 0.009 |
| 5.069 | 0.000 | 0.17 | 0.16 | 0.17 | 0.009 |
| 5.237 | 0.000 | 0.18 | 0.16 | 0.17 | 0.009 |
| 5.405 | 0.000 | 0.18 | 0.16 | 0.17 | 0.009 |
| 5.574 | 0.000 | 0.18 | 0.16 | 0.17 | 0.009 |
| 5.742 | 0.000 | 0.18 | 0.17 | 0.17 | 0.009 |
| 5.910 | 0.000 | 0.18 | 0.17 | 0.18 | 0.010 |
| 6.078 | 0.000 | 0.18 | 0.17 | 0.18 | 0.010 |
| 6.246 | 0.000 | 0.19 | 0.17 | 0.18 | 0.010 |
| 6.414 | 0.000 | 0.19 | 0.17 | 0.18 | 0.010 |
| 6.583 | 0.000 | 0.19 | 0.17 | 0.18 | 0.010 |
| 6.751 | 0.000 | 0.19 | 0.18 | 0.19 | 0.010 |
| 6.919 | 0.000 | 0.19 | 0.18 | 0.19 | 0.010 |
| 7.087 | 0.000 | 0.20 | 0.18 | 0.19 | 0.010 |
| 7.255 | 0.000 | 0.20 | 0.18 | 0.19 | 0.010 |
| 7.424 | 0.000 | 0.20 | 0.18 | 0.19 | 0.011 |
| 7.592 | 0.000 | 0.20 | 0.19 | 0.20 | 0.011 |
| 7.760 | 0.000 | 0.21 | 0.19 | 0.20 | 0.011 |
| 7.928 | 0.000 | 0.21 | 0.19 | 0.20 | 0.011 |
| 8.096 | 0.000 | 0.21 | 0.19 | 0.20 | 0.011 |
| 8.264 | 0.000 | 0.21 | 0.20 | 0.21 | 0.011 |
| 8.432 | 0.000 | 0.22 | 0.20 | 0.21 | 0.011 |
| 8.601 | 0.000 | 0.22 | 0.20 | 0.21 | 0.011 |
| 8.769 | 0.000 | 0.22 | 0.20 | 0.21 | 0.012 |
| 8.937 | 0.000 | 0.23 | 0.21 | 0.22 | 0.012 |
| 9.105 | 0.000 | 0.23 | 0.21 | 0.22 | 0.012 |
| 9.273 | 0.000 | 0.23 | 0.21 | 0.22 | 0.012 |
| 9.441 | 0.000 | 0.24 | 0.22 | 0.23 | 0.012 |
| 9.610 | 0.000 | 0.24 | 0.22 | 0.23 | 0.012 |
| 9.778 | 0.000 | 0.25 | 0.22 | 0.23 | 0.013 |
| 9.946 | 0.000 | 0.25 | 0.23 | 0.24 | 0.013 |
| 10.114 | 0.000 | 0.26 | 0.23 | 0.24 | 0.013 |
| 10.282 | 0.000 | 0.26 | 0.23 | 0.24 | 0.013 |
| 10.450 | 0.000 | 0.26 | 0.24 | 0.25 | 0.014 |
| 10.619 | 0.000 | 0.27 | 0.24 | 0.25 | 0.014 |
| 10.787 | 0.000 | 0.27 | 0.25 | 0.26 | 0.014 |
| 10.955 | 0.000 | 0.28 | 0.25 | 0.26 | 0.014 |
| 11.123 | 0.000 | 0.29 | 0.25 | 0.27 | 0.015 |
| 11.291 | 0.000 | 0.29 | 0.26 | 0.27 | 0.015 |
| 11.460 | 0.000 | 0.30 | 0.26 | 0.28 | 0.015 |
| 11.628 | 0.000 | 0.30 | 0.27 | 0.28 | 0.015 |
| 11.796 | 0.000 | 0.31 | 0.28 | 0.29 | 0.016 |

| | | | | | |
|---|---|---|---|---|---|
| 11.964 | 0.000 | 0.32 | 0.28 | 0.29 | 0.016 |
| 12.132 | 0.000 | 0.38 | 0.30 | 0.31 | 0.017 |
| 12.300 | 0.000 | 0.41 | 0.32 | 0.33 | 0.018 |
| 12.469 | 0.000 | 0.42 | 0.34 | 0.35 | 0.019 |
| 12.637 | 0.000 | 0.43 | 0.35 | 0.36 | 0.020 |
| 12.805 | 0.000 | 0.44 | 0.37 | 0.38 | 0.021 |
| 12.973 | 0.000 | 0.45 | 0.38 | 0.40 | 0.022 |
| 13.141 | 0.000 | 0.47 | 0.39 | 0.43 | 0.022 |
| 13.309 | 0.000 | 0.48 | 0.40 | 0.45 | 0.023 |
| 13.477 | 0.000 | 0.50 | 0.40 | 0.47 | 0.023 |
| 13.646 | 0.000 | 0.51 | 0.41 | 0.49 | 0.023 |
| 13.814 | 0.000 | 0.54 | 0.41 | 0.51 | 0.024 |
| 13.982 | 0.000 | 0.56 | 0.42 | 0.53 | 0.024 |
| 14.150 | 0.000 | 0.61 | 0.43 | 0.56 | 0.025 |
| 14.318 | 0.000 | 0.63 | 0.44 | 0.59 | 0.025 |
| 14.486 | 0.000 | 0.67 | 0.46 | 0.62 | 0.026 |
| 14.655 | 0.000 | 0.70 | 0.47 | 0.66 | 0.027 |
| 14.823 | 0.000 | 0.76 | 0.48 | 0.70 | 0.028 |
| 14.991 | 0.000 | 0.80 | 0.50 | 0.74 | 0.028 |
| 15.159 | 0.000 | 0.89 | 0.52 | 0.80 | 0.030 |
| 15.327 | 0.000 | 0.96 | 0.54 | 0.86 | 0.031 |
| 15.495 | 0.000 | 0.98 | 0.56 | 0.92 | 0.032 |
| 15.664 | 0.000 | 1.10 | 0.59 | 0.98 | 0.033 |
| 15.832 | 0.000 | 1.93 | 0.75 | 1.27 | 0.043 |
| 16.000 | 0.000 | 2.94 | 0.98 | 1.97 | 0.056 |
| 16.168 | 0.000 | 10.47 | 2.56 | 3.93 | 0.147 |
| 16.336 | 0.000 | 1.38 | 1.73 | 4.81 | 0.099 |
| 16.504 | 0.000 | 1.03 | 1.12 | 3.58 | 0.064 |
| 16.673 | 0.000 | 0.84 | 0.77 | 2.28 | 0.044 |
| 16.841 | 0.000 | 0.73 | 0.62 | 1.36 | 0.035 |
| 17.009 | 0.000 | 0.65 | 0.53 | 1.00 | 0.030 |
| 17.177 | 0.000 | 0.57 | 0.48 | 0.79 | 0.027 |
| 17.345 | 0.000 | 0.53 | 0.45 | 0.66 | 0.025 |
| 17.514 | 0.000 | 0.49 | 0.42 | 0.58 | 0.024 |
| 17.682 | 0.000 | 0.46 | 0.41 | 0.53 | 0.023 |
| 17.850 | 0.000 | 0.44 | 0.40 | 0.48 | 0.023 |
| 18.018 | 0.000 | 0.41 | 0.39 | 0.45 | 0.022 |
| 18.186 | 0.000 | 0.32 | 0.37 | 0.41 | 0.021 |
| 18.354 | 0.000 | 0.31 | 0.35 | 0.38 | 0.020 |
| 18.522 | 0.000 | 0.29 | 0.33 | 0.36 | 0.019 |
| 18.691 | 0.000 | 0.28 | 0.32 | 0.34 | 0.018 |
| 18.859 | 0.000 | 0.27 | 0.30 | 0.33 | 0.017 |
| 19.027 | 0.000 | 0.26 | 0.29 | 0.31 | 0.017 |
| 19.195 | 0.000 | 0.25 | 0.28 | 0.30 | 0.016 |
| 19.363 | 0.000 | 0.24 | 0.27 | 0.29 | 0.015 |
| 19.531 | 0.000 | 0.24 | 0.26 | 0.28 | 0.015 |
| 19.700 | 0.000 | 0.23 | 0.25 | 0.27 | 0.014 |
| 19.868 | 0.000 | 0.22 | 0.24 | 0.26 | 0.014 |
| 20.036 | 0.000 | 0.22 | 0.23 | 0.25 | 0.013 |
| 20.204 | 0.000 | 0.21 | 0.23 | 0.24 | 0.013 |
| 20.372 | 0.000 | 0.21 | 0.22 | 0.23 | 0.012 |
| 20.541 | 0.000 | 0.20 | 0.21 | 0.23 | 0.012 |
| 20.709 | 0.000 | 0.20 | 0.21 | 0.22 | 0.012 |
| 20.877 | 0.000 | 0.19 | 0.20 | 0.21 | 0.011 |
| 21.045 | 0.000 | 0.19 | 0.20 | 0.21 | 0.011 |
| 21.213 | 0.000 | 0.18 | 0.19 | 0.20 | 0.011 |
| 21.381 | 0.000 | 0.18 | 0.19 | 0.20 | 0.011 |
| 21.549 | 0.000 | 0.18 | 0.18 | 0.19 | 0.010 |
| 21.718 | 0.000 | 0.17 | 0.18 | 0.19 | 0.010 |
| 21.886 | 0.000 | 0.17 | 0.17 | 0.19 | 0.010 |
| 22.054 | 0.000 | 0.17 | 0.17 | 0.18 | 0.010 |

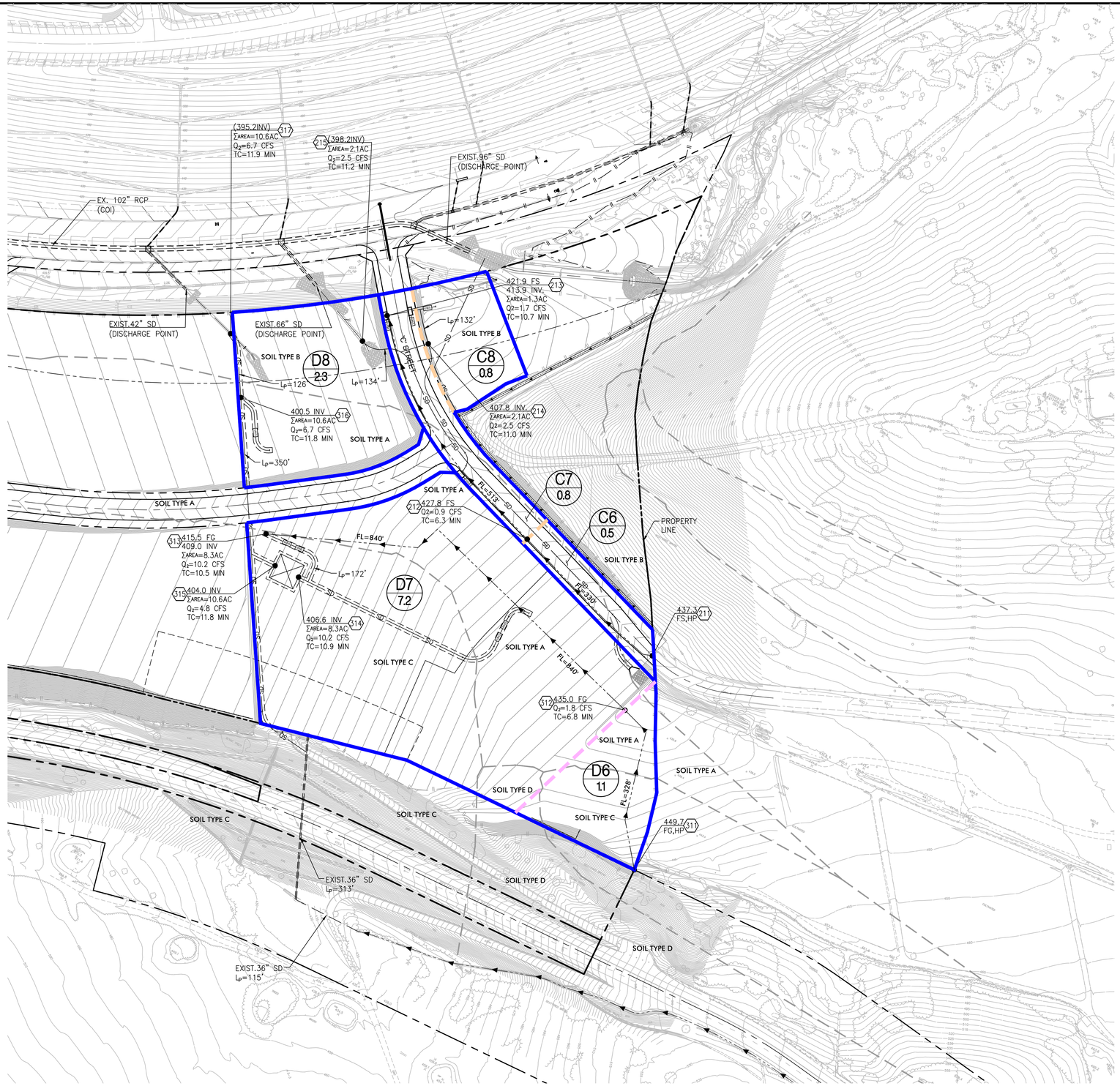
| | | | | | |
|---|---|---|---|---|---|
| 22.222 | 0.000 | 0.16 | 0.17 | 0.18 | 0.010 |
| 22.390 | 0.000 | 0.16 | 0.16 | 0.17 | 0.009 |
| 22.559 | 0.000 | 0.16 | 0.16 | 0.17 | 0.009 |
| 22.727 | 0.000 | 0.16 | 0.16 | 0.17 | 0.009 |
| 22.895 | 0.000 | 0.15 | 0.16 | 0.16 | 0.009 |
| 23.063 | 0.000 | 0.15 | 0.15 | 0.16 | 0.009 |
| 23.231 | 0.000 | 0.15 | 0.15 | 0.16 | 0.009 |
| 23.399 | 0.000 | 0.15 | 0.15 | 0.16 | 0.008 |
| 23.568 | 0.000 | 0.14 | 0.15 | 0.15 | 0.008 |
| 23.736 | 0.000 | 0.14 | 0.14 | 0.15 | 0.008 |
| 23.904 | 0.000 | 0.14 | 0.14 | 0.15 | 0.008 |
| 24.072 | 0.000 | 0.14 | 0.14 | 0.15 | 0.008 |
| 24.240 | 0.000 | 0.00 | 0.11 | 0.13 | 0.006 |
| 24.408 | 0.000 | 0.00 | 0.08 | 0.10 | 0.005 |
| 24.577 | 0.000 | 0.00 | 0.06 | 0.08 | 0.004 |
| 24.745 | 0.000 | 0.00 | 0.05 | 0.06 | 0.003 |
| 24.913 | 0.000 | 0.00 | 0.04 | 0.05 | 0.002 |
| 25.081 | 0.000 | 0.00 | 0.03 | 0.04 | 0.002 |
| 25.249 | 0.000 | 0.00 | 0.02 | 0.03 | 0.001 |
| 25.417 | 0.000 | 0.00 | 0.02 | 0.02 | 0.001 |

**HYDROLOGIC SOIL GROUP: "A", "B", "C", & "D"**

## LEGEND

- MAJOR DRAINAGE BOUNDARY
- SUB-DRAINAGE BOUNDARY 'C'
- SUB-DRAINAGE BOUNDARY 'D'
- SOIL TYPE BOUNDARY
- DRAINAGE BOUNDARY (PER WILSON MIKAMI REPORT)
- SUB-DRAINAGE BOUNDARY (PER WILSON MIKAMI REPORT)
- FLOWLINE
- A / 1.2 — SUBAREA DESIGNATION / SUBAREA (ACRES)
- 10 — NODE NUMBER
- Q2 — CALCULATED RUNOFF FOR 2 YR FREQ.
- Tc — TIME OF CONCENTRATION
- L — FLOW PATH LENGTH (SURFACE)
- COI — CITY OF IRVINE

NOTE:
(*) VALUES SHOWN WERE TAKEN FROM THE JEFFREY ROAD EXTENSION HYDROLOGY/HYDRAULIC REPORT, PREPARED BY WILSON MIKAMI CORPORATION, AND DATED SEPTEMBER 2019.




