LOW IMPACT DEVELOPMENT
STANDARD URBAN STORM WATER
MITIGATION PLAN

FOR
TORRANCE COMMERCE CENTER
2271-2311 & 2341 West 205th Street
Torrance, CA 90505

PREPARED FOR:
THE BROOKHOLLOW GROUP
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JN: 2089-940-001

December 2022

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I. INTRODUCTION

The municipal storm water National Pollutant Discharge Elimination System (NPDES) permit (Los Angeles County Permit) issued to the City of Torrance (Permittee) by the Los Angeles Regional Water Quality Control Board (Regional Board) in 2012, requires the development and implementation of a program addressing storm water pollution issues in development planning for private projects.

The requirement to implement a program for development planning is based on, federal and state statutes including Section 402 (p) of the Clean Water Act, Section 6217 of Coastal Zone Act Reauthorization Amendments of 1990 ("CZARA") and the California Water Code. The Clean Water Act Amendments of 1987 established a framework of regulating storm water discharges from municipal, industrial, and construction activities under the NPDES program.

The permittee will approve the project plan as part of the development plan approval process and prior to issuing building and grading permits for the projects covered by the SUSMP requirements.

In accordance with NPDES requirements, a "Water Quality Management Plan" or "Standard Urban Storm Water Mitigation Plan" shall be prepared by a Civil or Environmental Engineer. "Best Management Practices" shall be identified and incorporated into the design.

II. PROJECT DESCRIPTION

The project site is a 6.26-acre industrial development located on West 205th Street in the City of Torrance, California. The site is currently made up of 6 existing industrial building, parking areas and driveways. Entry to the site is from West 205th Street along the southern edge of the development.

The proposed development will consist of one approximately 126,000 square foot industrial warehouse structure with on grade parking areas. The industrial building is anticipated to be a concrete tilt-up structure. Landscaping will be provided throughout the site.

Currently, the site surface drains in a northerly direction. Most of the site flows northerly into an existing storm drain system with multiple inlets throughout the site. The rest of the site drains southerly and into existing catch basins along the north side of West 205th Street.

The proposed improvements to the site will generally maintain similar drainage patterns to the existing ones. At project completion, the site will add on CDS pre-treatment system and an ADS Infiltration System. Drainage area A-1 will be conveyed to one infiltration system along the northerly side of the site. The rest of the site will surface drain in a southerly direction.

Potential pollutants generated from this project include metals, oil and grease (gasoline), suspended solids (sediments), pathogens, nutrients, trash and debris. Sources of metals (total cadmium, total chromium, total copper, total lead, and total zinc) in the stormwater may include vehicle paints, metal rooftops, preservatives, and motor oil. Oil and grease are usually associated with leaking vehicles in driveways. There will be no fueling areas located on site. The major source of sediments is bare or poorly vegetated ground. In addition, wind and water have the potential to introduce sediments in stormwater runoff. Sources of pathogens include wild bird and animal waste, garbage, and leaky sanitary systems. Nutrients (total phosphorus) are generally associated with poor landscaping practices, leaks from sanitary systems, and animal wastes. The major source for trash and debris in stormwater is poorly managed trash containers.

To reduce pollutants from the urban runoff, various BMPs are proposed for the project. As a first line of defense, Source Control BMPs will be employed, which include: street sweeping, litter control, and catch basin inspection. To remove pollutants from the stormwater runoff, Treatment Control BMPs are implemented, which are the proposed Contech inserts and pretreatment units that filter the runoff prior to discharging into biofiltration system.

III. SITE DESCRIPTION

The site is bounded to the north by residential developments, to the south by West 205th Street and to the east and west by existing office buildings. The site is currently occupied by six existing industrial building, parking areas and driveways. The general location of the site is illustrated on the Vicinity Map included in Section VI.

The site is not within or adjacent to a Significant Ecological Area (SEA). The bioretention systems have been places away from Building and existing or proposed Utility lines.

See the table provided on the site plan for a breakdown or area that shows pervious and impervious features (roof, sidewalk, pavement, and landscape).

The site drains to a concrete lined channel and is not within a channel susceptible to hydro modification.

The project site is within Region 4 of the Regional Water Quality Control Board (RWQCB) jurisdiction and within the Dominguez Channel Watershed. Street runoff from the project flows easterly from the site and ultimately discharges into the Dominguez Channel, which flows south and empties into the Los Angeles/Long Beach Harbor.

The 2010 Integrated Report 303(d) list identifies the following pollutants of concern in the receiving waters:

Dominguez Channel:

303(d) List Pollutants of Concern: Benzo(a)anthracene, Benzo(a)pyrene, Chlordane, Chrysene, DDT, Lead, PCBs, Phenanthrene, Pyrene, Toxicity, Indicator bacteria, Benthic Community Effects, Copper, Dieldrin

TMDL List: Aldrin, Ammonia, ChemA, Chromium, PAHs, Zinc, Benzo(a)anthracene, Benzo(a)pyrene, Chlordane, Chrysene, DDT, Lead, PCBs, Phenanthrene, Pyrene, Toxicity, 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Cadmium, Dibenz[a,h]anthracene, Fluoranthene, Fluorene, Mercury, Naphthalene, Nickel, Nitrogen, Ammonia, Tributyltin, Indicator Bacteria, Benthic Community Effects, Copper, Dieldrin

To the best of our knowledge, there are no pre-existing water quality problems.

IV. SUSMP REQUIREMENTS AND PROVISIONS

1. Peak Storm Water Runoff Discharge Rates

   The project is required to attenuate peak flows to the levels allowable by the public storm drain plan.

2. Conserve Natural Areas

   There is no significant vegetation to save.

3. Minimize Stormwater Pollutants of Concern

   The project is designed to minimize, to the maximum extent practicable, the introduction of pollutants of concern (POCs) that may result in significant impacts, generated from site runoff. The BMPs described in Section IV are selected to minimize POCs. Particularly, Treatment Control BMPs are employed to effectively remove POCs from the project's stormwater runoff. Site runoff will drain through Contech units and into underground sub-surface infiltration systems. This stormwater "treatment train" approach is an effective way to target a wider variety of pollutants while utilizing existing facilities.

4. Protect Slopes and Channels

   There are no significant slopes within the project.

5. Provide Storm Drain System Stenciling and Signage

   All catch basins within the project site will be stenciled as per City Standards to prohibit dumping of improper materials. Legibility of stencils will be maintained. A stencil detail is included in Section VI for reference. Refer to Site Plan in Section VIII for locations of catch basins with stenciling.

6. Properly Design Outdoor Material Storage Areas

   There will be no outdoor material storage areas.

7. Properly Design Trash Storage Areas

   There are no trash enclosures on the project site.

8. Provide Proof of Ongoing BMP Maintenance

   The owner is responsible for maintenance of on-site BMPs in accordance with Section VII. A blank BMP Maintenance Form is provided on page 11. This form will be used to record implementation, maintenance, and inspection of BMPs. Records will be kept for at least five (5) years and must be made available for inspection upon request at any time.

9. Design Standards For Structural or Treatment Control BMPs

   On-site BMPs are designed and sized to treat the BMP design flow. See Section V for BMP Flow-Based Calculations. See Attachment D for BMP Details and Specifications.

10. Non-residential Developments (Commercial or Industrial) must comply with NPDES and/or LID as follows:

    Redevelopment projects, which are developments that result in creation or addition or replacement of either: (1) 5,000 square feet or more of impervious surface on a site that was previously developed; or (2) 10,000 square feet or more of impervious surface area on a site that was previously developed as a single family home.

    - Where 50 percent or more of the impervious surface of a previously developed site is proposed to be altered and the previous development project was not subject to post-construction stormwater quality control measures, the entire development site (e.g. both the existing development and the proposed alteration) must meet the requirements of the LID Standards Manual.
    - Where less than 50 percent of the impervious surface of a previously developed site is proposed to be altered and the previous development project was not subject to post-construction stormwater quality control measures, only the proposed alteration must meet the requirements of the LID Standards Manual.
    - Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways, which does not disturb additional area and maintains the original grade and alignment, is considered routine maintenance activity. Redevelopment does not include repaving of existing roads to maintain original line and grade.

    Requirements:

    A. The 85th percentile, 24-hour rain event is equal to 0.85, which is greater than 0.75
    B. Treatment Control systems will be used.
    C. The site's demand for green roofs and harvest and reuse is not potentially feasible due to the arid climate and high demand.

11. Catch Basin Inspection

    THE BROOKHOLLOW GROUP will be responsible for having all inlets inspected, at a minimum of once per year and cleaned if necessary.

12. Street Sweeping

THE BROOKHOLLOW GROUP will be responsible for having the driveways and parking areas swept immediately prior to October 1st of each year.

13. Water Conservation

Irrigation of landscaped areas is only allowed on Monday, Thursday, and Saturday and between the hours of 4:00 pm and 9:00 am. Over-watering of landscaped areas will be minimized. Hosing down of driveways, sidewalks, parking areas, patios and other paved areas are prohibited.

Source Control BMPs

Education for Property Owners, Tenants and Occupants
Owner will provide information contained within this report to educate its employees of general good housekeeping practices that contribute to the protection of storm water quality. See all attachments.

Common Area Landscape Management
Owner will be responsible for ongoing landscape maintenance of the Project consistent with the County Management Guidelines for Use of Fertilizers and Pesticides (see Attachment B) and County Ordinance No. 0-97-3987, Water Management and Urban Runoff.

BMP Maintenance
Owner will be responsible for implementation of each non-structural BMP and scheduled cleaning of all structural BMP facilities. See Table 1.

Common Area Litter Control
Owner will implement trash management and litter control procedures aimed at reducing off-site migration of trash and pollution of drainage water. Owner may contract with landscape maintenance firms to provide this service during regularly scheduled maintenance, which should consist of litter patrol and emptying of trash receptacles.

Employee Training
Owner will train its employees in the methods of storm water protection and public information. This will include the use of the materials contained within this WQMP.

Common Area Catch Basin Inspection
Owner will be responsible for having the catch basins inspected and cleaned after major rain events and immediately prior to October 1st of each year.

Private Street Sweeping
Owner will be responsible for having the driveways and parking areas swept immediately prior to October 1st of each year and on a regular basis (monthly at minimum).

Provide Storm Drain System Stenciling and Signage

Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message. Stencils and signs alert the public to the destination of pollutants discharged into storm water. The following requirements shall be included in the project design and shown on the project plans:

Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language (such as: "NO DUMPING-DRAINS TO OCEAN") and /or graphical icons to discourage illegal dumping.
Post signs and prohibitive language and/or graphical icons which prohibit illegal dumping at public access points along channels and creeks within the project area.
Maintain legibility of stencils and signs.

Design and Construct Trash and Waste Storage Areas to Reduce Pollution Introduction
The trash enclosure is designed to have drainage diverted around the area, not through the area. The trash bins will have rain tight lids installed.

Use Efficient Irrigation Systems and Landscape Design
The irrigation system will comply with the City and County requirements with respect to water conservation and programmable timers. The landscape areas will comply with the City approved landscape plans and maintenance will comply with the County Management Guidelines on Fertilizers and Pesticides.

V. VOLUME AND FLOW RATE CALCULATIONS

BMP flow quantities are shown below. Calculations were performed using the LADPW HydroCalc (0.2.0-beta) program. The 85th percentile, 24-hour event produces a 0.85-inch storm event, which is greater than the 0.75-inch storm and will be used as required by the LA County LID Manual.

RESULTS:

Flow Calculations:

SUBAREA	AREA (AC)	Q_{PM} (cfs)	Q_{BMP} (cfs)	BMP
A-1	6.26	1.62	2.1	PRETREATMENT SYSTEM

Volume Calculations:

SUBAREA	AREA (AC)	V_{PM} (cf)	V_{BMP} (cf)	BMP
A-1	6.26	16,835	17,245	INFILTRATION SYSTEM

NOTE: Refer to Site Plan in Section VIII for BMP locations and catchment areas.

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VI. BEST MANAGEMENT PRACTICES (BMPs)

Best Management Practices (BMPs) are intended to provide measures which minimize or eliminate the introduction of pollutants into the storm water system. Structural BMPs which are economical, practicable small scale measures to minimize pollutant runoff are to be constructed on new developments as appropriate. Non-structural BMPs include education, cleanup and facility maintenance to prevent pollutants from entering the storm water system.

SELECTED BMPs

The following BMPs have been selected and included as applicable to this site. They shall be implemented in an on going basis throughout the life of the project.

- Contech CDS Units - Proprietary Treatment Controls (T-6)
- ADS infiltration System
- Standard Catch Basin Stencil
- Storm Drain Signage (SD-13)
- Building & Grounds Maintenance (SC-41)

Details, Specifications and Fact Sheets are included in the following pages to offer guidelines and recommendations for installing, implementing, and maintaining the BMPs listed above.

VII. OPERATION AND MAINTENANCE GUIDELINES

Designated Responsible Party:
THE BROOKHOLLOW GROUP or its successors will be responsible for ongoing maintenance of the BMPs listed below.

Proprietary Treatment Device – Contech CDS Units and Filter Inserts:
Clean up and removal of accumulating trash and sediment per manufactures' recommendation

ADS MC-7200 System:
Regular inspection and maintenance are essential to assure a properly functioning stormwater system. A StormTech Isolate Row should initially be inspected immediately after completion of the site's construction, and prior to passing responsibility over to the site's owner. Refer to StormTech Guide for technical maintenance and operation details.

Employees Training Program:
Maintenance Guidelines are included in the Attachments (Section IX) and will be provided to BMP maintenance personnel at the time of hiring.

Recordkeeping
Inspection and Maintenance logs are provided in the following pages. A blank BMP Maintenance Form is provided following the Inspection and Maintenance logs for recording implementation, maintenance, and inspection of additional BMPs. Records will be kept for at least five (5) years and must be made available for inspection upon request at any time.

Transfer of Responsibility
By signing the Maintenance Covenant for SUSMP Requirements (hereinafter referred to as "covenant"), THE BROOKHOLLOW GROUP, agrees that the maintenance responsibilities outlined in the Operation and Maintenance Guidelines will be transferred to future property owners. At the time of transfer, the new property owner will sign the covenant and provide a copy of the recorded covenant to THE BROOKHOLLOW GROUP Department of Public Works.

Operations and Maintenance (O&M) Plan

Water Quality Management Plan
for

Torrance Commerce Center

2271-2311 & 2341 West 205th Street

Torrance, CA 90505

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			
Y	Education for Property Owners, Tenants and Occupants Practical information materials will be provided to the first residents/occupants/tenants on general housekeeping practices that contribute to the protection of stormwater quality. These materials will be initially developed and provided to first residents/occupants/tenants by the developer. Thereafter such materials will be available through the Permittees' education program. Different materials for residential, office commercial, retail commercial, vehicle-related commercial and industrial uses will be developed.	Provide education information to new owners, Tenants and occupants as needed	THE BROOKHOLLOW GROUP
N	Activity Restrictions		
Y	Common Area Landscape Management Identify on-going landscape maintenance requirements that are consistent with those in the County Water Conservation Resolution (or city equivalent) that include fertilizer and/or pesticide usage consistent with Management Guidelines for Use of Fertilizers. Statements regarding the specific applicable guidelines must be included.	Manage landscaping in accordance with County of Orange Water Conservation Ordinance No. 3802 and with Management Guidelines for Use of Fertilizers and Pesticides	Construction Superintendent during construction; THE BROOKHOLLOW GROUP during post-construction.
Y	BMP Maintenance The Project WQMP shall identify responsibility for implementation of each non-structural BMP and scheduled cleaning and/or maintenance of all structural BMP facilities.	See. BMP table.	THE BROOKHOLLOW GROUP
N	Title 22 CCR Compliance		
N	Local Water Quality Permit Compliance		

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
N	Spill Contingency Plan		
N	Underground Storage Tank Compliance		
N	Hazardous Materials Disclosure Compliance		
N	Uniform Fire Code Implementation		
Y	Common Area Litter Control For industrial/commercial developments, the owner should be required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water. The owner may contract with their landscape maintenance firms to provide this service during regularly scheduled maintenance, which should consist of litter patrol, emptying of trash receptacles in common areas, and noting trash disposal violations by tenants or businesses and reporting the violations to the owner for investigation.	Litter Maintenance. Daily.	Construction Superintendent during construction; THE BROOKHOLLOW GROUP during post-construction.
Y	Employee Training Education program (see N1) as it would apply to future employees of individual businesses. Developer either prepares manuals for initial purchasers of business site or for development that is constructed for an unspecified use makes commitment of future business owner to prepare. An example would be training on the proper storage and use of fertilizers and pesticides, or training on the implementation of hazardous spill contingency plans.	Include the education materials contained in the approved Water Quality Management Plan. Monthly for construction maintenance personnel and employees.	THE BROOKHOLLOW GROUP
N	Housekeeping of Loading Docks		

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Y	Common Area Catch Basin Inspection For industrial/commercial developments and for developments with privately maintained drainage systems, the owner is required to have at least 80 percent of drainage facilities inspected, cleaned and maintained on an annual basis with 100 percent of the facilities included in a two-year period. Cleaning should take place in the late summer/early fall prior to the start of the rainy season. Drainage facilities include catch basins, open drainage channels and lift stations. Records should be kept to document the annual maintenance.	Catch Basins will be inspected and cleaned after major rain events and immediately prior to the start of the rainy season on October 1st.	THE BROOKHOLLOW GROUP
Y	Street Sweeping Private Streets and Parking Lots Streets and parking lots are required to be swept prior to the storm season, in late summer or early fall, prior to the start of the rainy season or equivalent as required by the governing jurisdiction.	Parking lot will be swept monthly at a minimum and immediately prior to the start of the rainy season on October 1st.	THE BROOKHOLLOW GROUP

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
	Structural Source Control BMPs		
Y	Provide Storm Drain System Stenciling and Signage Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message. Stencils and signs alert the public to the destination of pollutants discharged into stormwater. The following requirements should be included in the project design and shown on the project plans: 1. Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language (such as: "NO DUMPING – DRAINS TO OCEAN") and/or graphical icons to discourage illegal dumping. 2. Post signs and prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area. 3. Maintain legibility of stencils and signs.	Repaint as necessary but at minimum once every five years. Annually	THE BROOKHOLLOW GROUP
N	Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction		

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
Y	Design Trash Enclosures to Reduce Pollutant Introduction Design trash storage areas to reduce pollutant introduction. All trash container areas shall meet the following requirements: 1. Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash; and 2. Provide solid roof or awning to prevent direct precipitation. Connection of trash area drains to the municipal storm drain system is prohibited. Potential conflicts with fire code and garbage hauling activities should be considered in implementing this source control.	Clean trash container area to prevent buildup of excess trash in area. Daily	Construction Superintendent during construction; THE BROOKHOLLOW GROUP during post-construction.
Y	Use Efficient Irrigation Systems and Landscape Design Projects shall design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system. The following methods to reduce excessive irrigation runoff shall be considered, and incorporated on common areas of development and other areas where determined applicable and feasible by the Permittee: 1. Employing rain shutoff devices to prevent irrigation after precipitation. 2. Designing irrigation systems to each landscape area's specific water requirements.	Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures. Verify that plants continue to be grouped according to similar water requirements in order to reduce excess irrigation runoff. Once a week, in conjunction with maintenance activities.	THE BROOKHOLLOW GROUP

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
	Use Efficient Irrigation Systems and Landscape Design 3. Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. 4. Implementing landscape plan consistent with County Water Conservation Resolution or city equivalent, which may include provision of water sensors, programmable irrigation times (for short cycles), etc. 5. The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the municipal storm drain system. 6. Employing other comparable, equally effective, methods to reduce irrigation water runoff. 7. Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements. Consider other design features, such as: • Use mulches (such as wood chips or shredded wood products) in planter areas without ground cover to minimize sediment in runoff. • Install appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant material where possible and/or as recommended by the landscape architect.		

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
	• Leave a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible. • Choose plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth.		
N	Protect Slopes and Channels		
N	Loading Dock Areas		
N	Maintenance Bays and Docks		
N	Vehicle Wash Areas		
N	Outdoor Processing Areas		
N	Equipment Wash Areas		
N	Fueling Areas		
N	Site Design and Landscape Planning		
N	Wash Water Controls for Food Preparation Areas		
N	Community Car Wash Racks		

Operations and Maintenance Plan

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		
Hydrologic Source Control BMP # 1		
Hydrologic Source Control BMP # 2		
Miscellaneous BMP # 1		
Infiltration BMP # 1 ADS Storm Tech Chamber MC 7200	Regular inspection and maintenance are essential to assure a properly functioning stormwater system. A StormTech Isolate Row should initially be inspected immediately after completion of the site's construction, and prior to passing responsibility over to the site's owner. Refer to StormTech Guide for technical maintenance and operation details.	THE BROOKHOLLOW GROUP
Infiltration BMP # 2		
Harvest and use BMP # 1		
Harvest and use BMP # 2		

Operations and Maintenance Plan

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		
Biotreatment BMP #		
Treatment Control BMPs		
Treatment Control BMP #1		
Pre-Treatment/Gross Solids Removal BMPs		
Pre-Treatment BMP # 1 Contech CDS	Inspection and minor maintenance procedures include inspection of the vault itself and removal of vegetation and trash and debris. Major maintenance activities include cartridge replacement and sediment removal. Two scheduled inspections/maintenance activities should take place during the year. The condition of the CDS unit should be checked after major storms for damage cause by high flows and for high sediment accumulation. Refer to Contech CDS and Maintenance specifications for technical maintenance details.	THE BROOKHOLLOW GROUP

Section X, Operations and Maintenance Plan

Required Permits

No permits are required for the implementation, operation, and maintenance of the BMPs.

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

Responsible Party

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

Name:	Robert Knapp
Company:	THE BROOKHOLLOW GROUP
Title:	
Address 1:	151 Kalmus Drive, Suite F-1
Address 2:	Costa Mesa, CA 92626
Phone Number:	714-850-3906
Email:	

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.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

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

BMP IMPLEMENTATION MAINTENANCE FORM

Today's Date: _____

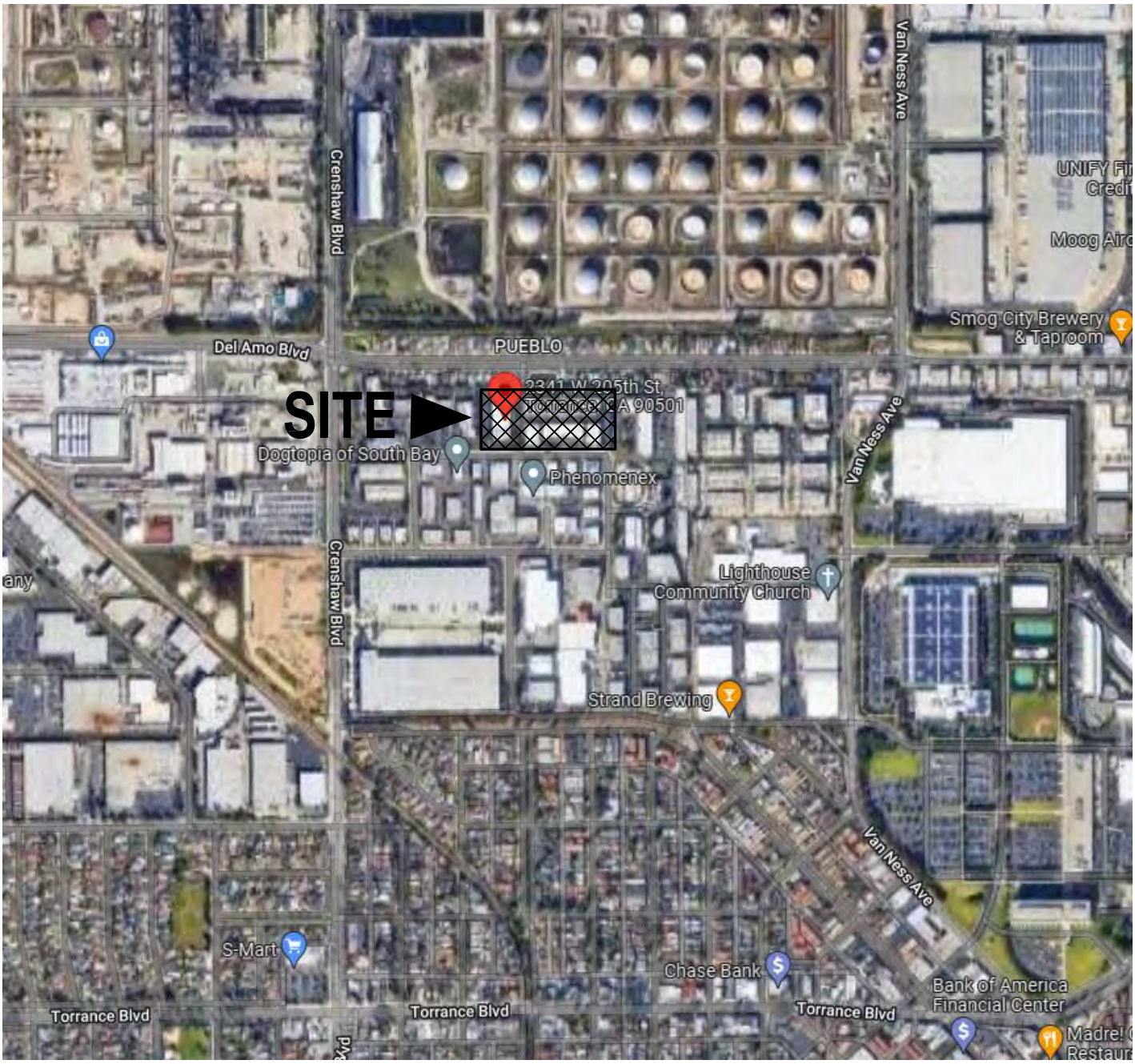
Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

SECTION VIII

VICINITY MAP
SITE PLAN



N

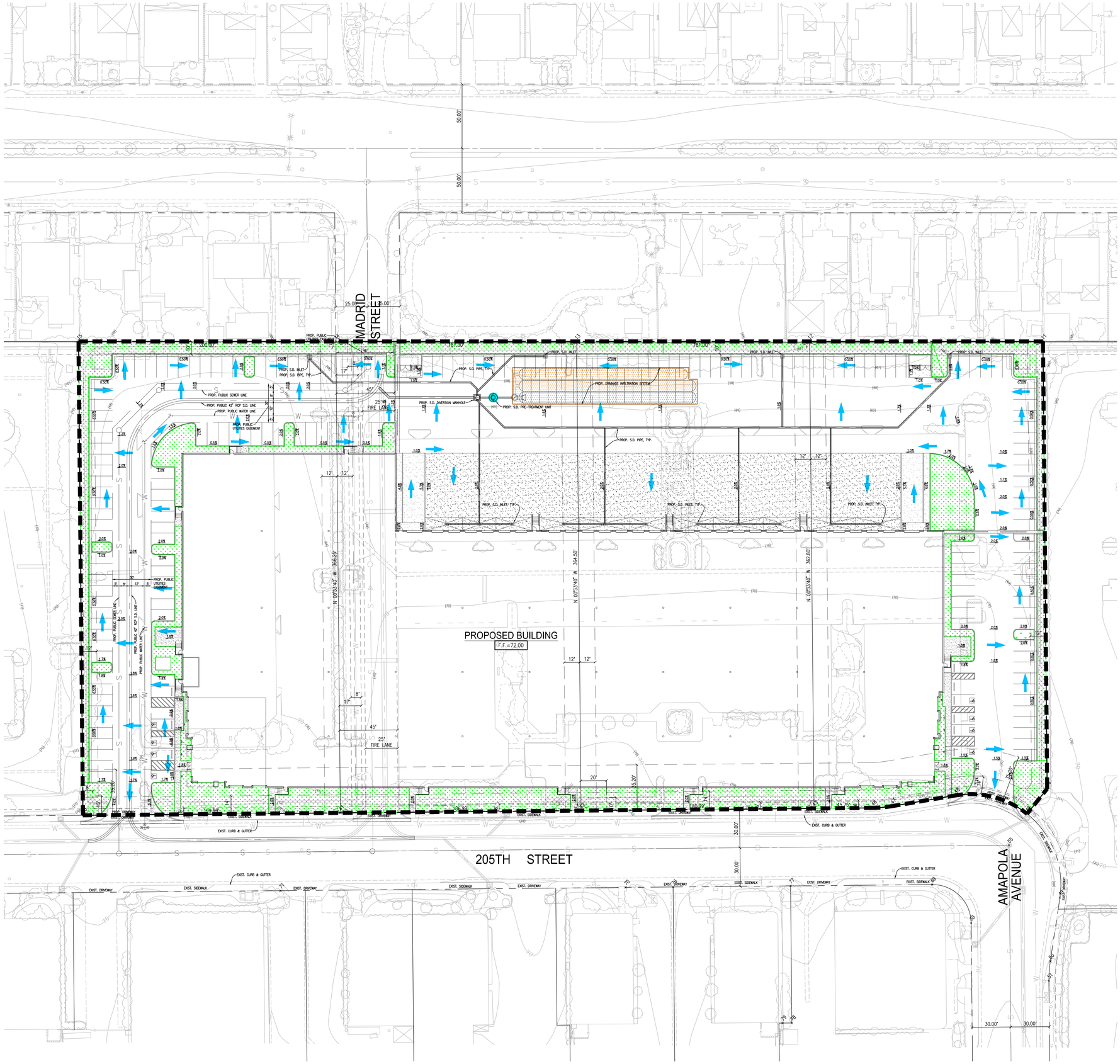
NO SCALE

WALDEN & ASSOCIATES
CIVIL ENGINEERS - LAND SURVEYORS - PLANNERS
2552 WHITE ROAD, SUITE B• IRVINE, CA 92614-6236
(949) 660-0110 FAX: 660-0418

LOCATION MAP

TORRANCE COMMERCE CENTER
TORRANCE, CA

W.O. No. 2089-940-001 Date 03/2022
Engr. DI Chk'd. MP Sheet 1 of 1



LEGEND:

- SURFACE DRAINAGE PATTERN
- DENOTES DRAINAGE TRIBUTARY AREA BOUNDARY
- PERVIOUS AREA
- SUBSURFACE INFILTRATION CHAMBERS (MC-7200)
- PRE-TREATMENT DEVICE (CDS 3020-6-C)
- DMA-A / 6.26 — DENOTES DRAINAGE AREA DESIGNATION; DENOTES DRAINAGE AREA IN ACRES

DMA	AREA AC	IMP. SF	PERV. SF
A-1	6.26	30,492	242,194

BMP	Vreq CF	Vbmp CF	Drawdown HR	GPS LAT, LONG
INF.	16,835	17,245	91	33.846330, -118.324285

BMP	Qreq CFS	Qbmp CFS	MODEL CDS	GPS LAT, LONG
PRE.	1.62	2.1	3020-6-C	33.846330, -118.324285

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LAND SURVEYORS
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LOW IMPACT DEVELOPMENT PLAN