100' 0' 50' 100'
SCALE: 1" = 100'

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |
| | | | | | |


FUSCOE ENGINEERING
15535 Sand Canyon Ave, Suite 100
Irvine, California 92618
949.474.1960 fuscoe.com


GATEWAY VILLAGE

PROPOSED HYDROMOD MAP FOR WATERSHED 'C' & 'D'

JOB NO. 308-092
DRAWN BY: JZ
SHEET 1 of 1

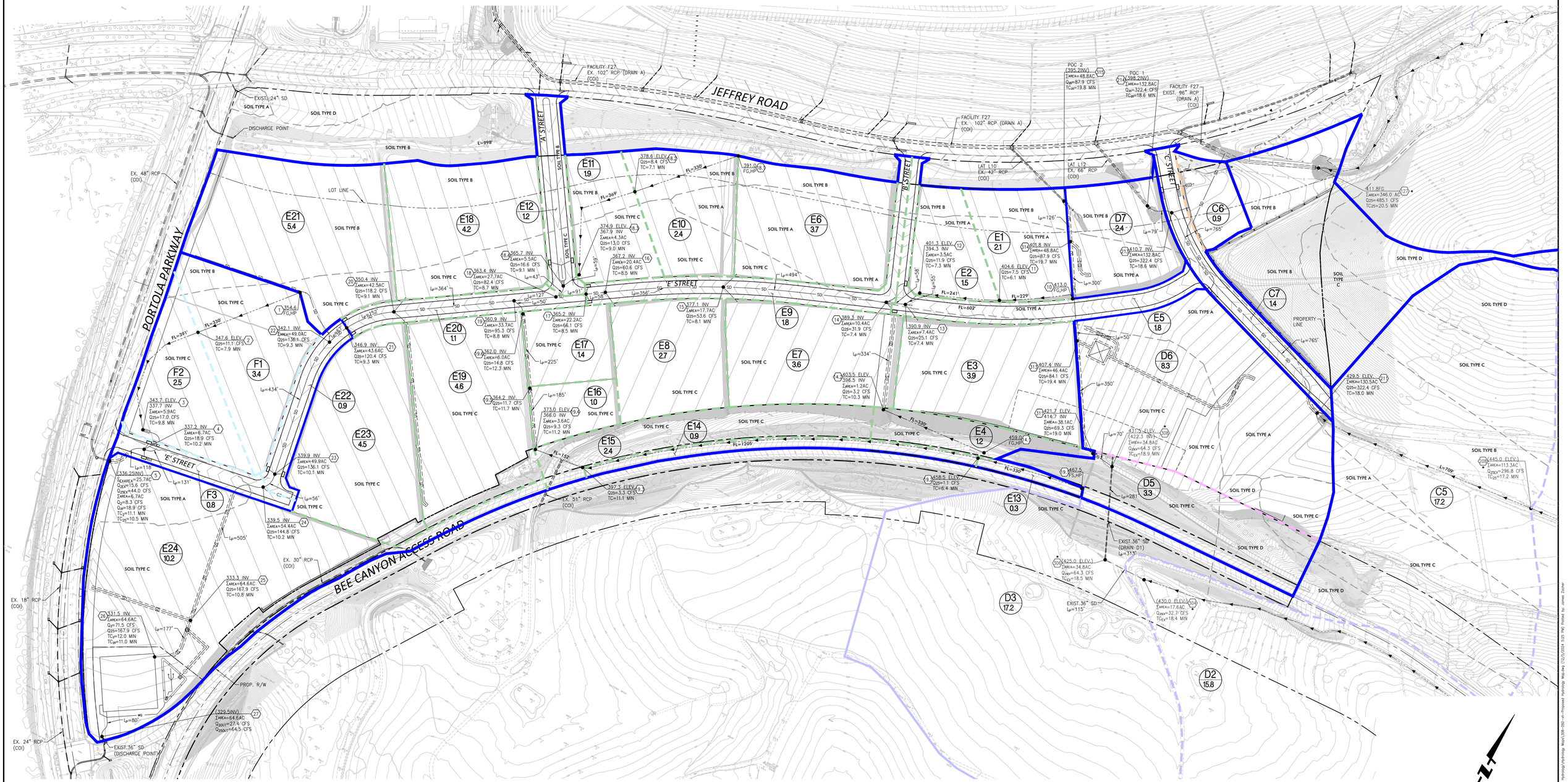

F:\Projects\308\092_Support Files\Reports\Hydrology\Preliminary Hydrology\Hydrology Maps\308-092-xh-Proposed 2 yr Hydromod Map.dwg (12/5/2024 5:22 PM) Plotted by: James Zacher

**HYDROLOGIC SOIL GROUP: "A", "B", "C", & "D"**

## LEGEND

- MAJOR DRAINAGE BOUNDARY
- SUB-DRAINAGE BOUNDARY C
- SUB-DRAINAGE BOUNDARY D
- SUB-DRAINAGE BOUNDARY E
- SUB-DRAINAGE BOUNDARY F
- SOIL TYPE BOUNDARY
- DRAINAGE BOUNDARY (PER WILSON MIKAMI REPORT)
- SUB-DRAINAGE BOUNDARY (PER WILSON MIKAMI REPORT)
- FLOWLINE
- DETENTION BASIN
- A / 12 — SUBAREA DESIGNATION / SUBAREA (ACRES)
- 10 — NODE NUMBER
- Q25 — CALCULATED RUNOFF FOR 25 YR FREQ.
- Tc — TIME OF CONCENTRATION
- L — FLOW PATH LENGTH (SURFACE)
- COI — CITY OF IRVINE

**NOTE:**
(*) VALUES SHOWN WERE TAKEN FROM THE JEFFREY ROAD EXTENSION HYDROLOGY/HYDRAULIC REPORT, PREPARED BY WILSON MIKAMI CORPORATION, AND DATED SEPTEMBER 2019.




| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | INIT. | DATE | DESCRIPTION | APP'D | DATE |


FUSCOE ENGINEERING
15535 Sand Canyon Ave, Suite 100
Irvine, California 92618
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GATEWAY VILLAGE

PROPOSED HYDROLOGY MAP

JOB NO. 308-092
DRAWN BY: JZ
SHEET 1 of 1

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  Gateway Hydrograph/ Detention Routing
  Proposed Condition
  2-year storm event
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         6.90       35.00       32.(AMC II)      0.400        0.578
         2        11.10       35.00       56.(AMC II)      0.300        0.578
         3        33.60       35.00       69.(AMC II)      0.250        0.578
         4         1.70       10.00       32.(AMC II)      0.400        0.801
         5         1.00       10.00       56.(AMC II)      0.300        0.801
         6         5.30       10.00       69.(AMC II)      0.250        0.801
         7         3.60      100.00       80.(AMC II)      0.250        0.055
         8         1.40       85.00       69.(AMC II)      0.250        0.134

    TOTAL AREA (Acres) =     64.60

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.101

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.433
==========================================================================

 Problem Descriptions:
  Gateway Hydrograph/ Detention Routing
  Proposed Condition (calibration coef: 0.8653)
  2-year storm event
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.87
    TOTAL CATCHMENT AREA(ACRES) =   64.60
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.101
    LOW LOSS FRACTION = 0.433
    TIME OF CONCENTRATION(MIN.) = 11.20
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------
```

```
    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     5.97
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     5.07

*******************************************************************************
  TIME      VOLUME        Q    0.        20.0      40.0      60.0      80.0
 (HOURS)     (AF)       (CFS)
-------------------------------------------------------------------------------
  0.13       0.0056      1.01  Q         .         .         .         .
  0.32       0.0213      1.02  Q         .         .         .         .
  0.51       0.0371      1.03  Q         .         .         .         .
  0.69       0.0530      1.03  Q         .         .         .         .
  0.88       0.0690      1.04  Q         .         .         .         .
  1.07       0.0852      1.05  Q         .         .         .         .
  1.25       0.1015      1.06  Q         .         .         .         .
  1.44       0.1179      1.07  Q         .         .         .         .
  1.63       0.1344      1.08  Q         .         .         .         .
  1.81       0.1511      1.08  Q         .         .         .         .
  2.00       0.1679      1.10  Q         .         .         .         .
  2.19       0.1849      1.10  Q         .         .         .         .
  2.37       0.2019      1.11  Q         .         .         .         .
  2.56       0.2192      1.12  Q         .         .         .         .
  2.75       0.2366      1.13  Q         .         .         .         .
  2.93       0.2541      1.14  Q         .         .         .         .
  3.12       0.2718      1.15  Q         .         .         .         .
  3.31       0.2897      1.16  Q         .         .         .         .
  3.49       0.3077      1.18  Q         .         .         .         .
  3.68       0.3259      1.18  Q         .         .         .         .
  3.87       0.3442      1.20  Q         .         .         .         .
  4.05       0.3628      1.20  Q         .         .         .         .
  4.24       0.3815      1.22  Q         .         .         .         .
  4.43       0.4004      1.23  Q         .         .         .         .
  4.61       0.4194      1.25  Q         .         .         .         .
  4.80       0.4387      1.25  Q         .         .         .         .
  4.99       0.4582      1.27  Q         .         .         .         .
  5.17       0.4779      1.28  Q         .         .         .         .
  5.36       0.4978      1.30  Q         .         .         .         .
  5.55       0.5179      1.31  Q         .         .         .         .
  5.73       0.5382      1.33  Q         .         .         .         .
  5.92       0.5588      1.34  Q         .         .         .         .
  6.11       0.5796      1.36  Q         .         .         .         .
  6.29       0.6006      1.37  Q         .         .         .         .
  6.48       0.6219      1.39  Q         .         .         .         .
  6.67       0.6435      1.40  Q         .         .         .         .
  6.85       0.6653      1.43  Q         .         .         .         .
  7.04       0.6874      1.44  Q         .         .         .         .
  7.23       0.7097      1.46  Q         .         .         .         .
  7.41       0.7324      1.48  Q         .         .         .         .
  7.60       0.7554      1.50  Q         .         .         .         .
  7.79       0.7787      1.52  Q         .         .         .         .
  7.97       0.8023      1.55  Q         .         .         .         .
  8.16       0.8263      1.56  Q         .         .         .         .
  8.35       0.8506      1.59  Q         .         .         .         .
  8.53       0.8752      1.61  Q         .         .         .         .
  8.72       0.9003      1.64  Q         .         .         .         .
  8.91       0.9258      1.66  Q         .         .         .         .
  9.09       0.9516      1.70  Q         .         .         .         .
  9.28       0.9779      1.71  Q         .         .         .         .
  9.47       1.0047      1.75  Q         .         .         .         .
  9.65       1.0319      1.77  Q         .         .         .         .
  9.84       1.0596      1.82  Q         .         .         .         .
 10.03       1.0879      1.84  Q         .         .         .         .
 10.21       1.1166      1.89  Q         .         .         .         .
 10.40       1.1460      1.92  Q         .         .         .         .
 10.59       1.1759      1.97  Q         .         .         .         .
 10.77       1.2065      2.00  Q         .         .         .         .
 10.96       1.2378      2.06  .Q        .         .         .         .
 11.15       1.2698      2.09  .Q        .         .         .         .
 11.33       1.3025      2.16  .Q        .         .         .         .
```

| | | | |
|---|---|---|---|
| 11.52 | 1.3360 | 2.19 | .Q |
| 11.71 | 1.3704 | 2.27 | .Q |
| 11.89 | 1.4057 | 2.31 | .Q |
| 12.08 | 1.4426 | 2.47 | .Q |
| 12.27 | 1.4845 | 2.96 | .Q |
| 12.45 | 1.5310 | 3.07 | .Q |
| 12.64 | 1.5789 | 3.13 | .Q |
| 12.83 | 1.6282 | 3.26 | .Q |
| 13.01 | 1.6790 | 3.33 | .Q |
| 13.20 | 1.7315 | 3.48 | .Q |
| 13.39 | 1.7858 | 3.56 | .Q |
| 13.57 | 1.8421 | 3.75 | .Q |
| 13.76 | 1.9007 | 3.85 | .Q |
| 13.95 | 1.9620 | 4.08 | . Q |
| 14.13 | 2.0261 | 4.23 | . Q |
| 14.32 | 2.0948 | 4.68 | . Q |
| 14.51 | 2.1685 | 4.87 | . Q |
| 14.69 | 2.2469 | 5.30 | . Q |
| 14.88 | 2.3306 | 5.56 | . Q |
| 15.07 | 2.4214 | 6.21 | . Q |
| 15.25 | 2.5205 | 6.64 | . Q |
| 15.44 | 2.6292 | 7.46 | . Q |
| 15.63 | 2.7463 | 7.72 | . Q |
| 15.81 | 2.9114 | 13.69 | . Q |
| 16.00 | 3.1782 | 20.90 | . Q |
| 16.19 | 3.9094 | 73.90 | . Q |
| 16.37 | 4.5558 | 9.89 | . Q |
| 16.56 | 4.6873 | 7.16 | . Q |
| 16.75 | 4.7877 | 5.86 | . Q |
| 16.93 | 4.8720 | 5.07 | . Q |
| 17.12 | 4.9460 | 4.52 | . Q |
| 17.31 | 5.0114 | 3.96 | .Q |
| 17.49 | 5.0702 | 3.65 | .Q |
| 17.68 | 5.1246 | 3.40 | .Q |
| 17.87 | 5.1754 | 3.19 | .Q |
| 18.05 | 5.2233 | 3.02 | .Q |
| 18.24 | 5.2647 | 2.35 | .Q |
| 18.43 | 5.3001 | 2.23 | .Q |
| 18.61 | 5.3336 | 2.12 | .Q |
| 18.80 | 5.3656 | 2.03 | .Q |
| 18.99 | 5.3962 | 1.94 | Q |
| 19.17 | 5.4255 | 1.87 | Q |
| 19.36 | 5.4538 | 1.80 | Q |
| 19.55 | 5.4810 | 1.73 | Q |
| 19.73 | 5.5073 | 1.68 | Q |
| 19.92 | 5.5328 | 1.62 | Q |
| 20.11 | 5.5575 | 1.58 | Q |
| 20.29 | 5.5814 | 1.53 | Q |
| 20.48 | 5.6047 | 1.49 | Q |
| 20.67 | 5.6274 | 1.45 | Q |
| 20.85 | 5.6495 | 1.41 | Q |
| 21.04 | 5.6711 | 1.38 | Q |
| 21.23 | 5.6921 | 1.35 | Q |
| 21.41 | 5.7127 | 1.32 | Q |
| 21.60 | 5.7328 | 1.29 | Q |
| 21.79 | 5.7525 | 1.26 | Q |
| 21.97 | 5.7717 | 1.24 | Q |
| 22.16 | 5.7906 | 1.21 | Q |
| 22.35 | 5.8092 | 1.19 | Q |
| 22.53 | 5.8274 | 1.17 | Q |
| 22.72 | 5.8452 | 1.15 | Q |
| 22.91 | 5.8628 | 1.13 | Q |
| 23.09 | 5.8800 | 1.11 | Q |
| 23.28 | 5.8969 | 1.09 | Q |
| 23.47 | 5.9136 | 1.07 | Q |
| 23.65 | 5.9300 | 1.06 | Q |
| 23.84 | 5.9462 | 1.04 | Q |
| 24.03 | 5.9621 | 1.02 | Q |
| 24.21 | 5.9700 | 0.00 | Q |

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

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    ======================                 =========
               0%                           1444.8
              10%                             67.2
              20%                             22.4
              30%                             11.2
              40%                             11.2
              50%                             11.2
              60%                             11.2
              70%                             11.2
              80%                             11.2
              90%                             11.2

 Problem Descriptions:
  Gateway Hydrograph/ Detention Routing
  Proposed Condition (calibration coef: 0.8653)
  2-year storm event
--------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.87
    TOTAL CATCHMENT AREA(ACRES) =   64.60
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.101
    LOW LOSS FRACTION = 0.433
    TIME OF CONCENTRATION(MIN.) = 11.20
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     5.97
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     5.07

********************************************************************************
  TIME     VOLUME       Q    0.       20.0      40.0      60.0      80.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------------
  0.13      0.0056      1.01  Q         .         .         .         .
  0.32      0.0213      1.02  Q         .         .         .         .
  0.51      0.0371      1.03  Q         .         .         .         .
  0.69      0.0530      1.03  Q         .         .         .         .
  0.88      0.0690      1.04  Q         .         .         .         .
  1.07      0.0852      1.05  Q         .         .         .         .
  1.25      0.1015      1.06  Q         .         .         .         .
  1.44      0.1179      1.07  Q         .         .         .         .
  1.63      0.1344      1.08  Q         .         .         .         .
  1.81      0.1511      1.08  Q         .         .         .         .
  2.00      0.1679      1.10  Q         .         .         .         .
  2.19      0.1849      1.10  Q         .         .         .         .
  2.37      0.2019      1.11  Q         .         .         .         .
  2.56      0.2192      1.12  Q         .         .         .         .
  2.75      0.2366      1.13  Q         .         .         .         .
  2.93      0.2541      1.14  Q         .         .         .         .
  3.12      0.2718      1.15  Q         .         .         .         .
  3.31      0.2897      1.16  Q         .         .         .         .
```