FOR

2271-2311 & 2341 West 205th Street

TORRANCE, CALIFORNIA

JOB NUMBER 2089-940-001
DATE: 07/2022
DRAWN: MP
CHECKED: MP
SHEET 1 OF 1

SECTION IX

ATTACHMENTS

ATTACHMENT A

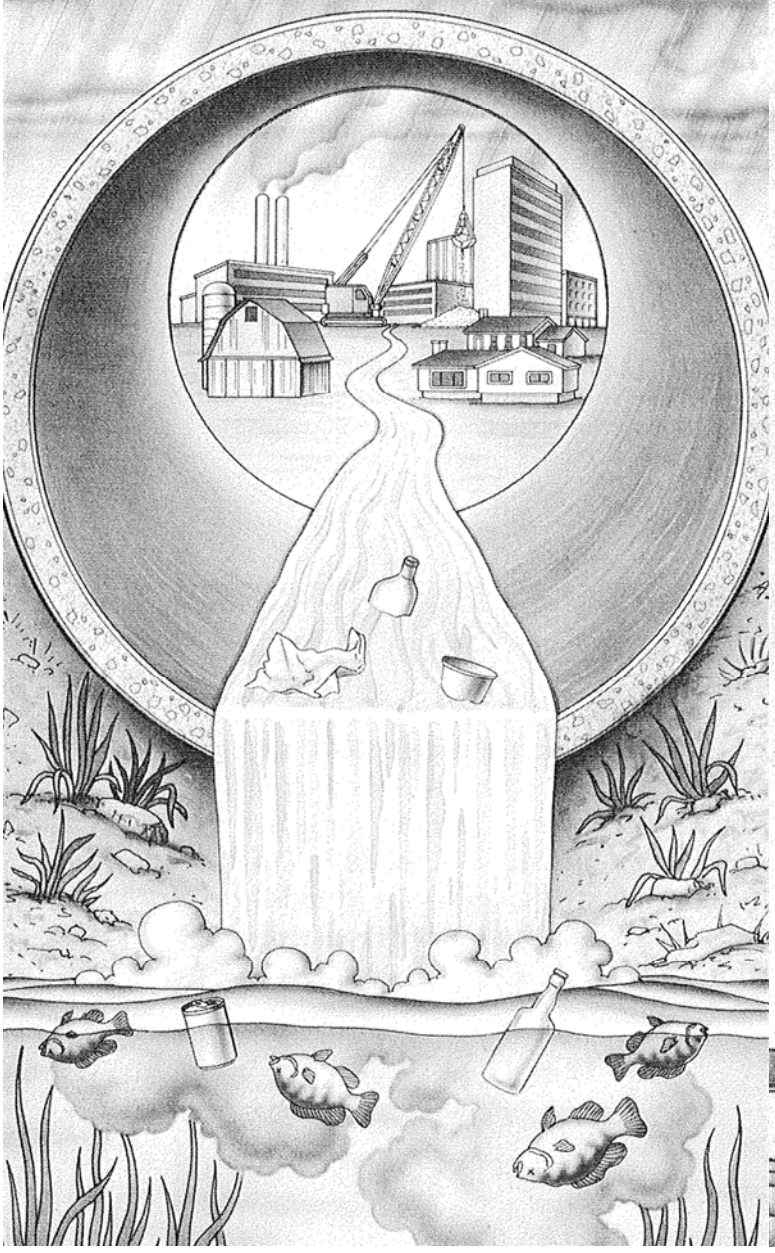
EPA: WHEN IT RAINS IT DRAINS

United States Environmental Protection Agency
August 1993
832-F-93-002
Office of Water
WH-547

EPA

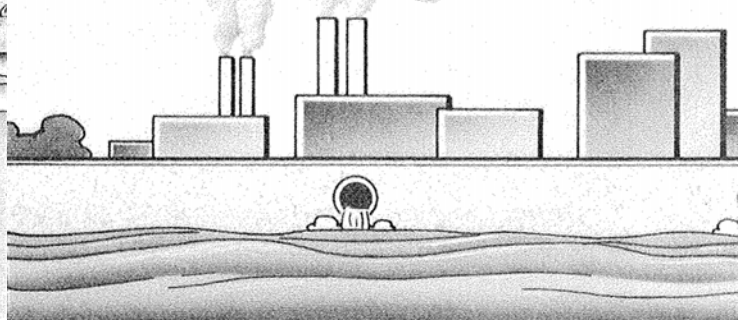
When It Rains, It Drains

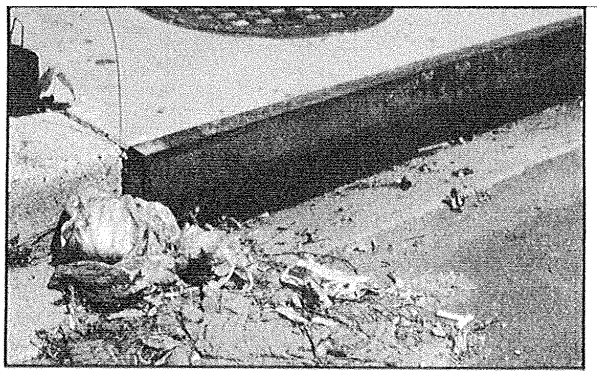
What Everyone Should Know About Storm Water



WHAT IS STORM WATER?

Storm water is water from precipitation that flows across the ground and pavement when it rains or when snow and ice melt. The water seeps into the ground or drains into what we call storm sewers. These are the drains you see at street corners or at low points on the sides of your streets. Collectively, the draining water is called storm water runoff and is a concern to us in commercial and industrial sites as well as your neighborhood because of the pollutants it carries.





Debris along street picked up by storm water.

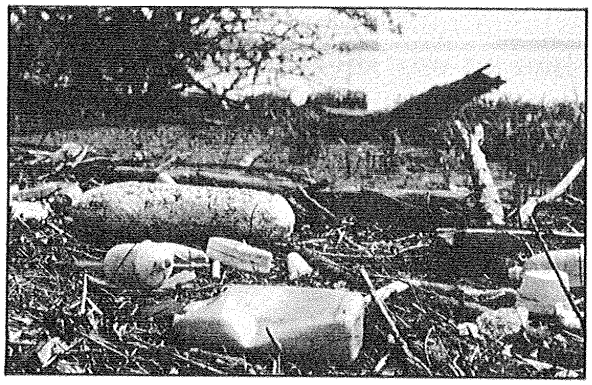
WHY IS STORM WATER A PROBLEM?

Storm water is a problem when it picks up debris, chemicals, and other pollutants as it flows or when it causes flooding and erosion of stream banks. The pollutants are deposited untreated into our waterways. The result can be the closing of our beaches; no swimming, fishing or boating; and injury to the plants and animals that live in or use the water.

WHAT ARE THESE POLLUTANTS? WHERE DO THEY COME FROM ? WHAT ARE SOME OF THEIR EFFECTS ON PLANTS, ANIMALS, AND HUMANS ?

The following information will answer these questions and let you know what you and your community can do to help recognize where there could be a problem and what to do to help solve it !

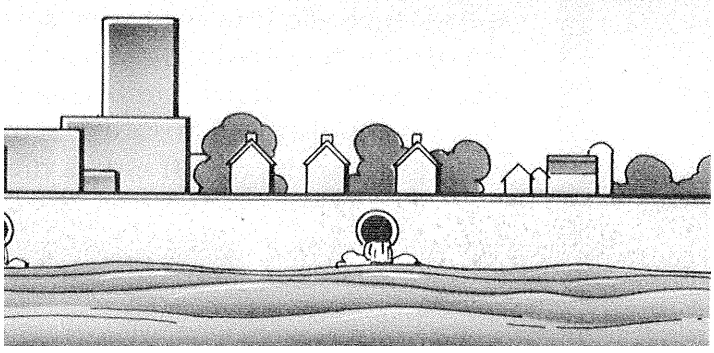
EPA has a storm water program that, with your help, can keep our rivers, lakes, streams, and oceans open to use and enjoyment, and healthy for plants and animals to live in.



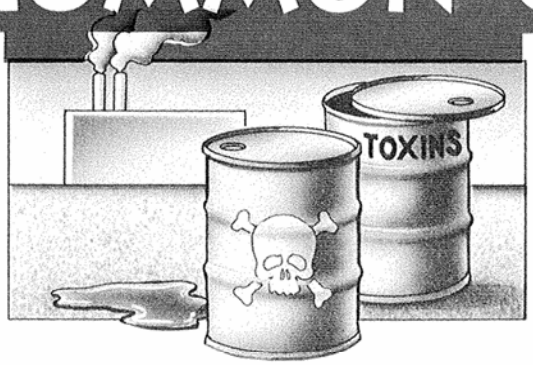
Debris washed up on the beach by storm water.

WHERE DOES THE STORM WATER GO AFTER IT DRAINS INTO STORM SEWERS?

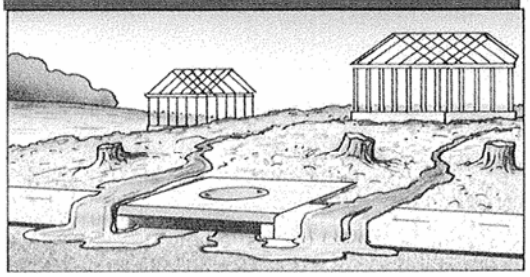
Storm water that does not seep into the ground, drains into systems of underground pipes or roadside ditches and may travel for many miles before being released into a lake, river, stream, wetland area, or coastal waters.



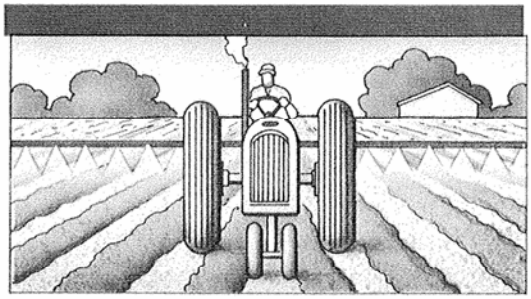
COMMON CONTRIBUTORS TO



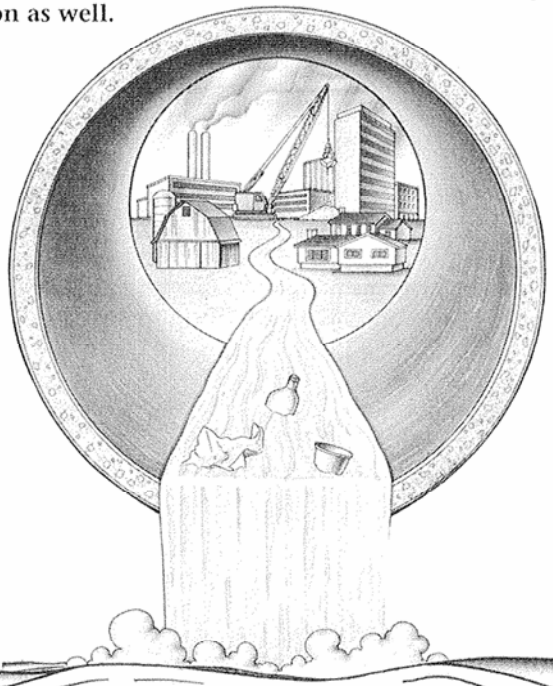
INDUSTRY – At industrial sites, chemical spills that contain toxic substances, smoke stacks that spew emissions, and uncovered or unprotected outdoor storage or waste areas can contribute pollutants to storm water runoff.



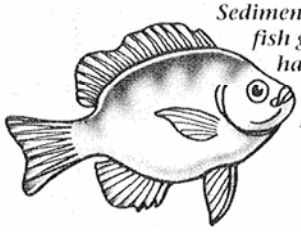
CONSTRUCTION – Waste from chemicals and materials used in construction can wash into our waterways during wet weather. Soil that erodes from construction sites can contribute to environmental degradation as well.



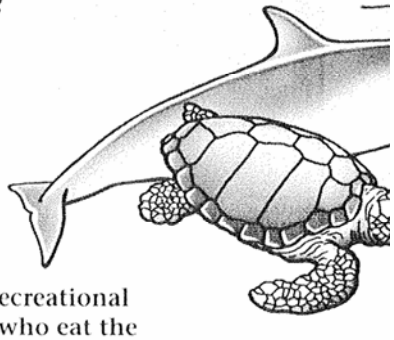
AGRICULTURE – Pesticides, fertilizers, and herbicides used in crop production can be toxic to aquatic life and can contribute to over-enrichment of the water, causing excess algae growth and oxygen depletion. Although storm water runoff from agricultural areas is not regulated under the EPA storm water permitting program, it is a nonpoint source of storm water pollution covered under other EPA programs.



WHAT ARE SOME OF THEIR EFFECTS ON PLANTS, ANIMALS, AND HUMANS?

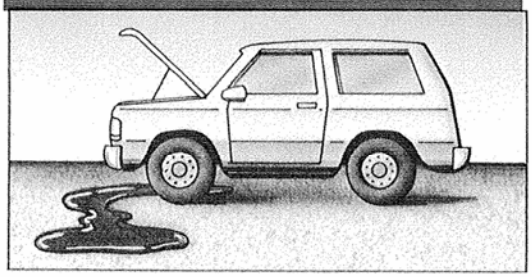


Sediment and other debris clog fish gills, damage fish habitat, and block the light needed for the plants to survive.

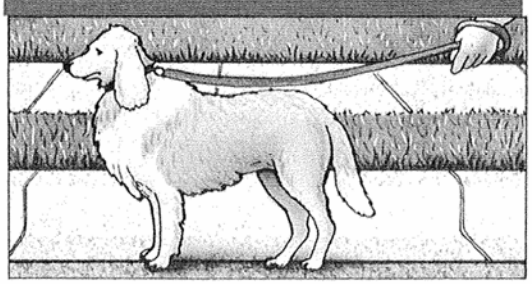


When polluted storm water runoff reaches our waterways, it can have many adverse effects on aquatic plant and animal life, other wildlife that use the water, humans who drink the water, use it for fishing, boating, swimming and other recreational activities, and on humans and animals who eat the contaminated fish and other seafood.

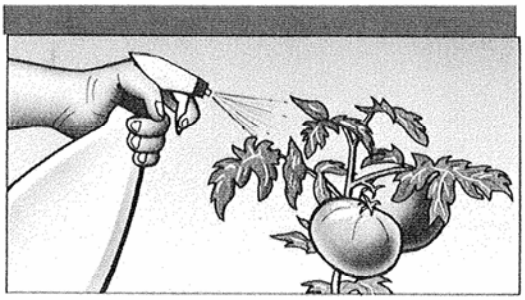
STORM WATER POLLUTION



HOUSEHOLD – Vehicles drip fluids (oil, grease, gasoline, antifreeze, brake fluids, etc.) onto paved areas where storm water runoff carries them through our storm drains and into our waterways.



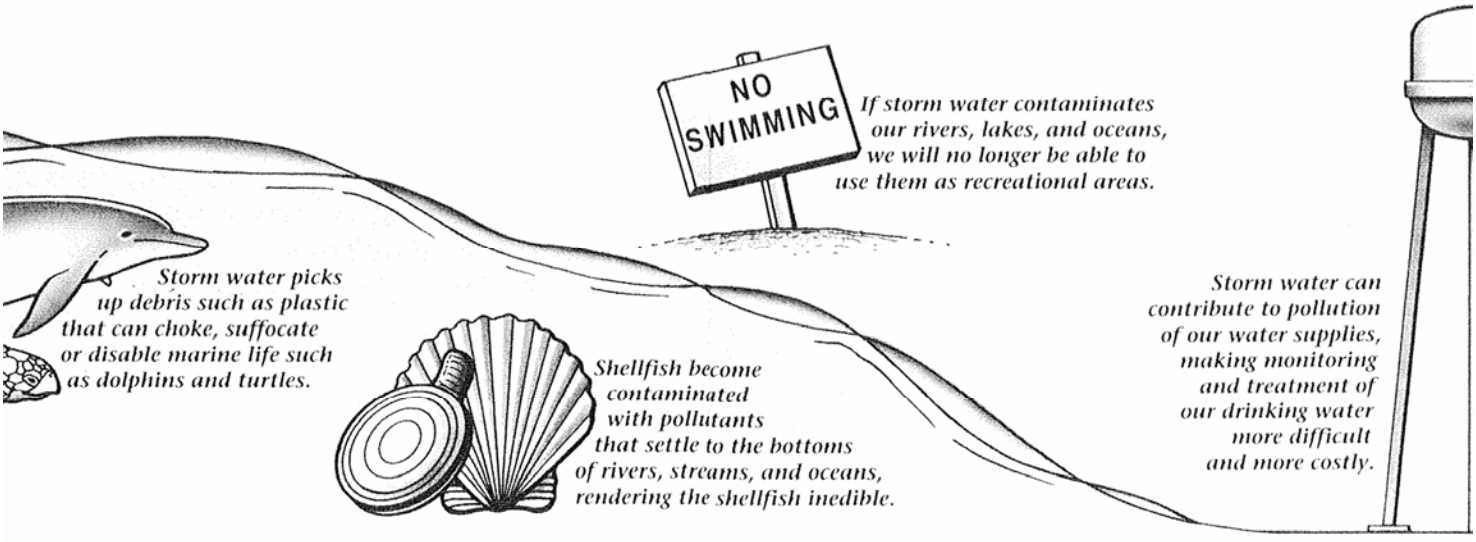
HOUSEHOLD – Pet wastes left on the ground get carried away by storm water, contributing harmful bacteria, parasites and viruses to our waterways.



HOUSEHOLD – Chemicals used to grow and maintain beautiful lawns and gardens, if not used properly, can run off into the storm drains when it rains or when we water our lawns and gardens.

OTHER COMMON HOUSEHOLD PRODUCTS THAT COULD CAUSE POLLUTION IF CARRIED OFF BY STORM WATER RUNOFF OR DUMPED DOWN STORM SEWERS:

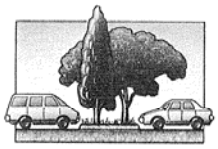
- Ammonia-based cleaners, drain cleaners
- Car care products such as detergents with phosphate and car waxes
- Paint, paint thinners, varnish, furniture refinishing products, paint brush cleaners
- Concrete or wood sealants
- Degreasers
- Chlorine bleaches and disinfectants (for swimming pools, etc.)



MUNICIPAL PROGRAM

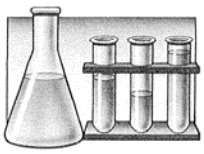
Here are some of the most important steps your community can take to control storm water pollution:

Prevent the release into the storm sewer system of hazardous substances such as used oil or household or yard chemicals

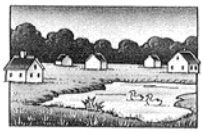


Make sure new commercial and residential developments include storm water management controls, such as reducing areas of paved surfaces to allow storm water to seep into the ground.

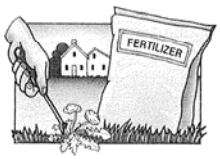
Promote practices such as street sweeping, limiting use of road salt, picking up litter, and disposing of leaves and yard wastes quickly.



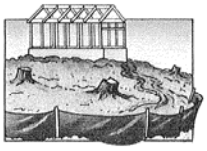
Collect samples of storm water from industrial sites to see whether pollutants are being released. If so, identify the type and quantity of pollutants being released.



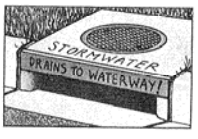
Design and institute flood control projects in a way that does not impair water quality.



Prevent runoff of excess pesticides, fertilizers, and herbicides by using them properly and efficiently. (Commercial, institutional, and residential landscapes can be designed to prevent pollution, conserve water, and look beautiful at the same time.)



Make sure that construction sites control the amount of soil that is washed off by rain into waterways.

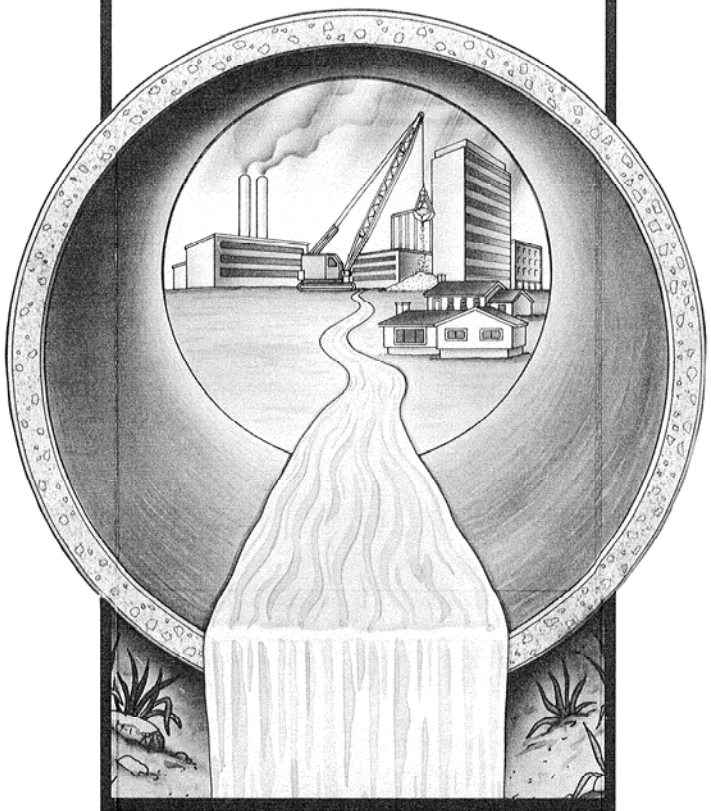


Promote citizen participation and public group activity to increase awareness and education at all levels. Encourage local collection pick-up days and recycling of household hazardous waste materials to prevent their disposal into storm drains.

MUNICIPAL SUCCESS STORY

A northwest city, recognizing the need for storm water management, set up a special water utility to oversee all local government storm water control activities and to raise the money for storm water projects. The city collects fees from citizens using the storm water sewer system and uses the funds to implement storm water programs. The program is still successfully providing funds for such varied purposes as flood control, maintenance of existing storm water controls, and public education.

We can agree that the best way to protect water quality is to avoid polluting it in the first place. EPA has a National Storm Water Permit Program that focuses on municipal and industrial pollution prevention to help control storm water pollution. This program involves issuing permits to certain municipalities and industries to control storm water pollution. Development of State and local storm water management programs can help to achieve the Clean Water Act goals of fishable and swimmable waters.



MUNICIPAL PROGRAM

Permits issued for municipal storm water systems allow communities to design storm water management programs that are suited for controlling pollutants in their own municipal systems. EPA hopes this flexibility will encourage community interest and participation in solving storm water runoff problems.

INDUSTRIAL PROGRAM

Most permits issued under the storm water program require development and use of a storm water pollution prevention plan. Such plans describe how the facility will prevent storm water from becoming polluted by making sure that:

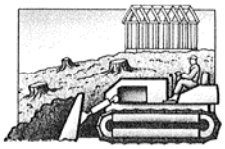
- Potential pollutants are not left outside uncovered
- Spills are prevented
- If spills occur, they are cleaned up right away
- There is no dumping of polluting substances into storm drains
- Grass and other vegetation is planted as quickly as possible after soils are disturbed

Some permits may require more extensive pollution control.

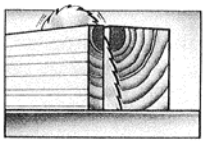
INDUSTRIAL PROGRAM

Storm water permits require many industrial facilities to prepare and implement storm water pollution prevention plans. Listed below are examples of industries and their pollution prevention activities.

Owners of construction sites that disturb 5 or more acres must develop a plan before beginning construction. The plan must limit the area of disturbed soil and provide controls — like sediment basins — to keep sediment from running off.

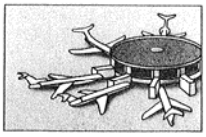


Operators of saw mills can reduce pollution by storing their materials and processing their products indoors; and removing any by-products from outdoor areas before these products come in contact with storm water runoff.

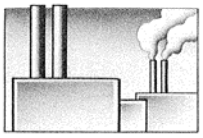


Operators of landfills should keep the storm water runoff from flowing over the pollutants and carrying them off the landfill site.

Airport employees can reduce storm water runoff pollution by using de-icing chemicals only in designated collection areas and by cleaning oil and grease spills from pavement immediately.

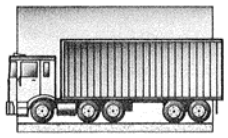


Chemical plant operators should develop spill prevention plans and use types of containers that do not rust or leak, eliminating exposure of materials to storm water runoff.

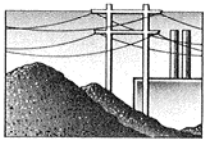


Owners of automobile junkyards should drain fluids from junked cars and properly dispose of hazardous chemicals.

Operators of trucking terminals should develop good housekeeping practices that clean up leaks and spills of oil and grease from the path of storm water runoff.



Power plant operators often store piles of coal and other fuels that have toxic components. Runoff from coal piles must be treated; other substances should be stored away from any possible contact with storm water runoff.



INDUSTRIAL SUCCESS STORY

A manufacturing facility located in a large midwestern city took an innovative approach to storm water management. Employees at a plant with a large fueling station noticed that during a rain storm, the runoff flowing into the city's storm sewer system had an oily sheen, caused by spilled fuel. To prevent future spills, the plant trained its drivers to avoid overfilling fuel tanks, laid down sawdust around the fueling station to absorb any accidental spills (the plant is careful not to wash the sawdust down the drain), and installed an oil/water separator to remove oil from the runoff before the runoff enters the storm drain.

WHAT CAN I DO TO HELP ?

First, become more aware of what may be causing storm water pollution in your area.

Second, help your municipality by:

1. Reporting to your local municipal officials -
   - Any dumping of inappropriate materials into storm water drains (such as oil, antifreeze).
   - Construction sites over 5 acres that do not have erosion or sediment controls.
2. Using good housekeeping practices with lawn care chemicals, oil, gasoline, pet wastes, etc.
3. Helping to start or participating in programs to recycle and safely dispose of used oil and household hazardous wastes and containers.
4. Telling others about pollution from storm water runoff and what they can do to help.

WHERE CAN I FIND OUT MORE INFORMATION?

Your EPA Regional Office
(Water Management Division)

1. EPA Region I (CT, ME, MA, NH, RI, VT)
   JFK Federal Bldg.; Boston, MA 02203
   617-565-3478
2. EPA Region II (NJ, NY, PR, VI)
   26 Federal Plaza; New York, NY 10278
   212-264-2513
3. EPA Region III (DE, MD, PA, VA, WV, DC)
   841 Chestnut Street; Philadelphia, PA 19107
   215-597-9410
4. EPA Region IV (AL, GA, FL, MS, NC, SC, TN, KY) 345 Courtland St., NE; Atlanta, GA 30365
   404-347-4450
5. EPA Region V (IL, IN, OH, MI, MN, WI)
   77 W. Jackson Blvd.; Chicago, IL 60604
   312-353-2145
6. EPA Region VI (AR, LA, OK, TX, NM)
   1445 Ross Ave., Suite 1200
   Dallas, TX 75202-2733
   214-655-7100
7. EPA Region VII (IA, KS, MO, NE)
   726 Minnesota Ave.; Kansas City, KS 66101
   913-551-7030
8. EPA Region VIII (CO, UT, WY, MT, ND, SD)
   999 18th St., Suite 500; Denver, CO 80202
   303-293-1542
9. EPA Region IX (AZ, CA, GM, HI, NV)
   75 Hawthorne Street; San Francisco, CA 94105
   415-744-2125
10. EPA Region X (AK, ID, OR, WA)
    1200 Sixth Ave.; Seattle, WA 98101
    206-553-1793

Other sources include:

- Storm Water Hotline (703) 821-4823
- State and Local Agencies

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ATTACHMENT B

EPA: PREVENTING POLLUTION THROUGH EFFICIENT WATER USE

United States Environmental Protection Agency
20W-0002
Reprinted
April 1997
OW (4204)
OPPE (2164)

EPA

Preventing Pollution Through Efficient Water Use

EPA

For more information on what you and your community can do to use water more efficiently, contact:

U.S. Environmental Protection Agency
Office of Water
401 M Street, S.W.
Washington, D.C. 20460

For more information on pollution prevention programs at U.S. EPA, contact:

U.S. Environmental Protection Agency
Office of Pollution Prevention
401 M Street, S.W.
Washington, D.C. 20460

How Efficient Water Use Helps Prevent Pollution

Other Reasons to Use Water Wisely

What Individuals Can Do

What Communities Can Do

How Efficient Water Use Helps Prevent Pollution

Using water more efficiently can help prevent pollution as well as protect and conserve our finite water resources. More efficient water use by you and your community has many other benefits.

Fewer Pollutants

- Using less water reduces the amount of wastewater discharged into our lakes, streams, rivers, and marine waters.
- The amount of pollutants wastewater carries can also be reduced, as treatment efficiency improves.
- Recycled process water can reduce pollutants from industry.
- More efficient irrigation can minimize runoff of agricultural pollutants and reduce the use of fertilizers and pesticides.

Protection of Aquatic Habitats

- Building fewer and smaller new water projects can help preserve wetlands, which naturally treat pollutants.
- Diverting less water preserves more streamflow to maintain a healthy aquatic environment.

Protection of Drinking Water Sources

- Less pumping of groundwater lowers the chance that pollutants will be drawn into a water supply well.
- With less water use, septic system performance can improve, reducing the risk of groundwater contamination.
- Highest quality water sources are preserved for drinking water by using treated wastewater for other uses.

Energy Conservation

- Efficient water use means less power needed to pump and treat water and wastewater.
- Less water use reduces the amount of energy required for heating hot water.
- Less energy demand results in fewer harmful by-products from power plants.

Other Reasons to Use Water Wisely

Preventing pollution is only one reason why using water efficiently makes sense. Here are a few more:

Money Saved

- Less water use results in fewer pumping and treatment costs.
- Saving money on water and wastewater operations frees money for meeting water quality, public health and water treatment goals.
- Water saved is also energy, and money, saved for you and your community.

Improved Reliability

- Water conservation provides a hedge against drought impacts.
- Improving water efficiency may be quicker and cheaper than developing a new supply.
- Reduced water use may extend the life of your water or wastewater facility.
- Reduced water use may increase the efficiency of wastewater treatment, and reduce overflows during storms.
- Communities which use water efficiently are better prepared to cope with effects of possible future climate change.

What Individuals Can Do

More efficient water use begins with individuals, in the home and place of work. Taking these and other steps, and encouraging others to do so, makes good economic as well as environmental sense.

In The Home

- Install a toilet dam or plastic bottle in your toilet tank.
- Install a water-efficient showerhead (2.5 gallons or less per minute).
- When you buy a new toilet, purchase a low flow model (1.6 gallons or less per flush).

Outdoors

- Water in the morning or evening, to minimize evaporation.
- Install a drip-irrigation watering system for valuable plants.
- Use drought-tolerant plants and grasses for landscaping, and reduce grass-covered areas.

At Work or School

- Adopt the same water-saving habits that are effective at home.
- Ask about installing water-efficient equipment and reducing outdoor water use.
- Encourage employers to explore the use of recycled "gray-water" or reclaimed wastewater.

What Communities Can Do

A water supplier or wastewater system operator (public or private) has cost-effective options to process and deliver water more efficiently. A community can do the same, and can foster ways to use water wisely.

Not all of these steps are expensive. The best choices vary by region and by community; start by asking if these are appropriate where you live and work.

A Water Supplier or Wastewater Processor Can:

- ☞ Identify who uses water, and reduce unaccounted-for water use.
- ☞ Find and repair leaking pipes.
- ☞ Consider a new pricing scheme which encourages conservation.
- ☞ Reduce excess pressure in water lines.
- ☞ Explore the reuse of treated wastewater for uses other than drinking water.
- ☞ Charge hookup fees which encourage more efficient water use in new buildings.
- ☞ Build water efficiency into future demand projections, facility planning, and drought planning.

A Community Can:

- ☞ Adopt plumbing and building codes that require water-efficient equipment and practices.
- ☞ Adopt a water-efficient landscaping ordinance to reduce the water used for golf courses and commercial landscapes.
- ☞ Retrofit older buildings with water-efficient equipment, starting with public buildings.
- ☞ Reduce municipal water use for landscaping and other uses.
- ☞ Conduct a public education campaign.
- ☞ Require developers to build in water efficiency measures.

ATTACHMENT C

SOLUTION TO POLLUTION
TWENTY WAYS TO PROTECT YOUR WATER

The Solution to Pollution - Begins with YOU!

Here are 20 WAYS that YOU can make a difference.

YOUR YARD

1. Apply pesticides and fertilizers carefully and sparingly. Do not apply chemicals if heavy rain is forecast.

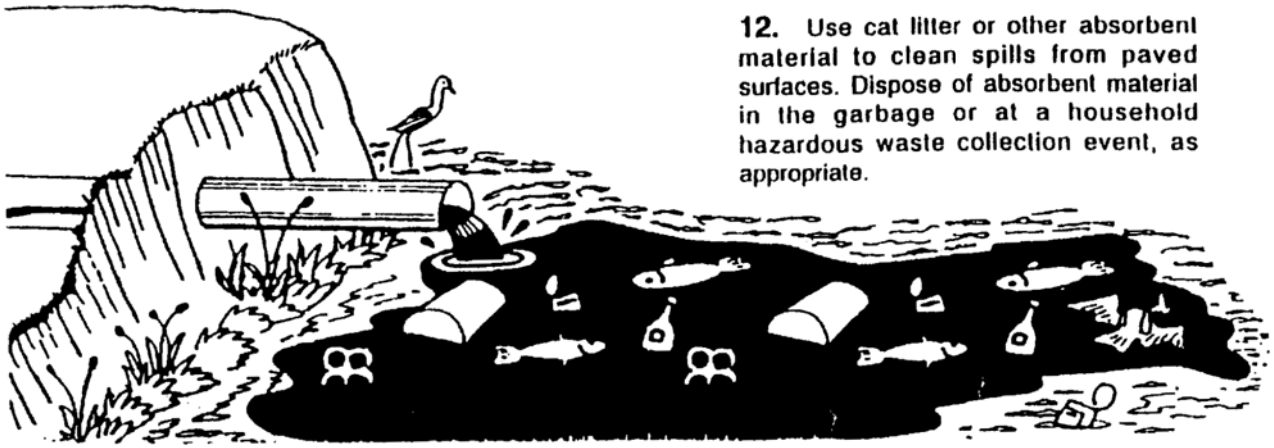
2. Use a broom, rather than a hose, to clean up garden clippings. Deposit leaves and clippings in a trash can or a compost pile.