| | | | |
|---|---|---|---|
| 3.49 | 0.3077 | 1.18 | Q |
| 3.68 | 0.3259 | 1.18 | Q |
| 3.87 | 0.3442 | 1.20 | Q |
| 4.05 | 0.3628 | 1.20 | Q |
| 4.24 | 0.3815 | 1.22 | Q |
| 4.43 | 0.4004 | 1.23 | Q |
| 4.61 | 0.4194 | 1.25 | Q |
| 4.80 | 0.4387 | 1.25 | Q |
| 4.99 | 0.4582 | 1.27 | Q |
| 5.17 | 0.4779 | 1.28 | Q |
| 5.36 | 0.4978 | 1.30 | Q |
| 5.55 | 0.5179 | 1.31 | Q |
| 5.73 | 0.5382 | 1.33 | Q |
| 5.92 | 0.5588 | 1.34 | Q |
| 6.11 | 0.5796 | 1.36 | Q |
| 6.29 | 0.6006 | 1.37 | Q |
| 6.48 | 0.6219 | 1.39 | Q |
| 6.67 | 0.6435 | 1.40 | Q |
| 6.85 | 0.6653 | 1.43 | Q |
| 7.04 | 0.6874 | 1.44 | Q |
| 7.23 | 0.7097 | 1.46 | Q |
| 7.41 | 0.7324 | 1.48 | Q |
| 7.60 | 0.7554 | 1.50 | Q |
| 7.79 | 0.7787 | 1.52 | Q |
| 7.97 | 0.8023 | 1.55 | Q |
| 8.16 | 0.8263 | 1.56 | Q |
| 8.35 | 0.8506 | 1.59 | Q |
| 8.53 | 0.8752 | 1.61 | Q |
| 8.72 | 0.9003 | 1.64 | Q |
| 8.91 | 0.9258 | 1.66 | Q |
| 9.09 | 0.9516 | 1.70 | Q |
| 9.28 | 0.9779 | 1.71 | Q |
| 9.47 | 1.0047 | 1.75 | Q |
| 9.65 | 1.0319 | 1.77 | Q |
| 9.84 | 1.0596 | 1.82 | Q |
| 10.03 | 1.0879 | 1.84 | Q |
| 10.21 | 1.1166 | 1.89 | Q |
| 10.40 | 1.1460 | 1.92 | Q |
| 10.59 | 1.1759 | 1.97 | Q |
| 10.77 | 1.2065 | 2.00 | Q |
| 10.96 | 1.2378 | 2.06 | .Q |
| 11.15 | 1.2698 | 2.09 | .Q |
| 11.33 | 1.3025 | 2.16 | .Q |
| 11.52 | 1.3360 | 2.19 | .Q |
| 11.71 | 1.3704 | 2.27 | .Q |
| 11.89 | 1.4057 | 2.31 | .Q |
| 12.08 | 1.4426 | 2.47 | .Q |
| 12.27 | 1.4845 | 2.96 | .Q |
| 12.45 | 1.5310 | 3.07 | .Q |
| 12.64 | 1.5789 | 3.13 | .Q |
| 12.83 | 1.6282 | 3.26 | .Q |
| 13.01 | 1.6790 | 3.33 | .Q |
| 13.20 | 1.7315 | 3.48 | .Q |
| 13.39 | 1.7858 | 3.56 | .Q |
| 13.57 | 1.8421 | 3.75 | .Q |
| 13.76 | 1.9007 | 3.85 | .Q |
| 13.95 | 1.9620 | 4.08 | . Q |
| 14.13 | 2.0261 | 4.23 | . Q |
| 14.32 | 2.0948 | 4.68 | . Q |
| 14.51 | 2.1685 | 4.87 | . Q |
| 14.69 | 2.2469 | 5.30 | . Q |
| 14.88 | 2.3306 | 5.56 | . Q |
| 15.07 | 2.4214 | 6.21 | . Q |
| 15.25 | 2.5205 | 6.64 | . Q |
| 15.44 | 2.6292 | 7.46 | . Q |
| 15.63 | 2.7463 | 7.72 | . Q |
| 15.81 | 2.9114 | 13.69 | . Q |
| 16.00 | 3.1782 | 20.90 | . Q |
| 16.19 | 3.9094 | 73.90 | . Q |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 16.37 | 4.5558 | 9.89 | . Q | . | . | . | . |
| 16.56 | 4.6873 | 7.16 | . Q | . | . | . | . |
| 16.75 | 4.7877 | 5.86 | . Q | . | . | . | . |
| 16.93 | 4.8720 | 5.07 | . Q | . | . | . | . |
| 17.12 | 4.9460 | 4.52 | . Q | . | . | . | . |
| 17.31 | 5.0114 | 3.96 | .Q | . | . | . | . |
| 17.49 | 5.0702 | 3.65 | .Q | . | . | . | . |
| 17.68 | 5.1246 | 3.40 | .Q | . | . | . | . |
| 17.87 | 5.1754 | 3.19 | .Q | . | . | . | . |
| 18.05 | 5.2233 | 3.02 | .Q | . | . | . | . |
| 18.24 | 5.2647 | 2.35 | .Q | . | . | . | . |
| 18.43 | 5.3001 | 2.23 | .Q | . | . | . | . |
| 18.61 | 5.3336 | 2.12 | .Q | . | . | . | . |
| 18.80 | 5.3656 | 2.03 | .Q | . | . | . | . |
| 18.99 | 5.3962 | 1.94 | Q | . | . | . | . |
| 19.17 | 5.4255 | 1.87 | Q | . | . | . | . |
| 19.36 | 5.4538 | 1.80 | Q | . | . | . | . |
| 19.55 | 5.4810 | 1.73 | Q | . | . | . | . |
| 19.73 | 5.5073 | 1.68 | Q | . | . | . | . |
| 19.92 | 5.5328 | 1.62 | Q | . | . | . | . |
| 20.11 | 5.5575 | 1.58 | Q | . | . | . | . |
| 20.29 | 5.5814 | 1.53 | Q | . | . | . | . |
| 20.48 | 5.6047 | 1.49 | Q | . | . | . | . |
| 20.67 | 5.6274 | 1.45 | Q | . | . | . | . |
| 20.85 | 5.6495 | 1.41 | Q | . | . | . | . |
| 21.04 | 5.6711 | 1.38 | Q | . | . | . | . |
| 21.23 | 5.6921 | 1.35 | Q | . | . | . | . |
| 21.41 | 5.7127 | 1.32 | Q | . | . | . | . |
| 21.60 | 5.7328 | 1.29 | Q | . | . | . | . |
| 21.79 | 5.7525 | 1.26 | Q | . | . | . | . |
| 21.97 | 5.7717 | 1.24 | Q | . | . | . | . |
| 22.16 | 5.7906 | 1.21 | Q | . | . | . | . |
| 22.35 | 5.8092 | 1.19 | Q | . | . | . | . |
| 22.53 | 5.8274 | 1.17 | Q | . | . | . | . |
| 22.72 | 5.8452 | 1.15 | Q | . | . | . | . |
| 22.91 | 5.8628 | 1.13 | Q | . | . | . | . |
| 23.09 | 5.8800 | 1.11 | Q | . | . | . | . |
| 23.28 | 5.8969 | 1.09 | Q | . | . | . | . |
| 23.47 | 5.9136 | 1.07 | Q | . | . | . | . |
| 23.65 | 5.9300 | 1.06 | Q | . | . | . | . |
| 23.84 | 5.9462 | 1.04 | Q | . | . | . | . |
| 24.03 | 5.9621 | 1.02 | Q | . | . | . | . |
| 24.21 | 5.9700 | 0.00 | Q | . | . | . | . |

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

| Percentile of Estimated Peak Flow Rate | Duration (minutes) |
|---|---|
| 0% | 1444.8 |
| 10% | 67.2 |
| 20% | 22.4 |
| 30% | 11.2 |
| 40% | 11.2 |
| 50% | 11.2 |
| 60% | 11.2 |
| 70% | 11.2 |
| 80% | 11.2 |
| 90% | 11.2 |