3. Divert rainwater runoff from hard surfaces onto grass and permeable soil to help filter harmful substances.

4. Don't overwater your lawn and garden . . . water will only run into the street and storm drain.

5. Pick up animal waste and dispose of it in trash cans. Animal waste contains coliform bacteria and can spread serious diseases.

6. Control soil erosion. Prevent dirt and debris from washing into storm drains.



YOUR HOME

7. Use and dispose of household products carefully. Cleaning solutions and solvents often contain toxic elements.

8. Use non-hazardous cleaning substances such as baking soda, white vinegar or borax.

9. Take unwanted household hazardous materials to a Countywide Household Hazardous Waste collection event or other local collection programs.

10. When using water-based paints, clean brushes in a sink. Don't pour clean-up water down the storm drain. Dispose of oil-based products and solvents at a hazardous waste collection event.

11. Buy recycled products and recycle reusable materials. Many waste haulers provide curb-side service. Call yours for more information.

12. Use cat litter or other absorbent material to clean spills from paved surfaces. Dispose of absorbent material in the garbage or at a household hazardous waste collection event, as appropriate.

YOUR AUTO

13. Take used motor oil, antifreeze and other toxic solvents to collection centers.

14. Fix oil, radiator, and transmission leaks. Don't leave oil slicks to wash off in the rain.

15. Take your car to a car wash or wash your car on the grass. Don't just wash grimy road dirt down the driveway and into the storm drain.

16. Reduce polluting automotive emissions. Keep your car tuned, carpool, and use public transportation.

YOUR NEIGHBORHOOD

17. ***Never pour anything into a storm drain.***

18. Tell others how to prevent stormwater pollution. Don't let others pollute your water.

19. Report illegal dumping to local authorities.

20. Organize a stenciling campaign in your neighborhood. (Storm drain stencils remind us that there should be "only rain in the drain.") Call us for information on how to stencil.

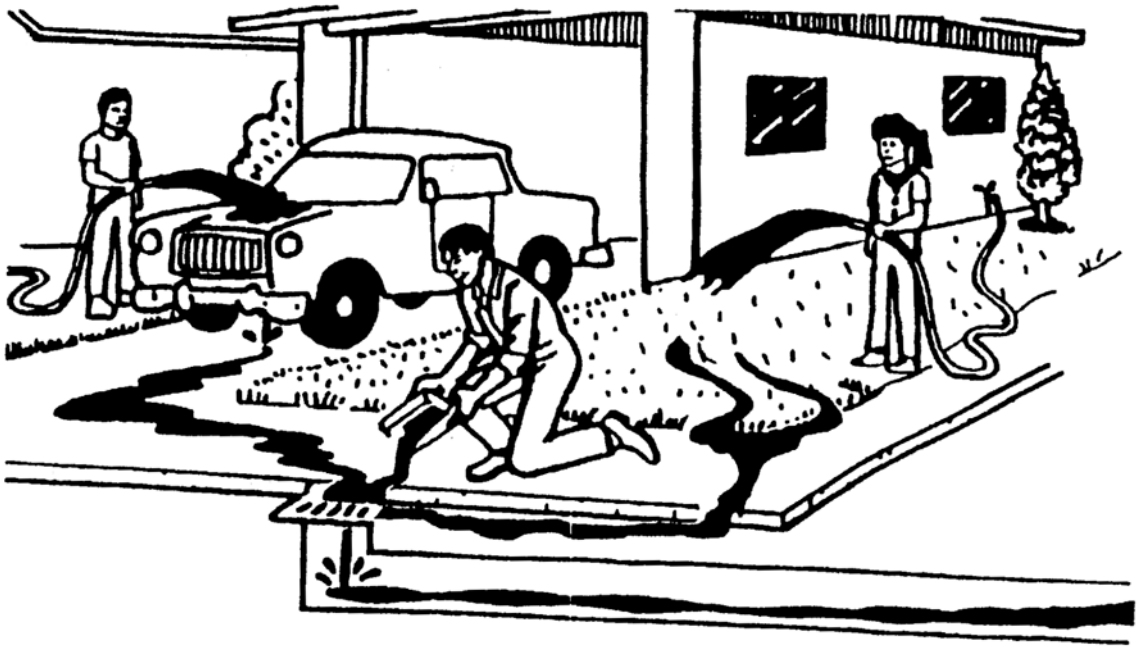
Twenty Ways to Protect Your Water

You Can Make A Difference!

Stormwater pollution . . . is fouling our water!

Every day, water from garden hoses, sprinklers and rainfall washes pollutants off roads and yards . . . right into neighborhood storm drains. Storm drains carry untreated water and pollutants ***directly*** *to our water resources.*

Some pollutants, such as grease and dirt from streets, reach the storm drains unintentionally. But, many pollutants like used motor oil, detergents, paints, and solvents, are carelessly dumped into the storm drains.



Polluted stormwater harms wildlife, jeopardizes the use of our rivers and lakes for recreation . . . and may eventually contaminate the water we drink!

SECTION X

APPENDIX

Peak Flow Hydrologic Analysis

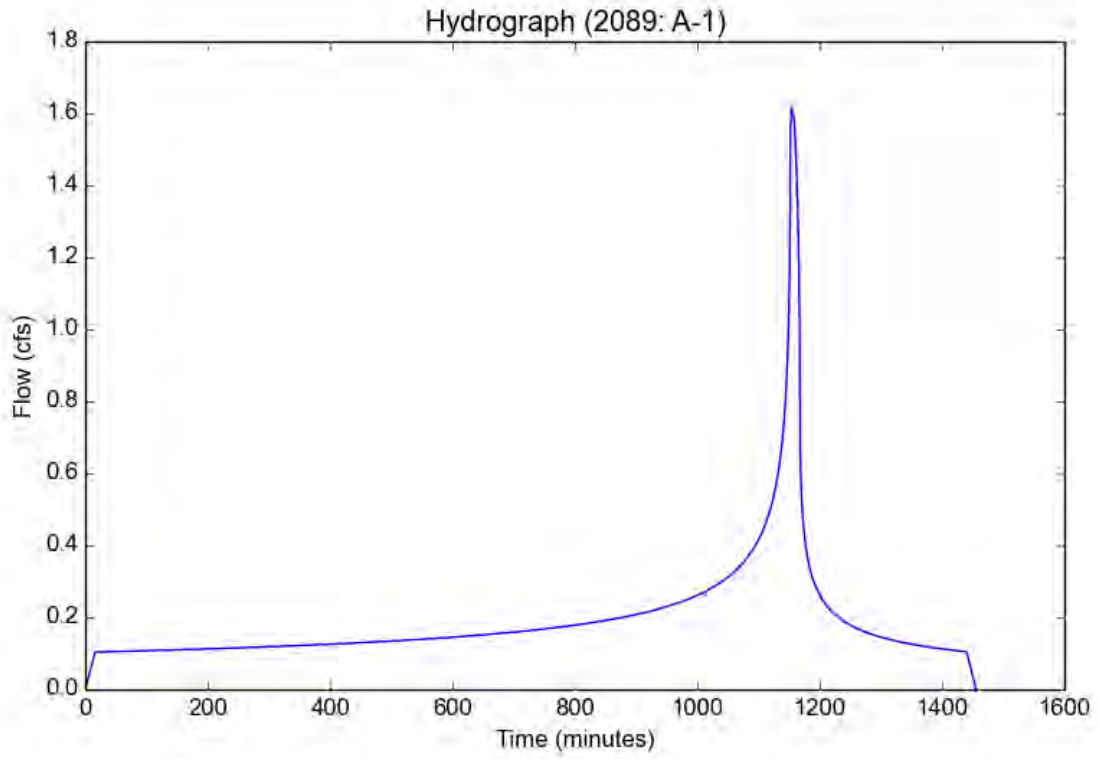
File location: G:/projdata/2089 W. 205th Street, Torrance/DWG/WQMP-SWPPP/Hydrocalc/2089 - A-1.pdf
Version: HydroCalc 1.0.3

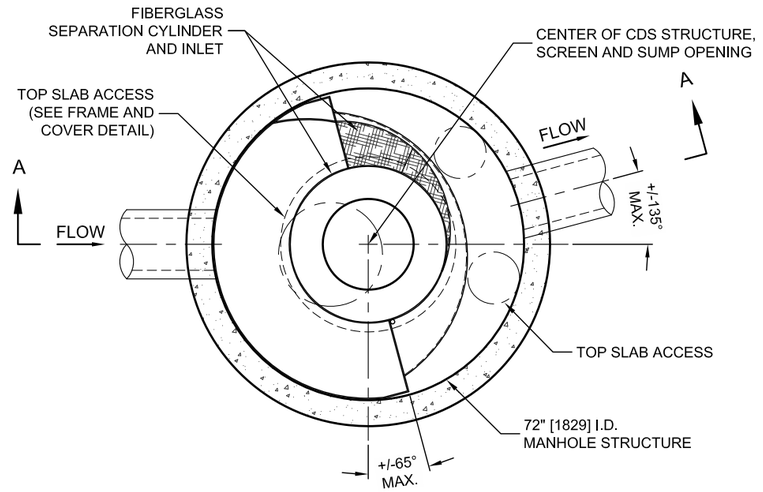
Input Parameters

Project Name	2089
Subarea ID	A-1
Area (ac)	6.26
Flow Path Length (ft)	184.0
Flow Path Slope (vft/hft)	0.005
85th Percentile Rainfall Depth (in)	0.92
Percent Impervious	0.89
Soil Type	10
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

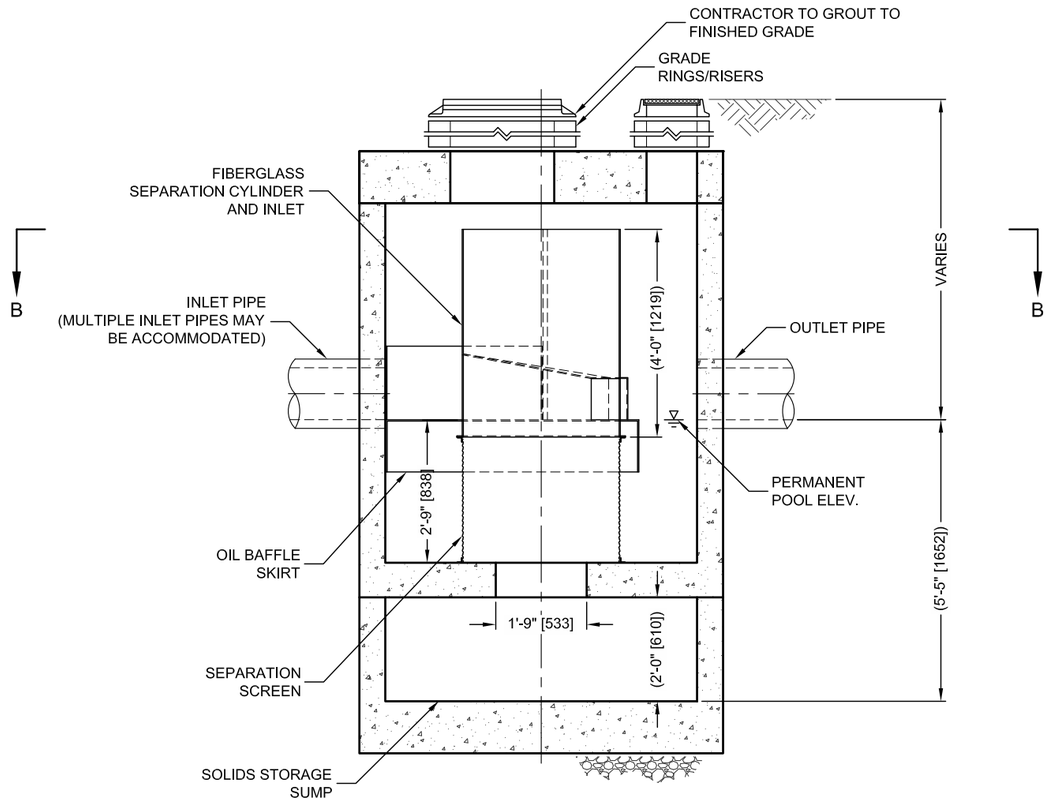
Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.92
Peak Intensity (in/hr)	0.3177
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.812
Time of Concentration (min)	16.0
Clear Peak Flow Rate (cfs)	1.6151
Burned Peak Flow Rate (cfs)	1.6151
24-Hr Clear Runoff Volume (ac-ft)	0.3865
24-Hr Clear Runoff Volume (cu-ft)	16835.3479





PLAN VIEW B-B
N.T.S.

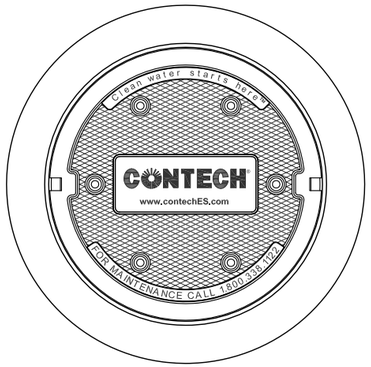


ELEVATION A-A
N.T.S.

CDS3020-6-C DESIGN NOTES

THE STANDARD CDS3020-6-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS3020-6-C
INLINE CDS
STANDARD DETAIL

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

2089
TORRANCE, CA

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-7200 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

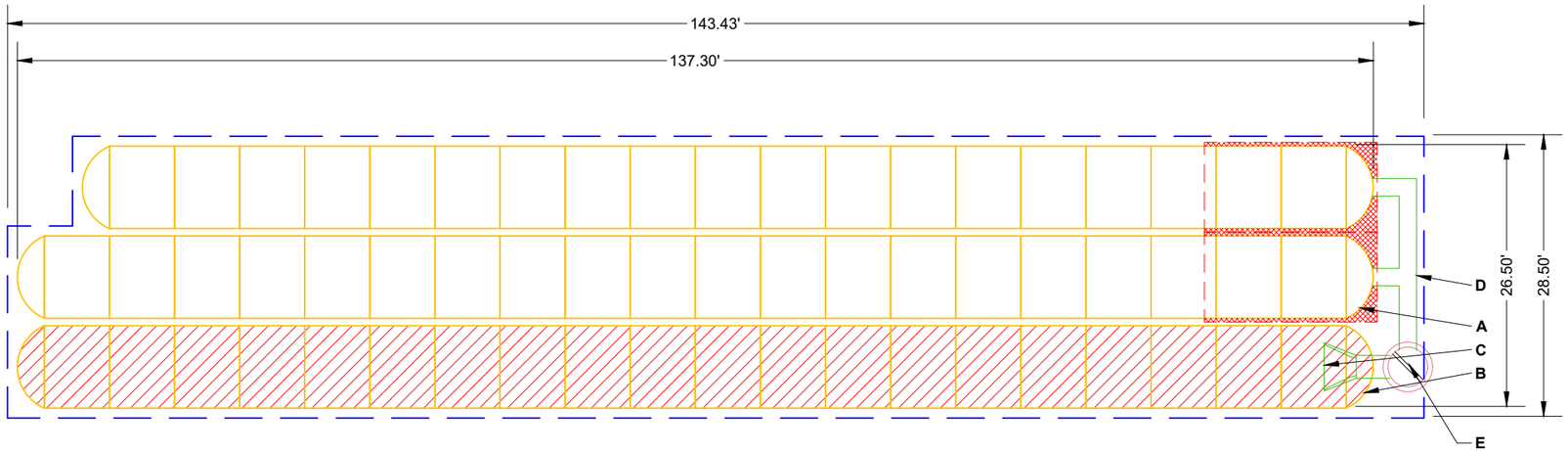
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

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

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS	
59	STORMTECH MC-7200 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
6	STORMTECH MC-7200 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
17245	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-7200 CHAMBER:	5.75
		24" ISOLATOR ROW PLUS INVERT:	0.94
		18" x 18" BOTTOM MANIFOLD INVERT:	0.91
4028	SYSTEM AREA (SF)	BOTTOM OF MC-7200 CHAMBER:	0.75
343.9	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MC720024RAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.97"	
CONCRETE STRUCTURE W/WEIR	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		11.0 CFS IN



ISOLATOR ROW PLUS
(SEE DETAIL)

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

BED LIMITS

NOTES

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

2089
TORRANCE, CA
DRAWN: MP
CHECKED: N/A
DATE:
PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

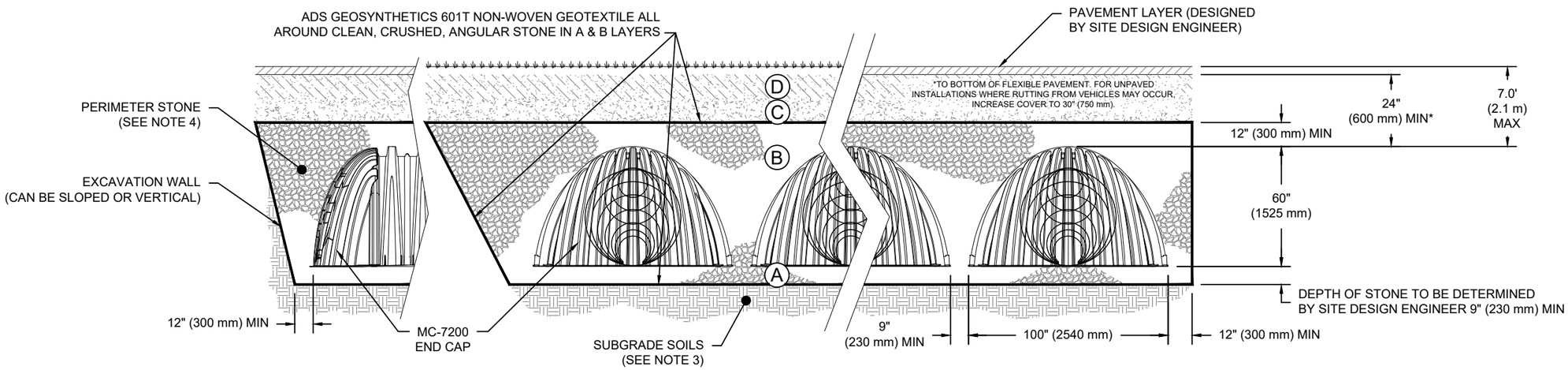
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 15' 30'

ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

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

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



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

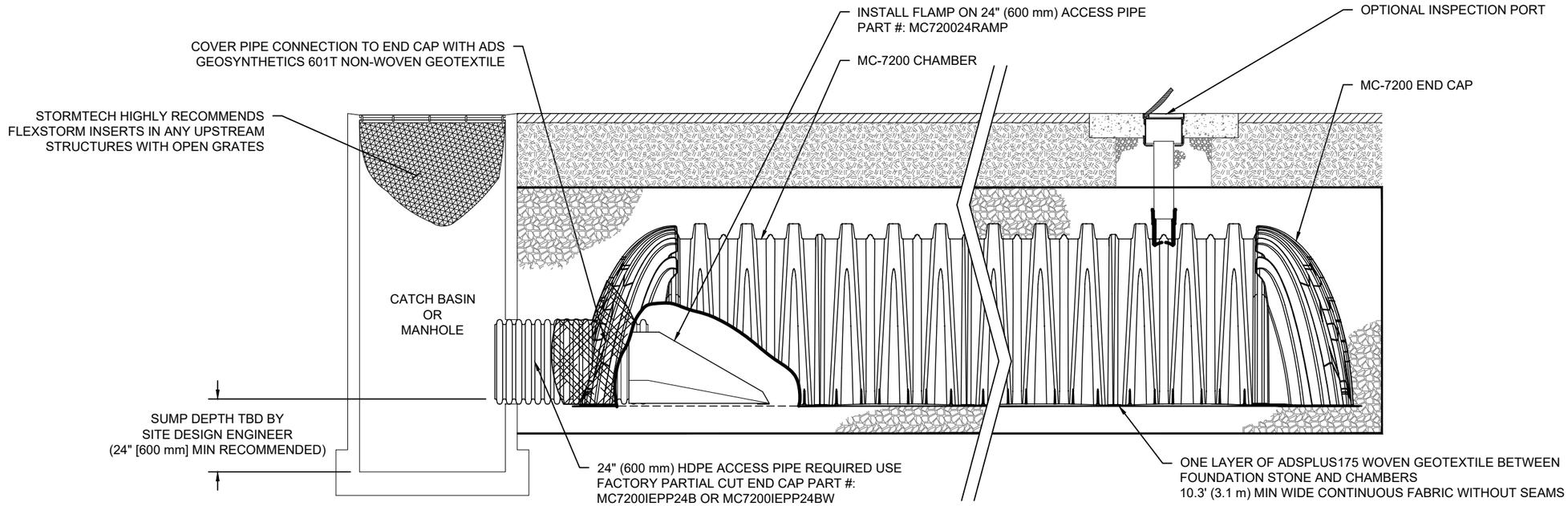
2089
TORRANCE, CA
DRAWN: MP
CHECKED: N/A
DATE:
PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SHEET
3 OF 5



MC-7200 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

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

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

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

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

NOTES

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

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

2089
TORRANCE, CA
DATE:
DRAWN: MP
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

4640 TRUEMAN BLVD
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StormTech® Chamber System

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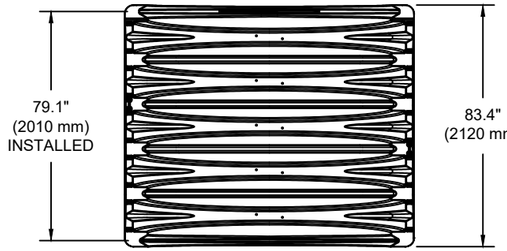
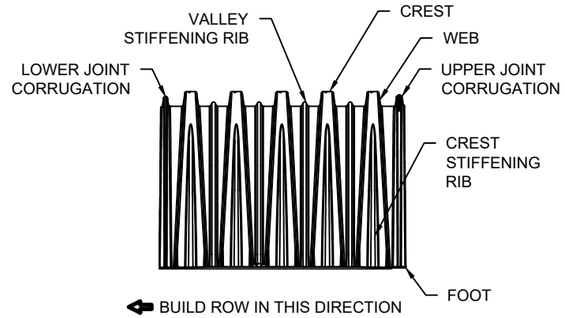
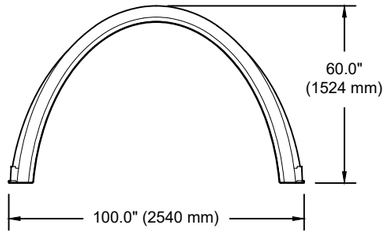
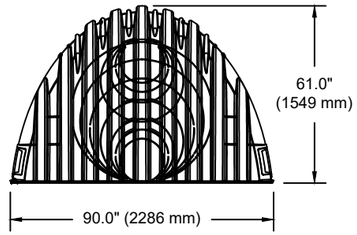
MC-7200 TECHNICAL SPECIFICATION

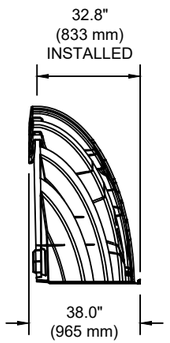
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

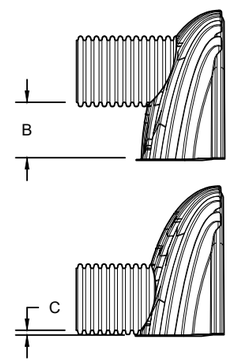
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

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

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

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

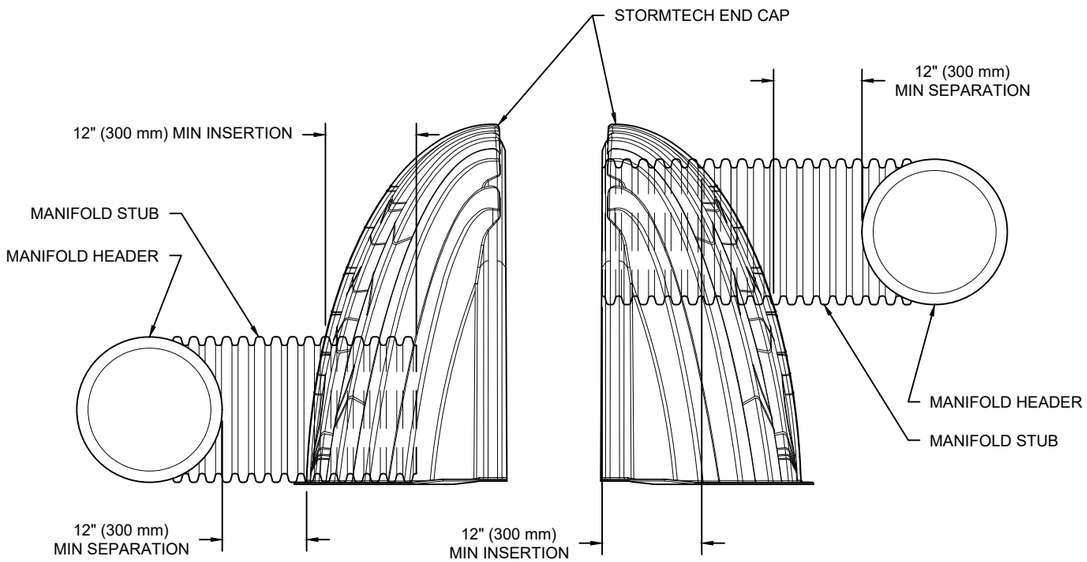
NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



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

2089
TORRANCE, CA
DATE:
DRAWN: MP
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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SECTION XI

Geotechnical Report (Infiltration Study)

June 20, 2022 Project No. 22070-01

Mr. Jeff Alvarez
EPD Solutions, Inc.
2355 Main Street, Suite 100
Irvine, CA 92614

Subject: ***Preliminary Geotechnical Evaluation, Proposed Industrial Development, 2771 West 205th Street, Torrance, California***

In accordance with your request, LGC Geotechnical, Inc. has performed a geotechnical evaluation for the proposed industrial development located at 2771 West 205th Street, in the City of Torrance, 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 development.

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.

Ryan Douglas, PE, GE 3147
Project Engineer

RLD/BPP/klr

Distribution: (1) Addressee (electronic copy)

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1.0 INTRODUCTION

1.1 Purpose and Scope of Services

This report presents the results of our geotechnical evaluation for the proposed industrial development located at 2271 West 205th Street in the City of Torrance, California. (see Site Location Map, Figure 1). The purpose of our work was to collect subsurface data in order to prepare a geotechnical report providing preliminary recommendations for design and construction of the proposed project. Our scope of services included:

- Review of pertinent readily available geotechnical information and geologic maps (Appendix A).
- Subsurface investigation including excavation, sampling, and logging of 7 small-diameter hollow stem borings.
- Performed 3 infiltration tests within the hollow stem borings.
- Laboratory testing of representative samples obtained during our subsurface investigation (Appendix C).
- Geotechnical analysis and evaluation of the data obtained.
- Preparation of this report presenting our preliminary findings, conclusions and recommendations with respect to the proposed site development.

1.2 Background and Project Description

The approximately 6.0-acre site is bound to the north by residential developments, to the south by West 205th Street and to the east and west by existing office buildings. Review of historic aerial photographs suggests the following:

1952 through 1980 Aerial Photos: At this time, the subject site contained a parking lot and undeveloped land.

1985 Aerial Photos: Construction of the current office building had begun with 5 out of the 6 buildings being complete.

1991 through 2018 Aerial Photos: By 1991, all 6 buildings had been built throughout the site. The site has remained essentially the same since this time except for some minor landscape improvements.

Based on the preliminary conceptual site plan (RGA, 2021), one approximately 126,000 square foot industrial warehouse structure with on grade parking areas is proposed. The proposed industrial building is anticipated to be a concrete tilt-up structure with estimated maximum column and wall loads of approximately 150 kips and 10 kips per linear foot, respectively. Please note no structural loads or preliminary grading plans were provided to us at the time of this report.

The recommendations provided herein are based upon the estimated structural loading and 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 and any changes to the assumed structural loads when they become available, in order to either confirm or modify

the recommendations provided herein. Additional field work and/or laboratory testing may be necessary.

1.3 Subsurface Evaluation

LGC Geotechnical performed a recent subsurface geotechnical evaluation of the site consisting of the excavation of seven hollow-stem auger borings (three of which were used for infiltration testing).

The four hollow-stem borings (HS-1 through HS-4) and three hollow-stem borings used for infiltration testing (I-1 through I-4) were drilled to a depth ranging from approximately 15 to 50 feet below existing grade and approximately 10 to 15 feet below existing grade, respectively. 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 an 8-inch-diameter hollow-stem auger. 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. 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 and tamped. Some settlement of the backfill soils may occur over time.

Infiltration testing was performed within three of the borings (I-1 through I-3) at a depths ranging from approximately 10 to 15 feet below existing grade, per the direction of the civil engineer. An LGC Geotechnical staff engineer installed standpipes, backfilled the boring annulus with crushed rock, and pre-soaked the infiltration wells prior to testing. Infiltration testing was performed in accordance with the County of Los Angeles testing guidelines. The infiltration test wells were subsequently backfilled with native soils and tapped at the completion of testing. Some settlement of the backfill soils may occur over time.

The approximate locations of borings are shown on the Boring Location Map (Figure 2). Boring logs are presented in Appendix B.

1.4 Laboratory Testing

Laboratory testing was performed on representative soil samples obtained from our subsurface evaluation. Laboratory testing included in-situ moisture and density tests, fines content, Atterberg Limits, expansion index, maximum density, direct shear, consolidation and corrosion (sulfate, chloride content, pH, and minimum resistivity).

The following is a summary of the recent laboratory test results.

- Dry density of the samples collected ranged from approximately 83 pounds per cubic foot (pcf) to 118 pcf, with an average of approximately 104 pcf. Field moisture contents ranged from approximately 3 percent to 38 percent, with an average of 14 percent.
- Five samples tested for fines content indicated a fines content (passing No. 200 sieve) of approximately 13 percent to 50 percent. According to the Unified Soils Classification System (USCS), the tested samples are classified as "coarse-grained" soil.
- One Atterberg Limit (liquid limit and plastic limit) test was performed. Results indicate a Plasticity Index value of 18. The plot is provided in Appendix C.
- One direct shear test was performed. The plot is provided in Appendix C.
- One consolidation test was performed. The stress vs. deformation plot is provided in Appendix C.
- One Expansion Index (EI) tests was performed. Results were an EI value of 37, corresponding to "Low" expansion potential.
- Laboratory compaction of a near-surface bulk sample resulted in a maximum dry density of 121.0 pcf at an optimum moisture content of 11.0 percent.
- Corrosion testing indicated soluble sulfate contents less than approximately 0.01 percent, chloride content of 185 parts per million (ppm), pH value of 8.13, and minimum resistivity value of 1,490 ohm-cm.

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.

LGC Geotechnical, Inc.

FIGURE 1
Site Location Map

PROJECT NAME	EPD - Torrance
PROJECT NO.	22070-01
ENG. / GEOL.	RLD
SCALE	Not to Scale
DATE	June 2022

2.0 GEOTECHNICAL CONDITIONS

2.1 Regional Geology

The subject site is generally located within the Peninsular Ranges Geomorphic Province, specifically within the coastal plain that forms the gently sloping flatlands to the north of the uplifted Palos Verdes Peninsula. The coastal plain consists of Quaternary older alluvium interpreted to be middle to late Pleistocene in age (Saucedo et al, 2016).

No known faults cross the site, and the only complex regional geologic feature near the site is an inferred anticline, as shown on the regional geologic map to pass about two miles to the south (Saucedo et al, 2016). The Newport Inglewood right lateral strike slip fault passes more than 5 miles east of the site.

2.2 Site Geology and Generalized Subsurface Conditions

Based on review of available geologic maps (Saucedo et al, 2016), the primary geologic unit underlying the site is Quaternary old alluvium. As encountered at the subject site, native alluvial soils generally consisted of medium dense to very dense sands and silty sands and stiff to hard silts and clays below the recommended removal and recompaction bottoms to the maximum explored depth of approximately 50 feet below existing grade (see Appendix B for Boring Logs). For the purposes of this report, the thin veneer of artificial fill present across the site has not been differentiated on the boring logs.