**Problem Descriptions:**
**Gateway Hydrograph/ Detention Routing**
**Proposed Condition (calibration coef: 0.8653)**
**2-year storm event**

```
    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.87
    TOTAL CATCHMENT AREA(ACRES) =   64.60
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.101
    LOW LOSS FRACTION = 0.433
    TIME OF CONCENTRATION(MIN.) = 11.20
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     5.97
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     5.07

********************************************************************************
  TIME     VOLUME       Q    0.       20.0      40.0      60.0      80.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------------
  0.13      0.0056      1.01  Q         .         .         .         .
  0.32      0.0213      1.02  Q         .         .         .         .
  0.51      0.0371      1.03  Q         .         .         .         .
  0.69      0.0530      1.03  Q         .         .         .         .
  0.88      0.0690      1.04  Q         .         .         .         .
  1.07      0.0852      1.05  Q         .         .         .         .
  1.25      0.1015      1.06  Q         .         .         .         .
  1.44      0.1179      1.07  Q         .         .         .         .
  1.63      0.1344      1.08  Q         .         .         .         .
  1.81      0.1511      1.08  Q         .         .         .         .
  2.00      0.1679      1.10  Q         .         .         .         .
  2.19      0.1849      1.10  Q         .         .         .         .
  2.37      0.2019      1.11  Q         .         .         .         .
  2.56      0.2192      1.12  Q         .         .         .         .
  2.75      0.2366      1.13  Q         .         .         .         .
  2.93      0.2541      1.14  Q         .         .         .         .
  3.12      0.2718      1.15  Q         .         .         .         .
  3.31      0.2897      1.16  Q         .         .         .         .
  3.49      0.3077      1.18  Q         .         .         .         .
  3.68      0.3259      1.18  Q         .         .         .         .
  3.87      0.3442      1.20  Q         .         .         .         .
  4.05      0.3628      1.20  Q         .         .         .         .
  4.24      0.3815      1.22  Q         .         .         .         .
  4.43      0.4004      1.23  Q         .         .         .         .
  4.61      0.4194      1.25  Q         .         .         .         .
  4.80      0.4387      1.25  Q         .         .         .         .
  4.99      0.4582      1.27  Q         .         .         .         .
  5.17      0.4779      1.28  Q         .         .         .         .
  5.36      0.4978      1.30  Q         .         .         .         .
  5.55      0.5179      1.31  Q         .         .         .         .
  5.73      0.5382      1.33  Q         .         .         .         .
  5.92      0.5588      1.34  Q         .         .         .         .
  6.11      0.5796      1.36  Q         .         .         .         .
  6.29      0.6006      1.37  Q         .         .         .         .
  6.48      0.6219      1.39  Q         .         .         .         .
  6.67      0.6435      1.40  Q         .         .         .         .
  6.85      0.6653      1.43  Q         .         .         .         .
  7.04      0.6874      1.44  Q         .         .         .         .
  7.23      0.7097      1.46  Q         .         .         .         .
  7.41      0.7324      1.48  Q         .         .         .         .
  7.60      0.7554      1.50  Q         .         .         .         .
  7.79      0.7787      1.52  Q         .         .         .         .
  7.97      0.8023      1.55  Q         .         .         .         .
  8.16      0.8263      1.56  Q         .         .         .         .
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8.35 | 0.8506 | 1.59 | Q | . | . | . | . |
| 8.53 | 0.8752 | 1.61 | Q | . | . | . | . |
| 8.72 | 0.9003 | 1.64 | Q | . | . | . | . |
| 8.91 | 0.9258 | 1.66 | Q | . | . | . | . |
| 9.09 | 0.9516 | 1.70 | Q | . | . | . | . |
| 9.28 | 0.9779 | 1.71 | Q | . | . | . | . |
| 9.47 | 1.0047 | 1.75 | Q | . | . | . | . |
| 9.65 | 1.0319 | 1.77 | Q | . | . | . | . |
| 9.84 | 1.0596 | 1.82 | Q | . | . | . | . |
| 10.03 | 1.0879 | 1.84 | Q | . | . | . | . |
| 10.21 | 1.1166 | 1.89 | Q | . | . | . | . |
| 10.40 | 1.1460 | 1.92 | Q | . | . | . | . |
| 10.59 | 1.1759 | 1.97 | Q | . | . | . | . |
| 10.77 | 1.2065 | 2.00 | Q | . | . | . | . |
| 10.96 | 1.2378 | 2.06 | .Q | . | . | . | . |
| 11.15 | 1.2698 | 2.09 | .Q | . | . | . | . |
| 11.33 | 1.3025 | 2.16 | .Q | . | . | . | . |
| 11.52 | 1.3360 | 2.19 | .Q | . | . | . | . |
| 11.71 | 1.3704 | 2.27 | .Q | . | . | . | . |
| 11.89 | 1.4057 | 2.31 | .Q | . | . | . | . |
| 12.08 | 1.4426 | 2.47 | .Q | . | . | . | . |
| 12.27 | 1.4845 | 2.96 | .Q | . | . | . | . |
| 12.45 | 1.5310 | 3.07 | .Q | . | . | . | . |
| 12.64 | 1.5789 | 3.13 | .Q | . | . | . | . |
| 12.83 | 1.6282 | 3.26 | .Q | . | . | . | . |
| 13.01 | 1.6790 | 3.33 | .Q | . | . | . | . |
| 13.20 | 1.7315 | 3.48 | .Q | . | . | . | . |
| 13.39 | 1.7858 | 3.56 | .Q | . | . | . | . |
| 13.57 | 1.8421 | 3.75 | .Q | . | . | . | . |
| 13.76 | 1.9007 | 3.85 | .Q | . | . | . | . |
| 13.95 | 1.9620 | 4.08 | . Q | . | . | . | . |
| 14.13 | 2.0261 | 4.23 | . Q | . | . | . | . |
| 14.32 | 2.0948 | 4.68 | . Q | . | . | . | . |
| 14.51 | 2.1685 | 4.87 | . Q | . | . | . | . |
| 14.69 | 2.2469 | 5.30 | . Q | . | . | . | . |
| 14.88 | 2.3306 | 5.56 | . Q | . | . | . | . |
| 15.07 | 2.4214 | 6.21 | . Q | . | . | . | . |
| 15.25 | 2.5205 | 6.64 | . Q | . | . | . | . |
| 15.44 | 2.6292 | 7.46 | . Q | . | . | . | . |
| 15.63 | 2.7463 | 7.72 | . Q | . | . | . | . |
| 15.81 | 2.9114 | 13.69 | . Q | . | . | . | . |
| 16.00 | 3.1782 | 20.90 | . Q | . | . | . | . |
| 16.19 | 3.9094 | 73.90 | . | . | . | . Q | . |
| 16.37 | 4.5558 | 9.89 | . Q | . | . | . | . |
| 16.56 | 4.6873 | 7.16 | . Q | . | . | . | . |
| 16.75 | 4.7877 | 5.86 | . Q | . | . | . | . |
| 16.93 | 4.8720 | 5.07 | . Q | . | . | . | . |
| 17.12 | 4.9460 | 4.52 | . Q | . | . | . | . |
| 17.31 | 5.0114 | 3.96 | .Q | . | . | . | . |
| 17.49 | 5.0702 | 3.65 | .Q | . | . | . | . |
| 17.68 | 5.1246 | 3.40 | .Q | . | . | . | . |
| 17.87 | 5.1754 | 3.19 | .Q | . | . | . | . |
| 18.05 | 5.2233 | 3.02 | .Q | . | . | . | . |
| 18.24 | 5.2647 | 2.35 | .Q | . | . | . | . |
| 18.43 | 5.3001 | 2.23 | .Q | . | . | . | . |
| 18.61 | 5.3336 | 2.12 | .Q | . | . | . | . |
| 18.80 | 5.3656 | 2.03 | .Q | . | . | . | . |
| 18.99 | 5.3962 | 1.94 | Q | . | . | . | . |
| 19.17 | 5.4255 | 1.87 | Q | . | . | . | . |
| 19.36 | 5.4538 | 1.80 | Q | . | . | . | . |
| 19.55 | 5.4810 | 1.73 | Q | . | . | . | . |
| 19.73 | 5.5073 | 1.68 | Q | . | . | . | . |
| 19.92 | 5.5328 | 1.62 | Q | . | . | . | . |
| 20.11 | 5.5575 | 1.58 | Q | . | . | . | . |
| 20.29 | 5.5814 | 1.53 | Q | . | . | . | . |
| 20.48 | 5.6047 | 1.49 | Q | . | . | . | . |
| 20.67 | 5.6274 | 1.45 | Q | . | . | . | . |
| 20.85 | 5.6495 | 1.41 | Q | . | . | . | . |
| 21.04 | 5.6711 | 1.38 | Q | . | . | . | . |

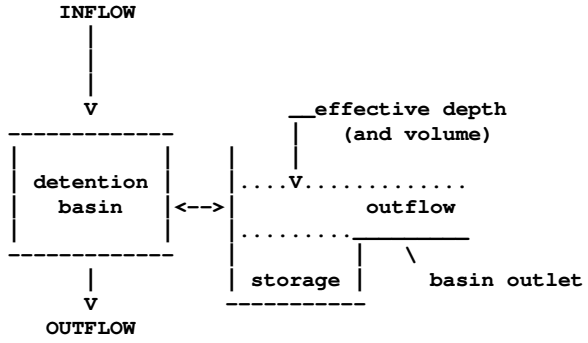
```
 21.23      5.6921      1.35  Q         .         .         .         .
 21.41      5.7127      1.32  Q         .         .         .         .
 21.60      5.7328      1.29  Q         .         .         .         .
 21.79      5.7525      1.26  Q         .         .         .         .
 21.97      5.7717      1.24  Q         .         .         .         .
 22.16      5.7906      1.21  Q         .         .         .         .
 22.35      5.8092      1.19  Q         .         .         .         .
 22.53      5.8274      1.17  Q         .         .         .         .
 22.72      5.8452      1.15  Q         .         .         .         .
 22.91      5.8628      1.13  Q         .         .         .         .
 23.09      5.8800      1.11  Q         .         .         .         .
 23.28      5.8969      1.09  Q         .         .         .         .
 23.47      5.9136      1.07  Q         .         .         .         .
 23.65      5.9300      1.06  Q         .         .         .         .
 23.84      5.9462      1.04  Q         .         .         .         .
 24.03      5.9621      1.02  Q         .         .         .         .
 24.21      5.9700      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    ======================                 =========
              0%                            1444.8
             10%                              67.2
             20%                              22.4
             30%                              11.2
             40%                              11.2
             50%                              11.2
             60%                              11.2
             70%                              11.2
             80%                              11.2
             90%                              11.2

  Problem Descriptions:
   Gateway Hydrograph/ Detention Routing
   Proposed Condition (calibration coef: 0.8653)
   2-year storm event