It should be noted that borings 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 above should not be construed to mean that the subsurface profile is uniform, and that soil is homogeneous within the project area. For details on the stratigraphy at the exploration locations, refer to Appendix B.

2.3 Groundwater

Groundwater was not encountered to the maximum explored depth of approximately 50 feet below existing grade during this recent evaluation. Historic high groundwater is mapped at greater than approximately 50 feet below current grade based on the seismic hazard zone report for the Ontario quadrangle (CDMG, 1998). Groundwater levels recorded nearby the subject site by the California Department of Water Resources were measured at depths approximately 85 feet below the ground surface (CDWR, 1999).

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 Field Infiltration Testing

Three shallow infiltration tests were performed in Borings I-1 through I-3 ranging from depths of approximately 10 to 15 feet below existing grade. The approximate locations are shown on the Boring Location Map (Figure 2). The borings for the infiltration tests were excavated using a drill rig equipped with an 8-inch diameter hollow-stem auger. Estimation of infiltration rates was accomplished in general accordance with the guidelines set forth by the County of Los Angeles (2021). A 3-inch diameter perforated PVC pipe was placed in the borehole above a thin layer of gravel and the annulus was backfilled with gravel. The infiltration wells were pre-soaked 1 hour prior to testing. Initially the procedure for 30-minute reading intervals was followed for the borings (I-1 through I-3). During the 30-minute period, water remained in the boring after 30 minutes. Therefore, the test procedure utilizing a thirty-minute reading interval was performed. Readings were taken for a minimum of 3 hours or until a "stabilized rate" was established. A "stabilized rate" is when the highest and lowest readings are within 10 percent of each other over three consecutive readings. At the completion of infiltration testing, the pipe was removed, backfilled with cuttings, tamped, and the asphalt was patched in the necessary areas. Some settlement of the backfill should be expected.

Based on the County of Los Angeles testing guidelines, the measured infiltration is calculated by dividing the volume of water discharged by the surface area of the test section (including sidewalls plus the bottom of the boring), in a given amount of time. The measured infiltration rates are provided in Table 1 below. Please note that the values provided in Table 1 do not include reduction factors for the test procedure, site variability, and long-term siltation plugging that are required for the design infiltration rate, refer to Table 8 in Section 4.8. Infiltration tests were performed using relatively clean water free of particulates, silt, etc. Refer to the infiltration test data provided in Appendix D. Refer to Section 4.8 for infiltration recommendations.

TABLE 1

Summary of Field Infiltration Testing

Infiltration Test Location	Infiltration Test Depth (ft)	Measured Infiltration Rate* (inch/hr.)
I-1	10	0.0
I-2	15	1.1
I-3	10	0.0

*Does Not Include Required Reduction Factors, refer to Table 8, Section 4.8.

2.5 Faulting and Seismic Hazards

Prompted by damaging earthquakes in Northern and Southern California, State legislation and policies concerning the classification and land-use criteria associated with faults have been developed. The Alquist-Priolo Earthquake Fault Zoning Act was implemented in 1972 to prevent the construction of urban developments across the trace of active faults. California Geologic Survey Special Publication 42 was created to provide guidance for following and implementing the law requirements. Special Publication 42 was most recently revised in 2018 (CDMG, 2018). According

to the State Geologist, an "active" fault is defined as one which has had surface displacement within Holocene time (roughly the last 11,700 years). Regulatory Earthquake Fault Zones have been delineated to encompass traces of known, Holocene-active faults to address hazards associated with surface fault rupture 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 identify the locations of active faults and recommend setbacks from locations of possible surface fault rupture.

The subject site is not located within a State of California Earthquake Fault Zone (i.e., Alquist-Priolo Earthquake Fault Act Zone) and no active faults are known to cross the site (CDMG, 2015). 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 Palos Verdes, Newport-Inglewood, Whittier, Compton Blind Thrust, and San Andreas Faults, among others (CGS, 2015). A discussion of these secondary effects is provided in the following sections.

2.5.1 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, 1999), the site is not located within a liquefaction hazard zone. Based on our field evaluation, site soils are generally not susceptible to liquefaction due to a lack of groundwater and the medium dense to very dense and fine-grained alluvium soils in the upper 50 feet; therefore, liquefaction potential is considered very low.

2.5.2 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 depth to groundwater, very low potential for liquefaction and lack of nearby "free face" conditions, the potential for lateral spreading is considered very low.

2.6 Seismic Design Criteria

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2019 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 33.845424 degrees north and longitude -118.325832 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.

A deaggregation of the PGA based on a 2,475-year average return period (MCE) indicates that an earthquake magnitude of 6.84 at a distance of approximately 8.35 km from the site would contribute the most to this ground motion (USGS, 2014).

Section 1803.5.12 of the 2019 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 0.848g (SEAOC, 2022).

TABLE 2

Seismic Design Parameters

Selected Parameters from 2019 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)	1.767g	From SEAOC, 2022
S_1 (Risk-Targeted Spectral Accelerations for 1-Second Periods)	0.633g	From SEAOC, 2022
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))	1.7	Value is only applicable per requirements/exceptions per Section 11.4.8 of ASCE 7
S_{MS} for Site Class D [Note: $S_{MS} = F_aS_S$]	1.767g	-
S_{M1} for Site Class D [Note: $S_{M1} = F_vS_1$]	1.076g	Value is only applicable per requirements/exceptions per Section 11.4.8 of ASCE 7
S_{DS} for Site Class D [Note: $S_{DS} = (^2/_3)S_{MS}$]	1.178g	-
S_{D1} for Site Class D [Note: $S_{D1} = (^2/_3)S_{M1}$]	0.717g	Value is only applicable per requirements/exceptions per Section 11.4.8 of ASCE 7
C_{RS} (Mapped Risk Coefficient at 0.2 sec)	0.899	ASCE 7 Chapter 22
C_{R1} (Mapped Risk Coefficient at 1 sec)	0.895	ASCE 7 Chapter 22
*Since site soils are Site Class D and S_1 is greater than or equal to 0.2, the seismic response coefficient Cs is determined by Eq. 12.8-2 for values of $T \leq 1.5T_s$ and taken equal to 1.5 times the value calculated in accordance with either Eq. 12.8-3 for $T_L \geq T > T_s$, or Eq. 12.8-4 for $T > T_L$. Refer to ASCE 7-16.		

2.7 Expansion Potential

Based on the results of previous laboratory testing, site soils are anticipated to have a "Low" expansion potential. Final expansion potential of site soils should be determined at the completion of grading. Results of expansion testing at finish grades will be utilized to confirm final foundation design.

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 grading and development. A summary of our geotechnical conclusions are as follows:

- As encountered at the subject site, native alluvial soils generally consisted of medium dense to very dense sands and silty sands and stiff to hard silts and clays below the recommended removal and recompaction bottoms to the maximum explored depth of approximately 50 feet below existing grade. The near-surface loose and compressible soils are not suitable for the planned improvements in their present condition (refer to Section 4.1).
- From a geotechnical perspective, onsite soils are anticipated to be suitable for use as general compacted fill, provided they are screened of construction debris and any oversized material (8 inches in greatest dimension).
- Groundwater was not encountered in our field evaluation to a maximum explored depth of 50 feet below existing grade. Historic high groundwater is mapped at greater than approximately 50 feet below current grade based on the seismic hazard zone report for the Ontario quadrangle (CDMG, 1998). Records indicate groundwater levels recorded in the area are at depths of approximately 85 feet below existing ground surface.
- The subject study area is not located within a mapped State of California Earthquake Fault Zone (i.e., Alquist-Priolo Earthquake Fault Act 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 as a result of 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 susceptible to liquefaction due to a lack of groundwater and medium dense to very dense as well as fine-grained alluvial soils in the upper 50 feet; therefore, liquefaction potential is considered very low.
- Based on the results of preliminary laboratory testing, site soils are anticipated to have “Low” 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 the sandy and silty earth materials 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.
- On-site soils will most likely not be suitable for backfill of site retaining walls. Import soils that will be used for retaining wall backfill should be tested and approved by the geotechnical consultant prior to the backfill of site walls.
- Field testing resulted in measured infiltration rates ranging from 0.0 to 1.1 inches per hour. The measured infiltration rates do not include a factor of safety. Discussion regarding infiltration is provided in Section 4.8.

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 2019 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

We anticipate that earthwork at the site will consist of required earthwork removals, precise grading and construction of the proposed new improvements, including the industrial structures, subsurface utilities, and vehicular pavement areas.

We recommend that earthwork onsite be performed in accordance with the following recommendations, future grading plan review report(s), the 2019 CBC/City of Torrance 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 of areas to receive structural fill or engineered improvements, the areas should be cleared of existing asphalt, surface obstructions, structures, foundations and

demolition debris. Vegetation and debris should be removed and properly disposed of off-site. Holes resulting from the removal of buried obstructions, which extend below proposed finish grades, should be replaced with suitable compacted fill material. Any abandoned sewer or storm drain lines should be completely removed and replaced with properly placed compacted fill. Deeper demolition may be required in order to remove existing foundations. We recommend the trenches associated with demolition which extend below the remedial grading depth be backfilled and properly compacted prior to the demolition contractor leaving the site.

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. At the conclusion of the clearing operations, a representative of LGC Geotechnical should observe and accept the site prior to further grading.

4.1.2 Removal and Recompaction Depths and Limits

In order to provide a relatively uniform bearing condition for the planned building structures, upper loose/compressible soils are to be temporarily removed and recompacted as properly compacted fills. Existing undocumented artificial fill within the influence of the proposed structural improvements should be removed to suitable, competent native materials prior to placement of artificial fill to design grades. For preliminary planning purposes, the depth of required removals and recompaction may be estimated as indicated below. Updated recommendations may be required based on additional field work, changes to building layouts and actual structural loads.

Buildings: Soils shall be temporarily removed and recompacted to a minimum depth of 6 feet below existing grade or 3 feet below the bottom of foundations, whichever is deeper. Additionally, existing undocumented fill and unsuitable topsoil encountered within the building footprints should be removed and recompacted for use 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.

Minor Site Structures: For minor site structures such as free-standing walls, retaining walls, etc., removal and recompaction should extend at least 3 feet below existing grade or 2 feet below the base of foundations, whichever is deeper. Where space is available, the envelope for removal and recompaction should extend laterally a minimum distance of 3 feet beyond the edges of the proposed minor site structure improvements.

Pavement and Hardscape: Within pavement and hardscape areas, removal and recompaction should extend to a depth of at least 2 feet below the existing grade or 1 foot below finished subgrade (i.e., below planned aggregate base/asphalt concrete), whichever is deeper. In general, the envelope for removal and recompaction should extend laterally a minimum distance of 2 feet beyond the edges of the proposed pavement and hardscape

improvements.

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.

Vehicular traffic, stockpiles, and equipment storage should be set back from the perimeter of excavations a minimum distance equivalent to a 1:1 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 can be provided.

4.1.4 Subgrade Preparation

In general, 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 requirements. Removal 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 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 of 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 sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve) per American Society for Testing and Materials (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. Most of the on-site soils do not appear to be suitable for retaining wall backfill due to their fines content (i.e., silt and clay content) and expansion potential; therefore, import of select sandy materials should be anticipated by the contractor. Samples of retaining wall backfill should be obtained prior to construction and provided to the geotechnical consultant for review to confirm the suitability.

Aggregate base (crushed aggregate base or crushed miscellaneous base) should conform to the requirements of Section 200-2 of the Standard Specifications for Public Works Construction ("Greenbook") for untreated base materials (except processed miscellaneous base), the City of Torrance or Caltrans Class 2 aggregate base.

The placement of demolition materials in compacted fill is acceptable from a geotechnical viewpoint provided the demolition material is broken up into pieces not larger than approximately 2 to 4 inches in maximum dimension and well blended into fill soils with essentially no resulting voids. Demolition material placed in fills must be free of construction debris (wood, organics, etc.) and reinforcing steel. If asphalt concrete fragments will be incorporated into the demolition materials, approval from an environmental viewpoint may be required and is not the purview of the geotechnical consultant. From our previous experience, we recommend that asphalt concrete fragments be limited to fill areas within planned street areas (i.e., not within building pad areas).

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 in order to achieve adequate compaction. Drying and/or mixing the very moist soils may be required prior to reusing the materials in compacted fills. Additionally, soils are present that will require additional moisture in

order to achieve the recommended compaction criteria.

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, if encountered.

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, or in accordance with the City of Torrance requirements, per ASTM D1557 at near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content), unless otherwise noted in the pavement recommendations section (see Sections 4.5 and 4.6).

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 (Mirafi 140N or approved alternative) to prevent the migration of fines into the rock backfill.

4.1.7 Trench and Retaining Wall Backfill and Compaction

If trenches are shallow or the use of conventional equipment may result in damage to the utilities, sand having a sand equivalent (SE) of 30 or greater (per Caltrans Test Method [CTM] 217) may be used to bed and shade the pipes within the pipe zone. Sand backfill within the pipe bedding zone may be densified by jetting or flooding and then tamped to ensure adequate compaction. The onsite soils may generally be considered suitable as trench backfill (zone defined as 12 inches above the pipe to subgrade), provided the soils are screened of rocks, construction debris, other material greater than 3 inches in diameter and significant organic matter. Trench backfill should be compacted in uniform lifts (as outlined above in Section "Material for Fill") by mechanical means to at least 90 percent relative compaction (per ASTM D1557). If gap-graded rock is used for trench backfill, refer to above Section 4.1.6.

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 3 (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, probe, and test the backfill to verify compliance with the project recommendations.

4.1.8 Shrinkage and Subsidence

Volumetric changes in earth quantities will occur when excavated onsite earth materials are replaced as properly compacted fill. The following is an estimate of shrinkage factors for the various soil types found onsite. These estimates are based on in-place densities of the various materials and on the estimated average degree of relative compaction that will be achieved during grading.

TABLE 3

Estimated Shrinkage

Soil Type	Allowance	Estimated Range
Artificial Fill/Alluvium	Shrinkage	0 to 10 %

Subsidence due to earthwork equipment is expected to be on the order of 0.1 feet. It should be stressed that these values are only estimates and that actual shrinkage factors are extremely difficult to predict. These values are estimates only and exclude losses due to removal of vegetation or debris. 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. The above shrinkage estimates are intended as an aid for others in determining preliminary earthwork quantities. However, these estimates should be used with some caution since they are not absolute values.

4.2 Preliminary Foundation Recommendations

The proposed structures may be supported on spread or continuous footings and conventional slabs, provided earthwork is performed in accordance with the recommendations presented in this report. Since the site soils are anticipated to be "Low" expansion potential (EI of 50 or less per ASTM D4829), special design considerations from a geotechnical perspective are anticipated, to minimize the impacts of expansive soils. This must be verified based on as-graded conditions.

Footings should be supported on properly compacted fill. 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/grading.

Preliminary foundation recommendations are provided in the following sections. The foundation design must be performed by the structural engineer based on the following geotechnical parameters and minimum values provided.

4.2.1 Slab Design and Construction

From a geotechnical perspective, minimum slab thicknesses of 6.5 inches and 4.5 inches are recommended for new slabs in the warehouse areas and office areas, respectively. Slabs are to be supported on compacted fill soils properly prepared in accordance with the recommendations provided in this report. Alternative slab-on-grade recommendations can be provided for alternative building types upon request. The structural engineer should structurally connect the slab to the perimeter foundation/grade beam. The actual slab reinforcement, connections and thickness should be determined by the structural engineer based on the imposed loading and geotechnical conditions of the site.

The foundation designer may use a modulus of vertical subgrade reaction (k) of 150 pounds per cubic inch (pounds per square inch per inch of deflection). This value is for a 1-foot by 1-foot square loaded area and should be adjusted by the structural designer for the area of the proposed footing using the following formula:

$k = 100 \times [(B+1)/2B]^2$
k = modulus of vertical subgrade reaction, pounds per cubic inch (pci)
B = foundation width (feet)

It is recommended that moisture content of the subgrade soils below slabs be maintained up to the time of concrete placement. The recommended moisture content of the slab subgrade soils should be between optimum moisture content and approximately 4 percent above optimum moisture content to a minimum depth of 12 inches. The moisture content of the slab subgrade should be verified by the geotechnical consultant within 1 to 2 days prior to concrete placement. In addition, this moisture content should be maintained around the immediate perimeter of the slab during construction and up to occupancy of the building structures. Additional recommendations regarding the control of surface water and landscaping adjacent to the building are provided in Section 4.9.