================================================================================
     FLOW-THROUGH DETENTION BASIN MODEL

     SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
     CONSTANT HYDROGRAPH TIME UNIT(MINUTES) =   11.200
     DEAD STORAGE(AF) =       0.00
     SPECIFIED DEAD STORAGE(AF) FILLED =       0.00
     ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN =    0.40
```



150' x 150' footprint
(7' depth)

DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 13

| *BASIN-DEPTH (FEET) | STORAGE (ACRE-FEET) | OUTFLOW (CFS) | ** | BASIN-DEPTH (FEET) | STORAGE (ACRE-FEET) | OUTFLOW (CFS) | * |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.000 | 0.000 | ** | 0.250 | 0.130 | 1.000 | * |
| 0.500 | 0.260 | 2.000 | ** | 0.750 | 0.390 | 3.000 | * |
| 1.000 | 0.520 | 4.000 | ** | 1.250 | 0.650 | 5.000 | * |
| 1.500 | 0.770 | 10.400 | ** | 1.750 | 0.900 | 14.600 | * |
| 2.000 | 1.030 | 17.900 | ** | 2.250 | 1.160 | 20.700 | * |
| 2.500 | 1.290 | 23.100 | ** | 3.000 | 1.550 | 27.400 | * |
| 3.500 | 1.810 | 31.000 | ** | | | | |

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

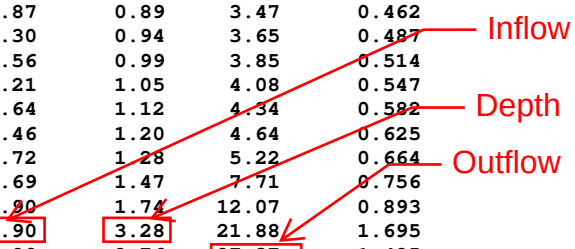
| INTERVAL NUMBER | DEPTH (FEET) | {S-O*DT/2} (ACRE-FEET) | {S+O*DT/2} (ACRE-FEET) |
|---|---|---|---|
| 1 | 0.00 | 0.00000 | 0.00000 |
| 2 | 0.25 | 0.12229 | 0.13771 |
| 3 | 0.50 | 0.24457 | 0.27543 |
| 4 | 0.75 | 0.36686 | 0.41314 |
| 5 | 1.00 | 0.48915 | 0.55085 |
| 6 | 1.25 | 0.61143 | 0.68857 |
| 7 | 1.50 | 0.68978 | 0.85022 |
| 8 | 1.75 | 0.78738 | 1.01262 |
| 9 | 2.00 | 0.89193 | 1.16807 |
| 10 | 2.25 | 1.00033 | 1.31967 |
| 11 | 2.50 | 1.11182 | 1.46818 |
| 12 | 3.00 | 1.33865 | 1.76135 |
| 13 | 3.50 | 1.57088 | 2.04912 |

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:
NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

| TIME (HRS) | DEAD-STORAGE FILLED(AF) | INFLOW (CFS) | EFFECTIVE DEPTH(FT) | OUTFLOW (CFS) | EFFECTIVE VOLUME(AF) |
|---|---|---|---|---|---|
| 0.133 | 0.000 | 1.01 | 0.38 | 1.57 | 0.199 |
| 0.320 | 0.000 | 1.02 | 0.37 | 1.51 | 0.192 |
| 0.507 | 0.000 | 1.03 | 0.36 | 1.45 | 0.185 |
| 0.693 | 0.000 | 1.03 | 0.35 | 1.40 | 0.180 |
| 0.880 | 0.000 | 1.04 | 0.34 | 1.36 | 0.175 |
| 1.067 | 0.000 | 1.05 | 0.33 | 1.33 | 0.171 |
| 1.253 | 0.000 | 1.06 | 0.32 | 1.30 | 0.167 |
| 1.440 | 0.000 | 1.07 | 0.31 | 1.27 | 0.164 |
| 1.627 | 0.000 | 1.08 | 0.31 | 1.25 | 0.161 |
| 1.813 | 0.000 | 1.08 | 0.31 | 1.23 | 0.159 |
| 2.000 | 0.000 | 1.10 | 0.30 | 1.21 | 0.157 |
| 2.187 | 0.000 | 1.10 | 0.30 | 1.20 | 0.155 |
| 2.373 | 0.000 | 1.11 | 0.30 | 1.19 | 0.154 |
| 2.560 | 0.000 | 1.12 | 0.29 | 1.18 | 0.153 |
| 2.747 | 0.000 | 1.13 | 0.29 | 1.18 | 0.153 |
| 2.933 | 0.000 | 1.14 | 0.29 | 1.17 | 0.152 |
| 3.120 | 0.000 | 1.15 | 0.29 | 1.17 | 0.152 |
| 3.307 | 0.000 | 1.16 | 0.29 | 1.17 | 0.152 |
| 3.493 | 0.000 | 1.18 | 0.29 | 1.17 | 0.152 |
| 3.680 | 0.000 | 1.18 | 0.29 | 1.17 | 0.152 |
| 3.867 | 0.000 | 1.20 | 0.29 | 1.17 | 0.152 |
| 4.053 | 0.000 | 1.20 | 0.29 | 1.17 | 0.153 |
| 4.240 | 0.000 | 1.22 | 0.30 | 1.18 | 0.154 |
| 4.427 | 0.000 | 1.23 | 0.30 | 1.18 | 0.154 |
| 4.613 | 0.000 | 1.25 | 0.30 | 1.19 | 0.155 |
| 4.800 | 0.000 | 1.25 | 0.30 | 1.20 | 0.156 |
| 4.987 | 0.000 | 1.27 | 0.30 | 1.20 | 0.157 |
| 5.173 | 0.000 | 1.28 | 0.30 | 1.21 | 0.158 |
| 5.360 | 0.000 | 1.30 | 0.31 | 1.22 | 0.159 |
| 5.547 | 0.000 | 1.31 | 0.31 | 1.23 | 0.161 |

| | | | | | |
|---|---|---|---|---|---|
| 5.733 | 0.000 | 1.33 | 0.31 | 1.24 | 0.162 |
| 5.920 | 0.000 | 1.34 | 0.31 | 1.25 | 0.163 |
| 6.107 | 0.000 | 1.36 | 0.32 | 1.26 | 0.165 |
| 6.293 | 0.000 | 1.37 | 0.32 | 1.27 | 0.166 |
| 6.480 | 0.000 | 1.39 | 0.32 | 1.28 | 0.168 |
| 6.667 | 0.000 | 1.40 | 0.33 | 1.30 | 0.169 |
| 6.853 | 0.000 | 1.43 | 0.33 | 1.31 | 0.171 |
| 7.040 | 0.000 | 1.44 | 0.33 | 1.32 | 0.173 |
| 7.227 | 0.000 | 1.46 | 0.34 | 1.34 | 0.175 |
| 7.413 | 0.000 | 1.48 | 0.34 | 1.35 | 0.177 |
| 7.600 | 0.000 | 1.50 | 0.34 | 1.37 | 0.179 |
| 7.787 | 0.000 | 1.52 | 0.35 | 1.38 | 0.181 |
| 7.973 | 0.000 | 1.55 | 0.35 | 1.40 | 0.183 |
| 8.160 | 0.000 | 1.56 | 0.36 | 1.42 | 0.185 |
| 8.347 | 0.000 | 1.59 | 0.36 | 1.44 | 0.188 |
| 8.533 | 0.000 | 1.61 | 0.37 | 1.45 | 0.190 |
| 8.720 | 0.000 | 1.64 | 0.37 | 1.47 | 0.193 |
| 8.907 | 0.000 | 1.66 | 0.38 | 1.49 | 0.195 |
| 9.093 | 0.000 | 1.70 | 0.38 | 1.51 | 0.198 |
| 9.280 | 0.000 | 1.71 | 0.39 | 1.53 | 0.201 |
| 9.467 | 0.000 | 1.75 | 0.39 | 1.56 | 0.204 |
| 9.653 | 0.000 | 1.77 | 0.40 | 1.58 | 0.207 |
| 9.840 | 0.000 | 1.82 | 0.40 | 1.60 | 0.210 |
| 10.027 | 0.000 | 1.84 | 0.41 | 1.63 | 0.214 |
| 10.213 | 0.000 | 1.89 | 0.42 | 1.66 | 0.217 |
| 10.400 | 0.000 | 1.92 | 0.42 | 1.68 | 0.221 |
| 10.587 | 0.000 | 1.97 | 0.43 | 1.71 | 0.225 |
| 10.773 | 0.000 | 2.00 | 0.44 | 1.74 | 0.229 |
| 10.960 | 0.000 | 2.06 | 0.45 | 1.77 | 0.233 |
| 11.147 | 0.000 | 2.09 | 0.46 | 1.81 | 0.237 |
| 11.333 | 0.000 | 2.16 | 0.47 | 1.84 | 0.242 |
| 11.520 | 0.000 | 2.19 | 0.47 | 1.88 | 0.247 |
| 11.707 | 0.000 | 2.27 | 0.48 | 1.92 | 0.252 |
| 11.893 | 0.000 | 2.31 | 0.50 | 1.96 | 0.258 |
| 12.080 | 0.000 | 2.47 | 0.51 | 2.01 | 0.265 |
| 12.267 | 0.000 | 2.96 | 0.53 | 2.09 | 0.278 |
| 12.453 | 0.000 | 3.07 | 0.56 | 2.19 | 0.292 |
| 12.640 | 0.000 | 3.13 | 0.59 | 2.29 | 0.305 |
| 12.827 | 0.000 | 3.26 | 0.61 | 2.39 | 0.318 |
| 13.013 | 0.000 | 3.33 | 0.64 | 2.50 | 0.331 |
| 13.200 | 0.000 | 3.48 | 0.66 | 2.60 | 0.344 |
| 13.387 | 0.000 | 3.56 | 0.69 | 2.70 | 0.358 |
| 13.573 | 0.000 | 3.75 | 0.72 | 2.81 | 0.372 |
| 13.760 | 0.000 | 3.85 | 0.74 | 2.92 | 0.387 |
| 13.947 | 0.000 | 4.08 | 0.77 | 3.04 | 0.403 |
| 14.133 | 0.000 | 4.23 | 0.81 | 3.16 | 0.419 |
| 14.320 | 0.000 | 4.68 | 0.85 | 3.31 | 0.440 |
| 14.507 | 0.000 | 4.87 | 0.89 | 3.47 | 0.462 |
| 14.693 | 0.000 | 5.30 | 0.94 | 3.65 | 0.487 |
| 14.880 | 0.000 | 5.56 | 0.99 | 3.85 | 0.514 |
| 15.067 | 0.000 | 6.21 | 1.05 | 4.08 | 0.547 |
| 15.253 | 0.000 | 6.64 | 1.12 | 4.34 | 0.582 |
| 15.440 | 0.000 | 7.46 | 1.20 | 4.64 | 0.625 |
| 15.627 | 0.000 | 7.72 | 1.28 | 5.22 | 0.664 |
| 15.813 | 0.000 | 13.69 | 1.47 | 7.71 | 0.756 |
| 16.000 | 0.000 | 20.80 | 1.74 | 12.07 | 0.893 |
| 16.187 | 0.000 | 73.90 | 3.28 | 21.88 | 1.695 |
| 16.373 | 0.000 | 9.89 | 2.76 | 27.37 | 1.425 |
| 16.560 | 0.000 | 7.16 | 2.28 | 23.19 | 1.178 |
| 16.747 | 0.000 | 5.86 | 1.90 | 18.81 | 0.978 |
| 16.933 | 0.000 | 5.07 | 1.62 | 14.51 | 0.833 |
| 17.120 | 0.000 | 4.52 | 1.43 | 10.68 | 0.738 |
| 17.307 | 0.000 | 3.96 | 1.31 | 7.66 | 0.681 |
| 17.493 | 0.000 | 3.65 | 1.25 | 5.69 | 0.649 |
| 17.680 | 0.000 | 3.40 | 1.20 | 4.90 | 0.626 |
| 17.867 | 0.000 | 3.19 | 1.16 | 4.72 | 0.602 |
| 18.053 | 0.000 | 3.02 | 1.11 | 4.54 | 0.579 |
| 18.240 | 0.000 | 2.35 | 1.05 | 4.33 | 0.548 |
| 18.427 | 0.000 | 2.23 | 1.00 | 4.11 | 0.519 |



| | | | | | |
|---|---|---|---|---|---|
| 18.613 | 0.000 | 2.12 | 0.95 | 3.89 | 0.492 |
| 18.800 | 0.000 | 2.03 | 0.90 | 3.69 | 0.466 |
| 18.987 | 0.000 | 1.94 | 0.85 | 3.50 | 0.442 |
| 19.173 | 0.000 | 1.87 | 0.81 | 3.32 | 0.420 |
| 19.360 | 0.000 | 1.80 | 0.77 | 3.15 | 0.399 |
| 19.547 | 0.000 | 1.73 | 0.73 | 3.00 | 0.380 |
| 19.733 | 0.000 | 1.68 | 0.70 | 2.85 | 0.362 |
| 19.920 | 0.000 | 1.62 | 0.66 | 2.72 | 0.345 |
| 20.107 | 0.000 | 1.58 | 0.63 | 2.59 | 0.329 |
| 20.293 | 0.000 | 1.53 | 0.60 | 2.48 | 0.314 |
| 20.480 | 0.000 | 1.49 | 0.58 | 2.37 | 0.301 |
| 20.667 | 0.000 | 1.45 | 0.55 | 2.27 | 0.288 |
| 20.853 | 0.000 | 1.41 | 0.53 | 2.17 | 0.277 |
| 21.040 | 0.000 | 1.38 | 0.51 | 2.09 | 0.266 |
| 21.227 | 0.000 | 1.35 | 0.49 | 2.01 | 0.256 |
| 21.413 | 0.000 | 1.32 | 0.47 | 1.93 | 0.246 |
| 21.600 | 0.000 | 1.29 | 0.46 | 1.86 | 0.237 |
| 21.787 | 0.000 | 1.26 | 0.44 | 1.79 | 0.229 |
| 21.973 | 0.000 | 1.24 | 0.43 | 1.73 | 0.222 |
| 22.160 | 0.000 | 1.21 | 0.41 | 1.68 | 0.214 |
| 22.347 | 0.000 | 1.19 | 0.40 | 1.62 | 0.208 |
| 22.533 | 0.000 | 1.17 | 0.39 | 1.57 | 0.201 |
| 22.720 | 0.000 | 1.15 | 0.38 | 1.53 | 0.196 |
| 22.907 | 0.000 | 1.13 | 0.37 | 1.48 | 0.190 |
| 23.093 | 0.000 | 1.11 | 0.36 | 1.44 | 0.185 |
| 23.280 | 0.000 | 1.09 | 0.35 | 1.40 | 0.180 |
| 23.467 | 0.000 | 1.07 | 0.34 | 1.37 | 0.176 |
| 23.653 | 0.000 | 1.06 | 0.33 | 1.33 | 0.171 |
| 23.840 | 0.000 | 1.04 | 0.32 | 1.30 | 0.167 |
| 24.027 | 0.000 | 1.02 | 0.31 | 1.27 | 0.163 |
| 24.213 | 0.000 | 0.00 | 0.28 | 1.19 | 0.145 |
| 24.400 | 0.000 | 0.00 | 0.25 | 1.05 | 0.129 |
| 24.587 | 0.000 | 0.00 | 0.22 | 0.94 | 0.114 |
| 24.773 | 0.000 | 0.00 | 0.20 | 0.83 | 0.102 |
| 24.960 | 0.000 | 0.00 | 0.17 | 0.74 | 0.090 |
| 25.147 | 0.000 | 0.00 | 0.15 | 0.65 | 0.080 |
| 25.333 | 0.000 | 0.00 | 0.14 | 0.58 | 0.071 |
| 25.520 | 0.000 | 0.00 | 0.12 | 0.52 | 0.063 |
| 25.707 | 0.000 | 0.00 | 0.11 | 0.46 | 0.056 |
| 25.893 | 0.000 | 0.00 | 0.10 | 0.41 | 0.050 |
| 26.080 | 0.000 | 0.00 | 0.09 | 0.36 | 0.044 |
| 26.267 | 0.000 | 0.00 | 0.08 | 0.32 | 0.039 |
| 26.453 | 0.000 | 0.00 | 0.07 | 0.29 | 0.035 |
| 26.640 | 0.000 | 0.00 | 0.06 | 0.25 | 0.031 |
| 26.827 | 0.000 | 0.00 | 0.05 | 0.22 | 0.027 |
| 27.013 | 0.000 | 0.00 | 0.05 | 0.20 | 0.024 |
| 27.200 | 0.000 | 0.00 | 0.04 | 0.18 | 0.022 |
| 27.387 | 0.000 | 0.00 | 0.04 | 0.16 | 0.019 |
| 27.573 | 0.000 | 0.00 | 0.03 | 0.14 | 0.017 |
| 27.760 | 0.000 | 0.00 | 0.03 | 0.12 | 0.015 |
| 27.947 | 0.000 | 0.00 | 0.03 | 0.11 | 0.013 |
| 28.133 | 0.000 | 0.00 | 0.02 | 0.10 | 0.012 |
| 28.320 | 0.000 | 0.00 | 0.02 | 0.09 | 0.011 |
| 28.507 | 0.000 | 0.00 | 0.02 | 0.08 | 0.009 |
| 28.693 | 0.000 | 0.00 | 0.02 | 0.07 | 0.008 |
| 28.880 | 0.000 | 0.00 | 0.01 | 0.06 | 0.007 |
| 29.067 | 0.000 | 0.00 | 0.01 | 0.05 | 0.007 |
| 29.253 | 0.000 | 0.00 | 0.01 | 0.05 | 0.006 |
| 29.440 | 0.000 | 0.00 | 0.01 | 0.04 | 0.005 |
| 29.627 | 0.000 | 0.00 | 0.01 | 0.04 | 0.005 |
| 29.813 | 0.000 | 0.00 | 0.01 | 0.03 | 0.004 |
| 30.000 | 0.000 | 0.00 | 0.01 | 0.03 | 0.004 |
| 30.187 | 0.000 | 0.00 | 0.01 | 0.03 | 0.003 |
| 30.373 | 0.000 | 0.00 | 0.01 | 0.02 | 0.003 |
| 30.560 | 0.000 | 0.00 | 0.00 | 0.02 | 0.003 |
| 30.747 | 0.000 | 0.00 | 0.00 | 0.02 | 0.002 |
| 30.933 | 0.000 | 0.00 | 0.00 | 0.02 | 0.002 |
| 31.120 | 0.000 | 0.00 | 0.00 | 0.01 | 0.002 |
| 31.307 | 0.000 | 0.00 | 0.00 | 0.01 | 0.002 |

| | | | | | |
|---|---|---|---|---|---|
| 31.493 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 31.680 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 31.867 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 32.053 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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            Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                        Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  Gateway Hydrograph
  Proposed Condition
  25-year storm event
```

WATERSHED 'E'

```
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.49 (inches)
```

| SOIL-COVER TYPE | AREA (Acres) | PERCENT OF PERVIOUS AREA | SCS CURVE NUMBER | LOSS RATE Fp(in./hr.) | YIELD |
|---|---|---|---|---|---|
| 1 | 6.90 | 35.00 | 32. | 0.400 | 0.616 |
| 2 | 11.10 | 35.00 | 56. | 0.300 | 0.677 |
| 3 | 33.60 | 35.00 | 69. | 0.250 | 0.740 |
| 4 | 1.70 | 10.00 | 32. | 0.400 | 0.853 |
| 5 | 1.00 | 10.00 | 56. | 0.300 | 0.870 |
| 6 | 5.30 | 10.00 | 69. | 0.250 | 0.888 |
| 7 | 3.60 | 100.00 | 80. | 0.250 | 0.546 |
| 8 | 1.40 | 85.00 | 69. | 0.250 | 0.444 |

```
    TOTAL AREA (Acres) =     64.60

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.101

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.284
==========================================================================

 Problem Descriptions:
  Gateway Hydrograph
  Proposed Condition (calibration coefficient: 0.86165)
  25-year storm event
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.86
    TOTAL CATCHMENT AREA(ACRES) =   64.60
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.101
    LOW LOSS FRACTION = 0.284
    TIME OF CONCENTRATION(MIN.) = 10.20
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

--------------------------------------------------------------------------
```

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  Gateway Flood Hydrograph Routing
  Proposed Condition (calib coef: 0.86165)
  25-year storm event
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.86
    TOTAL CATCHMENT AREA(ACRES) =   64.60
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.101
    LOW LOSS FRACTION = 0.284
    TIME OF CONCENTRATION(MIN.) = 10.20
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =    15.98
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     8.19

**************************************************************************
  TIME     VOLUME       Q    0.       45.0      90.0     135.0     180.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.02      0.0000      0.00  Q         .         .         .         .
  0.19      0.0191      2.72  Q         .         .         .         .
  0.36      0.0575      2.74  Q         .         .         .         .
  0.53      0.0961      2.76  Q         .         .         .         .
  0.70      0.1350      2.77  Q         .         .         .         .
  0.87      0.1742      2.80  Q         .         .         .         .
  1.04      0.2136      2.81  Q         .         .         .         .
  1.21      0.2533      2.84  Q         .         .         .         .
  1.38      0.2933      2.85  Q         .         .         .         .
  1.55      0.3336      2.88  Q         .         .         .         .
  1.72      0.3743      2.90  Q         .         .         .         .
  1.89      0.4152      2.93  Q         .         .         .         .
  2.06      0.4564      2.94  Q         .         .         .         .
  2.23      0.4979      2.97  Q         .         .         .         .
  2.40      0.5398      2.99  Q         .         .         .         .
  2.57      0.5820      3.02  Q         .         .         .         .
  2.74      0.6245      3.04  Q         .         .         .         .
  2.91      0.6674      3.07  Q         .         .         .         .
  3.08      0.7106      3.09  Q         .         .         .         .
  3.25      0.7542      3.12  Q         .         .         .         .
  3.42      0.7982      3.14  Q         .         .         .         .
```

WATERSHED 'E'

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3.59 | 0.8425 | 3.17 | Q | . | . | . | . |
| 3.76 | 0.8872 | 3.19 | Q | . | . | . | . |
| 3.93 | 0.9323 | 3.23 | Q | . | . | . | . |
| 4.10 | 0.9778 | 3.25 | Q | . | . | . | . |
| 4.27 | 1.0237 | 3.29 | Q | . | . | . | . |
| 4.44 | 1.0701 | 3.31 | Q | . | . | . | . |
| 4.61 | 1.1168 | 3.35 | Q | . | . | . | . |
| 4.78 | 1.1640 | 3.37 | Q | . | . | . | . |
| 4.95 | 1.2117 | 3.41 | Q | . | . | . | . |
| 5.12 | 1.2598 | 3.44 | Q | . | . | . | . |
| 5.29 | 1.3084 | 3.48 | Q | . | . | . | . |
| 5.46 | 1.3575 | 3.51 | Q | . | . | . | . |
| 5.63 | 1.4071 | 3.55 | Q | . | . | . | . |
| 5.80 | 1.4572 | 3.58 | Q | . | . | . | . |
| 5.97 | 1.5078 | 3.63 | Q | . | . | . | . |
| 6.14 | 1.5590 | 3.65 | Q | . | . | . | . |
| 6.31 | 1.6107 | 3.71 | Q | . | . | . | . |
| 6.48 | 1.6630 | 3.74 | Q | . | . | . | . |
| 6.65 | 1.7159 | 3.79 | Q | . | . | . | . |
| 6.82 | 1.7693 | 3.82 | Q | . | . | . | . |
| 6.99 | 1.8234 | 3.88 | Q | . | . | . | . |
| 7.16 | 1.8782 | 3.91 | Q | . | . | . | . |
| 7.33 | 1.9336 | 3.98 | Q | . | . | . | . |
| 7.50 | 1.9897 | 4.01 | Q | . | . | . | . |
| 7.67 | 2.0465 | 4.08 | Q | . | . | . | . |
| 7.84 | 2.1040 | 4.11 | Q | . | . | . | . |
| 8.01 | 2.1623 | 4.19 | Q | . | . | . | . |
| 8.18 | 2.2214 | 4.22 | Q | . | . | . | . |
| 8.35 | 2.2813 | 4.30 | Q | . | . | . | . |
| 8.52 | 2.3420 | 4.34 | Q | . | . | . | . |
| 8.69 | 2.4036 | 4.42 | Q | . | . | . | . |
| 8.86 | 2.4660 | 4.47 | Q | . | . | . | . |
| 9.03 | 2.5294 | 4.56 | .Q | . | . | . | . |
| 9.20 | 2.5938 | 4.61 | .Q | . | . | . | . |
| 9.37 | 2.6592 | 4.70 | .Q | . | . | . | . |
| 9.54 | 2.7257 | 4.75 | .Q | . | . | . | . |
| 9.71 | 2.7932 | 4.86 | .Q | . | . | . | . |
| 9.88 | 2.8619 | 4.92 | .Q | . | . | . | . |
| 10.05 | 2.9318 | 5.03 | .Q | . | . | . | . |
| 10.22 | 3.0029 | 5.09 | .Q | . | . | . | . |
| 10.39 | 3.0754 | 5.22 | .Q | . | . | . | . |
| 10.56 | 3.1492 | 5.29 | .Q | . | . | . | . |
| 10.73 | 3.2245 | 5.43 | .Q | . | . | . | . |
| 10.90 | 3.3013 | 5.50 | .Q | . | . | . | . |
| 11.07 | 3.3797 | 5.66 | .Q | . | . | . | . |
| 11.24 | 3.4597 | 5.74 | .Q | . | . | . | . |
| 11.41 | 3.5416 | 5.91 | .Q | . | . | . | . |
| 11.58 | 3.6254 | 6.01 | .Q | . | . | . | . |
| 11.75 | 3.7111 | 6.20 | .Q | . | . | . | . |
| 11.92 | 3.7990 | 6.31 | .Q | . | . | . | . |
| 12.09 | 3.8936 | 7.16 | .Q | . | . | . | . |
| 12.26 | 4.0056 | 8.78 | .Q | . | . | . | . |
| 12.43 | 4.1310 | 9.06 | . Q | . | . | . | . |
| 12.60 | 4.2593 | 9.21 | . Q | . | . | . | . |
| 12.77 | 4.3909 | 9.53 | . Q | . | . | . | . |
| 12.94 | 4.5259 | 9.70 | . Q | . | . | . | . |
| 13.11 | 4.6648 | 10.07 | . Q | . | . | . | . |
| 13.28 | 4.8077 | 10.27 | . Q | . | . | . | . |
| 13.45 | 4.9551 | 10.72 | . Q | . | . | . | . |
| 13.62 | 5.1074 | 10.96 | . Q | . | . | . | . |
| 13.79 | 5.2652 | 11.50 | . Q | . | . | . | . |
| 13.96 | 5.4289 | 11.80 | . Q | . | . | . | . |
| 14.13 | 5.5988 | 12.38 | . Q | . | . | . | . |
| 14.30 | 5.7750 | 12.71 | . Q | . | . | . | . |
| 14.47 | 5.9598 | 13.60 | . Q | . | . | . | . |
| 14.64 | 6.1545 | 14.12 | . Q | . | . | . | . |
| 14.81 | 6.3649 | 15.83 | . Q | . | . | . | . |
| 14.98 | 6.5946 | 16.88 | . Q | . | . | . | . |
| 15.15 | 6.8502 | 19.51 | . Q | . | . | . | . |

| | | | |
|---|---|---|---|
| 15.32 | 7.1364 | 21.22 | . Q . . . . |
| 15.49 | 7.4385 | 21.79 | . Q . . . . |
| 15.66 | 7.7649 | 24.68 | . Q . . . . |
| 15.83 | 8.2230 | 40.53 | . Q. . . . |
| 16.00 | 8.9077 | 56.94 | . . Q . . . |
| 16.17 | 10.5217 | 172.80 | . . . . Q . |
| 16.34 | 11.9437 | 29.63 | . Q . . . . |
| 16.51 | 12.3157 | 23.32 | . Q . . . . |
| 16.68 | 12.6065 | 18.09 | . Q . . . . |
| 16.85 | 12.8383 | 14.91 | . Q . . . . |
| 17.02 | 13.0353 | 13.13 | . Q . . . . |
| 17.19 | 13.2128 | 12.13 | . Q . . . . |
| 17.36 | 13.3768 | 11.22 | . Q . . . . |
| 17.53 | 13.5293 | 10.49 | . Q . . . . |
| 17.70 | 13.6724 | 9.88 | . Q . . . . |
| 17.87 | 13.8075 | 9.36 | . Q . . . . |
| 18.04 | 13.9360 | 8.92 | .Q . . . . |
| 18.21 | 14.0437 | 6.42 | .Q . . . . |
| 18.38 | 14.1317 | 6.10 | .Q . . . . |
| 18.55 | 14.2155 | 5.83 | .Q . . . . |
| 18.72 | 14.2956 | 5.58 | .Q . . . . |
| 18.89 | 14.3724 | 5.36 | .Q . . . . |
| 19.06 | 14.4462 | 5.16 | .Q . . . . |
| 19.23 | 14.5174 | 4.97 | .Q . . . . |
| 19.40 | 14.5861 | 4.81 | .Q . . . . |
| 19.57 | 14.6526 | 4.65 | .Q . . . . |
| 19.74 | 14.7170 | 4.51 | .Q . . . . |
| 19.91 | 14.7795 | 4.38 | Q . . . . |
| 20.08 | 14.8402 | 4.26 | Q . . . . |
| 20.25 | 14.8993 | 4.15 | Q . . . . |
| 20.42 | 14.9568 | 4.04 | Q . . . . |
| 20.59 | 15.0129 | 3.94 | Q . . . . |
| 20.76 | 15.0677 | 3.85 | Q . . . . |
| 20.93 | 15.1212 | 3.76 | Q . . . . |
| 21.10 | 15.1735 | 3.68 | Q . . . . |
| 21.27 | 15.2246 | 3.60 | Q . . . . |
| 21.44 | 15.2747 | 3.53 | Q . . . . |
| 21.61 | 15.3238 | 3.46 | Q . . . . |
| 21.78 | 15.3719 | 3.39 | Q . . . . |
| 21.95 | 15.4191 | 3.33 | Q . . . . |
| 22.12 | 15.4655 | 3.27 | Q . . . . |
| 22.29 | 15.5110 | 3.21 | Q . . . . |
| 22.46 | 15.5557 | 3.16 | Q . . . . |
| 22.63 | 15.5997 | 3.10 | Q . . . . |
| 22.80 | 15.6429 | 3.05 | Q . . . . |
| 22.97 | 15.6854 | 3.00 | Q . . . . |
| 23.14 | 15.7273 | 2.96 | Q . . . . |
| 23.31 | 15.7685 | 2.91 | Q . . . . |
| 23.48 | 15.8091 | 2.87 | Q . . . . |
| 23.65 | 15.8492 | 2.83 | Q . . . . |
| 23.82 | 15.8886 | 2.79 | Q . . . . |
| 23.99 | 15.9275 | 2.75 | Q . . . . |
| 24.16 | 15.9659 | 2.72 | Q . . . . |
| 24.33 | 15.9850 | 0.00 | Q . . . . |

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

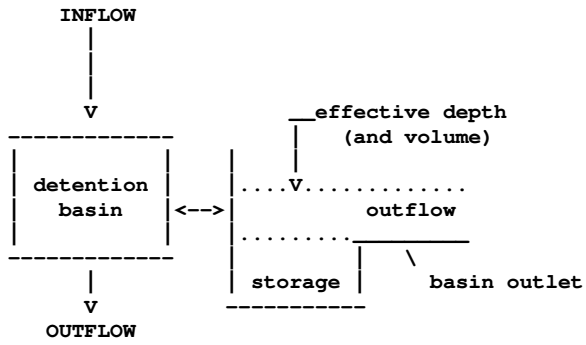
| Percentile of Estimated Peak Flow Rate | Duration (minutes) |
|---|---|
| 0% | 1448.4 |
| 10% | 102.0 |
| 20% | 30.6 |
| 30% | 20.4 |
| 40% | 10.2 |
| 50% | 10.2 |

```
              60%                              10.2
              70%                              10.2
              80%                              10.2
              90%                              10.2

  Problem Descriptions:
   Gateway Flood Hydrograph Routing
   Proposed Condition (calib coef: 0.86165)
   25-year storm event


================================================================================
     FLOW-THROUGH DETENTION BASIN MODEL

     SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
     CONSTANT HYDROGRAPH TIME UNIT(MINUTES) =   10.200
     DEAD STORAGE(AF) =       0.00
     SPECIFIED DEAD STORAGE(AF) FILLED =       0.00
     ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN =    0.00
```




150' x 150' footprint
(7' depth)

```
     DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
     TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES =  20
     *BASIN-DEPTH   STORAGE    OUTFLOW  **BASIN-DEPTH   STORAGE    OUTFLOW  *
     *    (FEET)  (ACRE-FEET)    (CFS)   **    (FEET)  (ACRE-FEET)    (CFS)   *
     *       0.000      0.000      0.000**       0.250      0.130      1.000*
     *       0.500      0.260      2.000**       0.750      0.390      3.000*
     *       1.000      0.520      4.000**       1.250      0.650      5.000*
     *       1.500      0.770     10.400**       1.750      0.900     14.600*
     *       2.000      1.030     17.900**       2.250      1.160     20.700*
     *       2.500      1.290     23.100**       3.000      1.550     27.400*
     *       3.500      1.810     31.000**       4.000      2.070     36.300*
     *       4.500      2.320     41.800**       5.000      2.580     49.500*
     *       5.500      2.840     55.900**       6.000      3.100     61.300*
     *       6.500      3.360     66.100**       7.000      3.620     70.500*
--------------------------------------------------------------------------------
     BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:
      INTERVAL   DEPTH    {S-O*DT/2}   {S+O*DT/2}
       NUMBER   (FEET)   (ACRE-FEET)  (ACRE-FEET)
           1     0.00       0.00000      0.00000
           2     0.25       0.12298      0.13702
           3     0.50       0.24595      0.27405
           4     0.75       0.36893      0.41107
           5     1.00       0.49190      0.54810
           6     1.25       0.61488      0.68512
           7     1.50       0.69694      0.84306
           8     1.75       0.79744      1.00256
           9     2.00       0.90426      1.15574
          10     2.25       1.01459      1.30541
          11     2.50       1.12773      1.45227
          12     3.00       1.35752      1.74248
          13     3.50       1.59223      2.02777
```

| | | | |
|---|---|---|---|
| 14 | 4.00 | 1.81500 | 2.32500 |
| 15 | 4.50 | 2.02636 | 2.61364 |
| 16 | 5.00 | 2.23227 | 2.92773 |
| 17 | 5.50 | 2.44731 | 3.23269 |
| 18 | 6.00 | 2.66938 | 3.53062 |
| 19 | 6.50 | 2.89566 | 3.82434 |
| 20 | 7.00 | 3.12475 | 4.11525 |

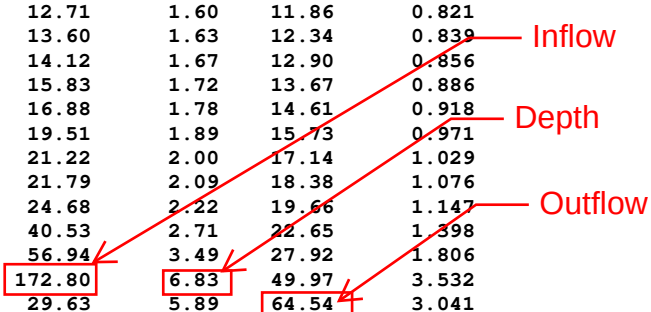
WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

| TIME (HRS) | DEAD-STORAGE FILLED(AF) | INFLOW (CFS) | EFFECTIVE DEPTH(FT) | OUTFLOW (CFS) | EFFECTIVE VOLUME(AF) |
|---|---|---|---|---|---|
| 0.020 | 0.000 | 0.00 | 0.00 | 0.00 | 0.000 |
| 0.190 | 0.000 | 2.72 | 0.07 | 0.14 | 0.036 |
| 0.360 | 0.000 | 2.74 | 0.13 | 0.41 | 0.069 |
| 0.530 | 0.000 | 2.76 | 0.19 | 0.65 | 0.099 |
| 0.700 | 0.000 | 2.77 | 0.24 | 0.86 | 0.126 |
| 0.870 | 0.000 | 2.80 | 0.29 | 1.06 | 0.150 |
| 1.040 | 0.000 | 2.81 | 0.33 | 1.24 | 0.172 |
| 1.210 | 0.000 | 2.84 | 0.37 | 1.40 | 0.192 |
| 1.380 | 0.000 | 2.85 | 0.41 | 1.55 | 0.211 |
| 1.550 | 0.000 | 2.88 | 0.44 | 1.69 | 0.228 |
| 1.720 | 0.000 | 2.90 | 0.47 | 1.81 | 0.243 |
| 1.890 | 0.000 | 2.93 | 0.49 | 1.92 | 0.257 |
| 2.060 | 0.000 | 2.94 | 0.52 | 2.03 | 0.270 |
| 2.230 | 0.000 | 2.97 | 0.54 | 2.12 | 0.282 |
| 2.400 | 0.000 | 2.99 | 0.56 | 2.21 | 0.293 |
| 2.570 | 0.000 | 3.02 | 0.58 | 2.29 | 0.303 |
| 2.740 | 0.000 | 3.04 | 0.60 | 2.37 | 0.312 |
| 2.910 | 0.000 | 3.07 | 0.62 | 2.44 | 0.321 |
| 3.080 | 0.000 | 3.09 | 0.63 | 2.50 | 0.329 |
| 3.250 | 0.000 | 3.12 | 0.65 | 2.56 | 0.337 |
| 3.420 | 0.000 | 3.14 | 0.66 | 2.62 | 0.344 |
| 3.590 | 0.000 | 3.17 | 0.68 | 2.68 | 0.351 |
| 3.760 | 0.000 | 3.19 | 0.69 | 2.73 | 0.358 |
| 3.930 | 0.000 | 3.23 | 0.70 | 2.78 | 0.364 |
| 4.100 | 0.000 | 3.25 | 0.71 | 2.83 | 0.370 |
| 4.270 | 0.000 | 3.29 | 0.72 | 2.87 | 0.376 |
| 4.440 | 0.000 | 3.31 | 0.73 | 2.91 | 0.382 |
| 4.610 | 0.000 | 3.35 | 0.74 | 2.96 | 0.387 |
| 4.780 | 0.000 | 3.37 | 0.75 | 3.00 | 0.392 |
| 4.950 | 0.000 | 3.41 | 0.76 | 3.04 | 0.398 |
| 5.120 | 0.000 | 3.44 | 0.77 | 3.08 | 0.403 |
| 5.290 | 0.000 | 3.48 | 0.78 | 3.12 | 0.408 |
| 5.460 | 0.000 | 3.51 | 0.79 | 3.16 | 0.413 |
| 5.630 | 0.000 | 3.55 | 0.80 | 3.19 | 0.418 |
| 5.800 | 0.000 | 3.58 | 0.81 | 3.23 | 0.423 |
| 5.970 | 0.000 | 3.63 | 0.82 | 3.27 | 0.428 |
| 6.140 | 0.000 | 3.65 | 0.83 | 3.31 | 0.433 |
| 6.310 | 0.000 | 3.71 | 0.84 | 3.35 | 0.438 |
| 6.480 | 0.000 | 3.74 | 0.85 | 3.38 | 0.443 |
| 6.650 | 0.000 | 3.79 | 0.86 | 3.42 | 0.448 |
| 6.820 | 0.000 | 3.82 | 0.87 | 3.46 | 0.453 |
| 6.990 | 0.000 | 3.88 | 0.88 | 3.50 | 0.458 |
| 7.160 | 0.000 | 3.91 | 0.89 | 3.54 | 0.463 |
| 7.330 | 0.000 | 3.98 | 0.90 | 3.58 | 0.469 |
| 7.500 | 0.000 | 4.01 | 0.91 | 3.63 | 0.474 |
| 7.670 | 0.000 | 4.08 | 0.92 | 3.67 | 0.480 |
| 7.840 | 0.000 | 4.11 | 0.93 | 3.71 | 0.485 |
| 8.010 | 0.000 | 4.19 | 0.95 | 3.76 | 0.491 |
| 8.180 | 0.000 | 4.22 | 0.96 | 3.80 | 0.497 |
| 8.350 | 0.000 | 4.30 | 0.97 | 3.85 | 0.504 |
| 8.520 | 0.000 | 4.34 | 0.98 | 3.90 | 0.510 |
| 8.690 | 0.000 | 4.42 | 0.99 | 3.95 | 0.517 |

| | | | | | |
|---|---|---|---|---|---|
| 8.860 | 0.000 | 4.47 | 1.01 | 4.00 | 0.523 |
| 9.030 | 0.000 | 4.56 | 1.02 | 4.05 | 0.530 |
| 9.200 | 0.000 | 4.61 | 1.03 | 4.11 | 0.537 |
| 9.370 | 0.000 | 4.70 | 1.05 | 4.16 | 0.545 |
| 9.540 | 0.000 | 4.75 | 1.06 | 4.22 | 0.552 |
| 9.710 | 0.000 | 4.86 | 1.08 | 4.28 | 0.561 |
| 9.880 | 0.000 | 4.92 | 1.09 | 4.34 | 0.569 |
| 10.050 | 0.000 | 5.03 | 1.11 | 4.41 | 0.577 |
| 10.220 | 0.000 | 5.09 | 1.13 | 4.48 | 0.586 |
| 10.390 | 0.000 | 5.22 | 1.15 | 4.55 | 0.596 |
| 10.560 | 0.000 | 5.29 | 1.16 | 4.62 | 0.605 |
| 10.730 | 0.000 | 5.43 | 1.18 | 4.69 | 0.615 |
| 10.900 | 0.000 | 5.50 | 1.20 | 4.77 | 0.626 |
| 11.070 | 0.000 | 5.66 | 1.22 | 4.86 | 0.637 |
| 11.240 | 0.000 | 5.74 | 1.25 | 4.94 | 0.648 |
| 11.410 | 0.000 | 5.91 | 1.27 | 5.18 | 0.658 |
| 11.580 | 0.000 | 6.01 | 1.28 | 5.53 | 0.665 |
| 11.750 | 0.000 | 6.20 | 1.29 | 5.81 | 0.671 |
| 11.920 | 0.000 | 6.31 | 1.30 | 6.02 | 0.675 |
| 12.090 | 0.000 | 7.16 | 1.32 | 6.36 | 0.686 |
| 12.260 | 0.000 | 8.78 | 1.37 | 7.14 | 0.709 |
| 12.430 | 0.000 | 9.06 | 1.40 | 7.99 | 0.724 |
| 12.600 | 0.000 | 9.21 | 1.42 | 8.54 | 0.733 |
| 12.770 | 0.000 | 9.53 | 1.44 | 8.94 | 0.742 |
| 12.940 | 0.000 | 9.70 | 1.45 | 9.26 | 0.748 |
| 13.110 | 0.000 | 10.07 | 1.47 | 9.56 | 0.755 |
| 13.280 | 0.000 | 10.27 | 1.48 | 9.85 | 0.761 |
| 13.450 | 0.000 | 10.72 | 1.50 | 10.16 | 0.769 |
| 13.620 | 0.000 | 10.96 | 1.51 | 10.46 | 0.776 |
| 13.790 | 0.000 | 11.50 | 1.53 | 10.75 | 0.786 |
| 13.960 | 0.000 | 11.80 | 1.55 | 11.09 | 0.796 |
| 14.130 | 0.000 | 12.38 | 1.58 | 11.46 | 0.809 |
| 14.300 | 0.000 | 12.71 | 1.60 | 11.86 | 0.821 |
| 14.470 | 0.000 | 13.60 | 1.63 | 12.34 | 0.839 |
| 14.640 | 0.000 | 14.12 | 1.67 | 12.90 | 0.856 |
| 14.810 | 0.000 | 15.83 | 1.72 | 13.67 | 0.886 |
| 14.980 | 0.000 | 16.88 | 1.78 | 14.61 | 0.918 |
| 15.150 | 0.000 | 19.51 | 1.89 | 15.73 | 0.971 |
| 15.320 | 0.000 | 21.22 | 2.00 | 17.14 | 1.029 |
| 15.490 | 0.000 | 21.79 | 2.09 | 18.38 | 1.076 |
| 15.660 | 0.000 | 24.68 | 2.22 | 19.66 | 1.147 |
| 15.830 | 0.000 | 40.53 | 2.71 | 22.65 | 1.398 |
| 16.000 | 0.000 | 56.94 | 3.49 | 27.92 | 1.806 |
| 16.170 | 0.000 | 172.80 | 6.83 | 49.97 | 3.532 |
| 16.340 | 0.000 | 29.63 | 5.89 | 64.54 | 3.041 |
| 16.510 | 0.000 | 23.32 | 5.03 | 54.99 | 2.596 |
| 16.680 | 0.000 | 18.09 | 4.30 | 44.76 | 2.221 |
| 16.850 | 0.000 | 14.91 | 3.71 | 36.43 | 1.919 |
| 17.020 | 0.000 | 13.13 | 3.22 | 31.12 | 1.666 |
| 17.190 | 0.000 | 12.13 | 2.81 | 27.39 | 1.452 |
| 17.360 | 0.000 | 11.22 | 2.46 | 24.24 | 1.269 |
| 17.530 | 0.000 | 10.49 | 2.17 | 21.25 | 1.118 |
| 17.700 | 0.000 | 9.88 | 1.94 | 18.43 | 0.998 |
| 17.870 | 0.000 | 9.36 | 1.76 | 15.91 | 0.906 |
| 18.040 | 0.000 | 8.92 | 1.63 | 13.68 | 0.839 |
| 18.210 | 0.000 | 6.42 | 1.50 | 11.46 | 0.768 |
| 18.380 | 0.000 | 6.10 | 1.40 | 9.29 | 0.723 |
| 18.550 | 0.000 | 5.83 | 1.35 | 7.69 | 0.697 |
| 18.720 | 0.000 | 5.58 | 1.31 | 6.74 | 0.680 |
| 18.890 | 0.000 | 5.36 | 1.29 | 6.13 | 0.670 |
| 19.060 | 0.000 | 5.16 | 1.27 | 5.71 | 0.662 |
| 19.230 | 0.000 | 4.97 | 1.26 | 5.40 | 0.656 |
| 19.400 | 0.000 | 4.81 | 1.25 | 5.16 | 0.651 |
| 19.570 | 0.000 | 4.65 | 1.24 | 5.01 | 0.646 |
| 19.740 | 0.000 | 4.51 | 1.23 | 4.95 | 0.640 |
| 19.910 | 0.000 | 4.38 | 1.22 | 4.90 | 0.633 |
| 20.080 | 0.000 | 4.26 | 1.20 | 4.84 | 0.625 |
| 20.250 | 0.000 | 4.15 | 1.18 | 4.77 | 0.616 |
| 20.420 | 0.000 | 4.04 | 1.17 | 4.70 | 0.607 |



| | | | | | |
|---|---|---|---|---|---|
| 20.590 | 0.000 | 3.94 | 1.15 | 4.63 | 0.597 |
| 20.760 | 0.000 | 3.85 | 1.13 | 4.55 | 0.587 |
| 20.930 | 0.000 | 3.76 | 1.11 | 4.48 | 0.577 |
| 21.100 | 0.000 | 3.68 | 1.09 | 4.40 | 0.567 |
| 21.270 | 0.000 | 3.60 | 1.07 | 4.32 | 0.557 |
| 21.440 | 0.000 | 3.53 | 1.05 | 4.25 | 0.547 |
| 21.610 | 0.000 | 3.46 | 1.03 | 4.17 | 0.537 |
| 21.780 | 0.000 | 3.39 | 1.01 | 4.09 | 0.527 |
| 21.950 | 0.000 | 3.33 | 0.99 | 4.02 | 0.517 |
| 22.120 | 0.000 | 3.27 | 0.98 | 3.94 | 0.508 |
| 22.290 | 0.000 | 3.21 | 0.96 | 3.87 | 0.499 |
| 22.460 | 0.000 | 3.16 | 0.94 | 3.80 | 0.490 |
| 22.630 | 0.000 | 3.10 | 0.92 | 3.73 | 0.481 |
| 22.800 | 0.000 | 3.05 | 0.91 | 3.66 | 0.472 |
| 22.970 | 0.000 | 3.00 | 0.89 | 3.60 | 0.464 |
| 23.140 | 0.000 | 2.96 | 0.88 | 3.54 | 0.456 |
| 23.310 | 0.000 | 2.91 | 0.86 | 3.47 | 0.448 |
| 23.480 | 0.000 | 2.87 | 0.85 | 3.41 | 0.440 |
| 23.650 | 0.000 | 2.83 | 0.83 | 3.36 | 0.433 |
| 23.820 | 0.000 | 2.79 | 0.82 | 3.30 | 0.425 |
| 23.990 | 0.000 | 2.75 | 0.80 | 3.25 | 0.418 |
| 24.160 | 0.000 | 2.72 | 0.79 | 3.19 | 0.412 |
| 24.330 | 0.000 | 0.00 | 0.71 | 3.00 | 0.370 |
| 24.500 | 0.000 | 0.00 | 0.64 | 2.70 | 0.332 |
| 24.670 | 0.000 | 0.00 | 0.57 | 2.42 | 0.298 |
| 24.840 | 0.000 | 0.00 | 0.51 | 2.17 | 0.267 |
| 25.010 | 0.000 | 0.00 | 0.46 | 1.95 | 0.240 |
| 25.180 | 0.000 | 0.00 | 0.41 | 1.75 | 0.215 |
| 25.350 | 0.000 | 0.00 | 0.37 | 1.57 | 0.193 |
| 25.520 | 0.000 | 0.00 | 0.33 | 1.41 | 0.173 |
| 25.690 | 0.000 | 0.00 | 0.30 | 1.26 | 0.156 |
| 25.860 | 0.000 | 0.00 | 0.27 | 1.13 | 0.140 |
| 26.030 | 0.000 | 0.00 | 0.24 | 1.02 | 0.125 |
| 26.200 | 0.000 | 0.00 | 0.22 | 0.91 | 0.112 |
| 26.370 | 0.000 | 0.00 | 0.19 | 0.82 | 0.101 |
| 26.540 | 0.000 | 0.00 | 0.17 | 0.74 | 0.091 |
| 26.710 | 0.000 | 0.00 | 0.16 | 0.66 | 0.081 |
| 26.880 | 0.000 | 0.00 | 0.14 | 0.59 | 0.073 |
| 27.050 | 0.000 | 0.00 | 0.13 | 0.53 | 0.065 |
| 27.220 | 0.000 | 0.00 | 0.11 | 0.48 | 0.059 |
| 27.390 | 0.000 | 0.00 | 0.10 | 0.43 | 0.053 |
| 27.560 | 0.000 | 0.00 | 0.09 | 0.38 | 0.047 |
| 27.730 | 0.000 | 0.00 | 0.08 | 0.35 | 0.042 |
| 27.900 | 0.000 | 0.00 | 0.07 | 0.31 | 0.038 |
| 28.070 | 0.000 | 0.00 | 0.07 | 0.28 | 0.034 |
| 28.240 | 0.000 | 0.00 | 0.06 | 0.25 | 0.031 |
| 28.410 | 0.000 | 0.00 | 0.05 | 0.22 | 0.028 |
| 28.580 | 0.000 | 0.00 | 0.05 | 0.20 | 0.025 |
| 28.750 | 0.000 | 0.00 | 0.04 | 0.18 | 0.022 |
| 28.920 | 0.000 | 0.00 | 0.04 | 0.16 | 0.020 |
| 29.090 | 0.000 | 0.00 | 0.03 | 0.15 | 0.018 |
| 29.260 | 0.000 | 0.00 | 0.03 | 0.13 | 0.016 |
| 29.430 | 0.000 | 0.00 | 0.03 | 0.12 | 0.014 |
| 29.600 | 0.000 | 0.00 | 0.02 | 0.11 | 0.013 |
| 29.770 | 0.000 | 0.00 | 0.02 | 0.09 | 0.012 |
| 29.940 | 0.000 | 0.00 | 0.02 | 0.08 | 0.010 |
| 30.110 | 0.000 | 0.00 | 0.02 | 0.08 | 0.009 |
| 30.280 | 0.000 | 0.00 | 0.02 | 0.07 | 0.008 |
| 30.450 | 0.000 | 0.00 | 0.01 | 0.06 | 0.008 |
| 30.620 | 0.000 | 0.00 | 0.01 | 0.05 | 0.007 |
| 30.790 | 0.000 | 0.00 | 0.01 | 0.05 | 0.006 |
| 30.960 | 0.000 | 0.00 | 0.01 | 0.04 | 0.005 |
| 31.130 | 0.000 | 0.00 | 0.01 | 0.04 | 0.005 |
| 31.300 | 0.000 | 0.00 | 0.01 | 0.04 | 0.004 |
| 31.470 | 0.000 | 0.00 | 0.01 | 0.03 | 0.004 |
| 31.640 | 0.000 | 0.00 | 0.01 | 0.03 | 0.004 |
| 31.810 | 0.000 | 0.00 | 0.01 | 0.03 | 0.003 |
| 31.980 | 0.000 | 0.00 | 0.01 | 0.02 | 0.003 |
| 32.150 | 0.000 | 0.00 | 0.00 | 0.02 | 0.003 |

| | | | | | |
|---|---|---|---|---|---|
| 32.320 | 0.000 | 0.00 | 0.00 | 0.02 | 0.002 |
| 32.490 | 0.000 | 0.00 | 0.00 | 0.02 | 0.002 |
| 32.660 | 0.000 | 0.00 | 0.00 | 0.01 | 0.002 |
| 32.830 | 0.000 | 0.00 | 0.00 | 0.01 | 0.002 |
| 33.000 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 33.170 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 33.340 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 33.510 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |
| 33.680 | 0.000 | 0.00 | 0.00 | 0.01 | 0.001 |

# WATERSHED 'E'

| Detention Tank Volume and Outflow (Gateway) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| H (ft) | Length (ft) | Width (ft) | Square Feet (SF) | Area (Acre) | Total Volume (ac-ft) | Total Volume (cf) | Outflow w/30" orifice at basin bottom (cfs) | Outflow w/24" orifice at 3.5ft above bottom (cfs) | Total outflow (cfs) |
| 0 | 150 | 150 | 22500 | 0.52 | 0.00 | 0 | 0.0 | 0.0 | 0.0 |
| 0.25 | 150 | 150 | 22500 | 0.52 | 0.13 | 5625 | 1.0 | 0.0 | 1.0 |
| 0.50 | 150 | 150 | 22500 | 0.52 | 0.26 | 11250 | 2.0 | 0.0 | 2.0 |
| 0.75 | 150 | 150 | 22500 | 0.52 | 0.39 | 16875 | 3.0 | 0.0 | 3.0 |
| 1.00 | 150 | 150 | 22500 | 0.52 | 0.52 | 22500 | 4.0 | 0.0 | 4.0 |
| 1.25 | 150 | 150 | 22500 | 0.52 | 0.65 | 28125 | 5.0 | 0.0 | 5.0 |
| 1.50 | 150 | 150 | 22500 | 0.52 | 0.77 | 33750 | 10.4 | 0.0 | 10.4 |
| 1.75 | 150 | 150 | 22500 | 0.52 | 0.90 | 39375 | 14.6 | 0.0 | 14.6 |
| 2.00 | 150 | 150 | 22500 | 0.52 | 1.03 | 45000 | 17.9 | 0.0 | 17.9 |
| 2.25 | 150 | 150 | 22500 | 0.52 | 1.16 | 50625 | 20.7 | 0.0 | 20.7 |
| 2.50 | 150 | 150 | 22500 | 0.52 | 1.29 | 56250 | 23.1 | 0.0 | 23.1 |
| 2.75 | 150 | 150 | 22500 | 0.52 | 1.42 | 61875 | 25.3 | 0.0 | 25.3 |
| 3.00 | 150 | 150 | 22500 | 0.52 | 1.55 | 67500 | 27.4 | 0.0 | 27.4 |
| 3.25 | 150 | 150 | 22500 | 0.52 | 1.68 | 73125 | 29.3 | 0.0 | 29.3 |
| 3.50 | 150 | 150 | 22500 | 0.52 | 1.81 | 78750 | 31.0 | 0.0 | 31.0 |
| 3.75 | 150 | 150 | 22500 | 0.52 | 1.94 | 84375 | 32.7 | 1.0 | 33.7 |
| 4.00 | 150 | 150 | 22500 | 0.52 | 2.07 | 90000 | 34.3 | 2.0 | 36.3 |
| 4.25 | 150 | 150 | 22500 | 0.52 | 2.20 | 95625 | 35.8 | 3.0 | 38.8 |
| 4.50 | 150 | 150 | 22500 | 0.52 | 2.32 | 101250 | 37.3 | 4.5 | 41.8 |
| 4.75 | 150 | 150 | 22500 | 0.52 | 2.45 | 106875 | 38.7 | 6.6 | 45.3 |
| 5.00 | 150 | 150 | 22500 | 0.52 | 2.58 | 112500 | 40.1 | 9.4 | 49.5 |
| 5.25 | 150 | 150 | 22500 | 0.52 | 2.71 | 118125 | 41.4 | 11.5 | 52.9 |
| 5.50 | 150 | 150 | 22500 | 0.52 | 2.84 | 123750 | 42.7 | 13.2 | 55.9 |
| 5.75 | 150 | 150 | 22500 | 0.52 | 2.97 | 129375 | 43.9 | 14.8 | 58.7 |
| 6.00 | 150 | 150 | 22500 | 0.52 | 3.10 | 135000 | 45.1 | 16.2 | 61.3 |
| 6.25 | 150 | 150 | 22500 | 0.52 | 3.23 | 140625 | 46.3 | 17.5 | 63.8 |
| 6.50 | 150 | 150 | 22500 | 0.52 | 3.36 | 146250 | 47.4 | 18.7 | 66.1 |
| 6.75 | 150 | 150 | 22500 | 0.52 | 3.49 | 151875 | 48.5 | 19.9 | 68.4 |
| 7.00 | 150 | 150 | 22500 | 0.52 | 3.62 | 157500 | 49.6 | 20.9 | 70.5 |

# Rating Table for Circular Orifice - 3

| Project Description | |
|---|---|
| Solve For | Discharge |

| Input Data | |
|---|---|
| Headwater Elevation | 7.000 ft |
| Centroid Elevation | 1.250 ft |
| Tailwater Elevation | 0.000 ft |
| Discharge Coefficient | 0.526 |
| Diameter | 30.0 in |

| Headwater Elevation (ft) | Discharge (cfs) | Velocity (ft/s) |
|---|---|---|
| 0.000 | | (N/A) |
| 0.250 | | (N/A) |
| 0.500 | | (N/A) |
| 0.750 | | (N/A) |
| 1.000 | | (N/A) |
| 1.250 | | (N/A) |
| 1.500 | 10.35 | 2.11 |
| 1.750 | 14.63 | 2.98 |
| 2.000 | 17.92 | 3.65 |
| 2.250 | 20.69 | 4.22 |
| 2.500 | 23.13 | 4.71 |
| 2.750 | 25.34 | 5.16 |
| 3.000 | 27.37 | 5.58 |
| 3.250 | 29.26 | 5.96 |
| 3.500 | 31.04 | 6.32 |
| 3.750 | 32.72 | 6.67 |
| 4.000 | 34.31 | 6.99 |
| 4.250 | 35.84 | 7.30 |
| 4.500 | 37.30 | 7.60 |
| 4.750 | 38.71 | 7.89 |
| 5.000 | 40.07 | 8.16 |
| 5.250 | 41.38 | 8.43 |
| 5.500 | 42.66 | 8.69 |
| 5.750 | 43.90 | 8.94 |
| 6.000 | 45.10 | 9.19 |
| 6.250 | 46.27 | 9.43 |
| 6.500 | 47.41 | 9.66 |
| 6.750 | 48.53 | 9.89 |
| 7.000 | 49.62 | 10.11 |

# Rating Table for Circular Orifice - 3

| Project Description | |
|---|---|
| Solve For | Discharge |

| Input Data | |
|---|---|
| Headwater Elevation | 7.000 ft |
| Centroid Elevation | 1.000 ft |
| Tailwater Elevation | 0.000 ft |
| Discharge Coefficient | 0.526 |
| Diameter | 24.0 in |

| Headwater Elevation (ft) | Discharge (cfs) | Velocity (ft/s) |
|---|---|---|
| 0.000 | | (N/A) |
| 0.250 | | (N/A) |
| 0.500 | | (N/A) |
| 0.750 | | (N/A) |
| 1.000 | | (N/A) |
| 1.250 | 6.62 | 2.11 |
| 1.500 | 9.36 | 2.98 |
| 1.750 | 11.47 | 3.65 |
| 2.000 | 13.24 | 4.22 |
| 2.250 | 14.81 | 4.71 |
| 2.500 | 16.22 | 5.16 |
| 2.750 | 17.52 | 5.58 |
| 3.000 | 18.73 | 5.96 |
| 3.250 | 19.86 | 6.32 |
| 3.500 | 20.94 | 6.67 |
| 3.750 | 21.96 | 6.99 |
| 4.000 | 22.94 | 7.30 |
| 4.250 | 23.87 | 7.60 |
| 4.500 | 24.78 | 7.89 |
| 4.750 | 25.65 | 8.16 |
| 5.000 | 26.49 | 8.43 |
| 5.250 | 27.30 | 8.69 |
| 5.500 | 28.09 | 8.94 |
| 5.750 | 28.86 | 9.19 |
| 6.000 | 29.61 | 9.43 |
| 6.250 | 30.34 | 9.66 |
| 6.500 | 31.06 | 9.89 |
| 6.750 | 31.76 | 10.11 |
| 7.000 | 32.44 | 10.33 |