The following recommendations are for informational purposes only, as they are unrelated to the geotechnical performance of the foundation. The following recommendations may be superseded by the foundation engineer and/or owner. Some post-construction moisture migration should be expected below the foundation. In general, interior floor slabs with moisture sensitive floor coverings should be underlain by a minimum 10 mil thick polyolefin material vapor retarder, which has a water vapor transmission rate (permeance) of less than 0.03 perms. The need for sand and/or the

sand thickness (above and/or below the vapor retarder) should be specified by the structural engineer, architect or concrete contactor. The selection and thickness of sand is not a geotechnical engineering issue and is therefore outside our purview.

4.2.2 Foundation Design Parameters

For the proposed industrial warehouse structures, minimum continuous wall and column footing widths are to be 12 inches and 24 inches, respectively, minimum foundation embedment is to extend a minimum of 18 inches below the adjacent exterior grade, and interior column footings should be embedded a minimum of 12 inches beneath the adjacent subgrade. Footing reinforcement should be designed by the structural engineer based on the structural loading conditions.

The following allowable bearing pressures for both continuous and column spread footings presented in Table 4 are recommended for corresponding footing widths and embedments.

TABLE 4

Allowable Soil Bearing Pressures

Allowable Static Bearing Pressure (psf)	Minimum Footing Width (feet)	Minimum Footing Embedment* (feet)
3,000	4	2.5
2,500	3	2
2,000	2	1.5
1,500	1	1

* Refers to minimum depth measured below lowest adjacent grade.

Perimeter building foundations should be designed to be continuous across openings such as exterior doorways and flatwork should be connected to the building.

These allowable bearing values indicated above (exclusive of the weight of the footings) 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). The allowable bearing pressures are applicable for level (ground slope equal to or flatter than 5H:1V) conditions only.

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 on the order of 1-inch or less. Differential static settlement may be taken as half of the static settlement (i.e., ½-inch over a horizontal span of 40 feet).

The foundation is to be excavated into competent compacted artificial fill placed during grading operations. It is recommended that the foundation subgrade soils be evaluated by the geotechnical engineer prior to steel and/or concrete placement.

4.2.3 Lateral Load Resistance

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 225 psf per foot of depth (or pcf) to a maximum of 2,250 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. 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.

4.3 Lateral Earth Pressures for Retaining Walls

The following preliminary lateral earth pressures may be used for site retaining walls. Lateral earth pressures are provided as equivalent fluid unit weights, in pound per square foot (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.

The following lateral earth pressures are presented on Table 5 for approved on-site select or import granular soils with a maximum of 35 percent fines (passing the No. 200 sieve per ASTM D-421/422) and Very Low expansion potential (EI of 20 or less per ASTM D4829). Retaining wall backfill should also be limited to fill material not exceeding 3 inches in greatest dimension. The wall designer should clearly indicate on the retaining wall plans the required sandy soil backfill criteria. Most of the on-site soils do not appear to be suitable for retaining wall backfill due to their fines content (i.e., silt and clay content) and expansion potential; therefore, import of select sandy materials should be anticipated by the contractor.

TABLE 5

Lateral Earth Pressures – Import Sandy Backfill

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. The equivalent fluid pressure values assume free-draining conditions. Retaining wall structures should be provided with appropriate drainage and appropriately waterproofed (Refer to Figure 3). Please note that waterproofing and outlet systems are not the purview of the geotechnical consultant. 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 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 structure. In addition to the recommended earth pressure, retaining walls adjacent to streets should be designed to resist vehicular traffic if applicable. Uniform surcharges may be estimated using the applicable coefficient of lateral earth pressure using a rectangular distribution. A factor of 0.35 and 0.5 may be used for the active and at-rest conditions, respectively. The vertical traffic surcharge may be determined by the structural designer. The retaining wall designer should contact the geotechnical engineer for any required geotechnical input in estimating any applicable surcharge loads.

If required, the retaining wall designer may use a seismic lateral earth pressure increment of 5 pcf for level backfill conditions. This increment should be applied in addition to the provided static lateral earth pressure using a "normal" triangular distribution with the resultant acting at H/3 in relation to the base of the retaining structure (where H is the retained height). For the restrained, at-rest condition, the seismic increment may be added to the applicable active lateral earth pressure (in lieu of the at-rest lateral earth pressure) when analyzing short duration seismic loading. Per Section 1803.5.12 of the 2019 CBC, the seismic lateral earth pressure is applicable to structures assigned to Seismic Design Category D through F for retaining wall structures supporting more than 6 feet of backfill height. This seismic lateral earth pressure is estimated using the procedure outlined by the Structural Engineers Association of California (Lew, et al, 2010).

Soil bearing and lateral resistance (friction coefficient and passive resistance) are provided in Section 4.2. 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.

4.4 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 indicated soluble sulfate contents less than approximately 0.01 percent, chloride content of approximately 185 parts per million (ppm), pH value of approximately 8.13, and minimum resistivity value of 1,490 ohm-cm. 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 1,500 ppm (0.15 percent) or greater. Based on the test results, soils are not considered corrosive using Caltrans criteria.

Based on laboratory sulfate test results, the near surface soils are designated to a class "S0" 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" sulfate classification.

Laboratory testing may need 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.

4.5 Preliminary Asphalt Concrete Pavement Sections

For the purposes of these preliminary recommendations, we have assumed an R-value of 15 and calculated pavement sections for Traffic Indices of 5.0 (or less), 6.0, and 7.0. R-value testing of the drive aisles and parking subgrade will need to be performed to confirm our preliminary testing results/assumptions once the underground utilities have been backfilled, drive aisles and parking areas have been graded to finish subgrade elevations, and the final Traffic Index is determined by the Civil Engineer. Determination of the Traffic Index is not the purview of the geotechnical consultant. Final asphalt concrete pavement sections should be confirmed by the project civil engineer based upon the projected design Traffic Index. If requested, LGC Geotechnical will provide sections for alternate TI values.

TABLE 6

Preliminary Asphalt Concrete Pavement Sections

Assumed Traffic Index	5.0 (or less)	6.0	7.0
R -Value Subgrade	15	15	15
AC Thickness	4.0 inches	4.0 inches	5.0 inches
Aggregate Base Thickness	6.0 inches	9.5 inches	11.5 inches

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.

Aggregate base material (crushed aggregate base and crushed miscellaneous base) 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, or the City of Torrance specifications, at or slightly above optimum moisture content per ASTM D1557. Earthwork recommendations are provided in Section 4.1 "Site Earthwork" and the related sub-sections of this report.

4.6 Preliminary Portland Cement Concrete Pavement Sections

For the purposes of these preliminary recommendations, we used an assumed R-value of 15. Preliminary minimum Portland Cement Concrete (PCC) pavement street sections are provided in Table 7 for Traffic Indices of 5.0 (or less), 6.0, and 7.0 and may be utilized in the design. These recommendations must be confirmed with R-value testing of representative near-surface soils at the completion of grading and after underground utilities have been installed and backfilled. Final PCC pavement sections should be confirmed by the project civil engineer based upon the projected design Traffic Index. If requested, LGC Geotechnical will provide sections for alternate TI values. The appropriate paving section must be selected by the project civil engineer/client based on design traffic indexes.

TABLE 7

Preliminary PCC Pavement Sections

Provided Traffic Index	5.0 (or less)	6.0	7.0
R -Value Subgrade	15	15	15
PCC Thickness	5.0 inches	6.0 inches	7.0 inches
Aggregate Base Thickness	4.0 inches	4.0 inches	4.0 inches

For preliminary planning purposes, the PCC pavement sections may consist of a minimum of concrete over aggregate base compacted to 95 percent relative compaction (see Table 7 for section thicknesses). The concrete should have a minimum compressive strength of 3,250 psi and a minimum flexural strength of 505 psi at the time the pavement is subjected to traffic. Steel reinforcement is not required (ACI, 2017). The provided pavement sections assume that edge restraints like a curb and gutter will be provided. To reduce the potential (but not eliminate) for cracking, paving should provide control joints at regular intervals in each direction. The maximum joint spacing within all PCC pavements is recommended to be equal to or less than 30 times the pavement thickness; however, we recommend joint spacing not exceed 15 feet in each direction. Joints should be a depth of 1/3 of the concrete thickness. Decreasing the spacing of these joints will further reduce, but not eliminate the potential for unsightly cracking.

If semi-trailers are to be disconnected from the tractors from dolly jacks the design should consider concentrated loads imposed on the concrete pavement. These loads typically exceed the axle loads of the semi-trailer combination and are applied to smaller contact areas, especially if applied near joint locations. If these irregular loadings are confined to specific areas of the site, the pavement section required thickness can be economized. These and other factors (e.g., traffic patterns, irregular loading, doweled vs un-doweled joints, etc.) outlined in ACI, 2017 should be addressed for the final design.

The thicknesses shown are minimum thicknesses. Increasing the thickness of any or all of the above layers 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.

Aggregate base material (crushed aggregate base and crushed miscellaneous base) 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, or the City of Torrance specifications, at or slightly above optimum moisture content per ASTM D1557. Earthwork recommendations are provided in Section 4.1 "Site Earthwork" and the related sub-sections of this report.

4.7 Nonstructural Concrete Flatwork

Nonstructural concrete (such as flatwork, sidewalks, 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 should be designed in accordance with the minimum guidelines outlined below. 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.

Nonstructural and non-vehicular concrete flatwork placed on compacted subgrade may be a minimum 4-inches in thickness (full) with crack control joints spaced 8 feet apart for flatwork slabs and 6 feet apart for flatwork sidewalks. Crack control joints should be sawcut or deep open tool joint to a minimum of 1/3 the concrete thickness. Reinforcement should consist of No. 3 bars spaced at 24 inches on center, both ways. The compacted subgrade below the nonstructural and non-vehicular concrete flatwork should be wet down prior to placing concrete.

To reduce the potential for nonstructural concrete flatwork to separate from entryways and doorways, the owner may elect to install dowels to tie these two elements together.

4.8 Subsurface Water Infiltration

It should be noted that intentionally infiltrating storm water conflicts with the geotechnical engineering objective of directing surface water away from structures and 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. Distress in the form of movement of foundations and other improvements could occur as a result of soil saturation and loss of soil support of foundations and pavements, settlement, collapse, internal soil erosion, and/or expansion. Additionally, off-site properties and improvements may be subjected to seepage, springs, instability, movements of foundations or other impacts as a result of water infiltration and migration. Infiltrated water may enter underground utility pipe zones or other highly permeable layers and migrate laterally along these layers, potentially impacting other improvements located far away from the point of infiltration. Any proposed infiltration system should not be located near slopes or settlement sensitive existing/proposed improvements in order to reduce the potential for slope failures and geotechnical distress issues related to infiltration.

If water must be infiltrated due to regulatory requirements, we recommend the absolute minimum amount of water be infiltrated and that the infiltration areas not be located near settlement-sensitive existing/proposed improvements, basement/retaining walls, or any slopes. As with all systems that are designed to concentrate surface flow and direct the water into the subsurface soils, some minor settlement, nuisance type localized saturation and/or other water related issues should be expected. Due to variability in geologic and hydraulic conductivity characteristics, these effects may be experienced at the onsite location and/or potentially at other locations beyond the physical limits of the subject site. Infiltrated water may enter underground utility pipe zones or flow along heterogeneous soil layers or geologic structure and migrate laterally impacting other improvements which may be located far away or at an elevation much lower than the infiltration source. Recommendations for subsurface water infiltration are provided below.

The design infiltration rate is determined by dividing the measured infiltration rate by a series of reduction factors including; test procedure (RF_t), site variability (RF_v) and long-term siltation plugging and maintenance (RF_s). Based on the Los Angeles County testing guidelines (2021), the reduction factor for long-term siltation plugging and maintenance (RF_s) is the purview of the infiltration system designer. The test procedure reduction factor and recommended site variability reduction factor applied to the measured infiltration rate is provided in Table 8 below. The design infiltration rate is the measured infiltration rate divided by the total reduction factor ($RF_t + RF_v + RF_s$).

TABLE 8

Reduction Factors Applied to Measured Infiltration Rate

Consideration	Reduction Factor
Test procedure, boring percolation, RF_t	1.0
Site variability, number of tests, etc., RF_v	1.0
Long-term siltation plugging and maintenance, RF_s	Per Infiltration Designer
Total Reduction Factor, RF = $RF_t + RF_v + RF_s$	**TBD**

Per the requirements of the Los Angeles County testing guidelines (2021), subsurface materials shall have a design infiltration rate equal to or greater than 0.3 inches per hour. When the Total Reduction Factor (will be at least 3.0, to be determined by the civil engineer) is applied to the measured infiltration rate of infiltration test, the resulting design infiltration rate for infiltration test I-2 may be equal to or greater than the minimum infiltration rate required by the County of Los Angeles for infiltration. Therefore, considering the results of the infiltration testing at I-2 and review of the subsurface data below a depth of 15 feet across the site, if required, stormwater may be infiltrated into the subsurface soils at a depth of at least 15 feet below existing grade using the values presented in Table 1 and Reduction Factors presented above in Table 8. Results of field infiltration testing are provided in Appendix D.

The following should be considered for design of any required infiltration system:

- To facilitate infiltration more favorably, we recommend drilling approximately 8-inch diameter holes to depths of approximately 20 feet below the bottom of the infiltration system bottom (~35 feet below existing grade) and backfilling the holes with clean granular sand or crushed rock. The drilled holes would likely be spaced about 20 feet on center along the infiltration system bottom. Actual dimensions and spacing of drilled holes may differ based on conditions exposed during grading.
- Water discharge from any infiltration systems should not occur within the zone of influence of foundation footings (column and load bearing wall locations). For preliminary purposes we recommend a minimum setback of 15 feet from the structural improvements.
- An adequate setback distance between any infiltration facility and adjacent private property should be maintained.
- The water quality infiltration system should be designed with an overflow system directly connected to the storm drain system in order to prevent failure of the infiltration system, either as a result of lower than anticipated infiltration and/or very high flow volumes.
- The infiltration values provided are based on clean water and this requires the removal of trash, debris, soil particles, etc., and on-going maintenance. Over time, siltation and plugging may reduce the infiltration rate and subsequent effectiveness of the infiltration system. It should be noted that methods to prevent this shall be the responsibility of the infiltration designer and are not the purview of the geotechnical consultant. If adequate measures cannot be incorporated into the design and maintenance of the system, then the infiltration rates may need to be further reduced. These and other factors should be considered in selecting a design infiltration rate.
- Any designed infiltration system will require routine periodic maintenance.
- As with any systems that are designed to concentrate the surface flow and direct the water into the subsurface soils, some type of nuisance water and/or other water-related issues should be expected.
- Contamination and environmental suitability of the site for infiltration was not evaluated by us and should be evaluated by others (environmental consultant). We only addressed the geotechnical issues associated with stormwater infiltration.

LGC Geotechnical should be provided with details for any planned required infiltration system early in the design process for geotechnical input.

4.9 Surface Drainage and Landscaping

Due to the presence of expansive soils, special provisions should be considered to limit the potential for surface water to penetrate the soils adjacent to the proposed structures and improvements.

4.9.1 General

Surface drainage should be carefully taken into consideration during precise grading, building construction, future landscaping, and throughout the design life of the industrial structure. Positive drainage should be provided to direct surface water away from improvements and towards either the street or other suitable drainage devices. Ponding of water, adjacent to any structural improvement foundation, must be avoided. The performance of structural foundations is dependent upon maintaining adequate surface drainage away from them, thereby reducing excessive moisture fluctuations. From a geotechnical perspective, area drains, drainage swales, and finished grade soils should be aligned so as to transport surface water to a minimum distance of 5 feet away from the proposed foundations. Roof gutters and downspout systems should be discharged directly to a pipe or to a paved surface with a positive gradient away from the building and should not outlet directly into unpaved landscape areas.

Decorative gravel tends to act as a reservoir trapping surface water, therefore, we do not recommend it be used adjacent to buildings unless the system is designed with a subsurface drainage system and is properly lined.

4.9.2 Precise Grading

From a geotechnical perspective, we recommend that compacted finished grade soils adjacent to the proposed industrial 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 the 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. We do not recommend that area drains be connected to basement/retaining subdrains.

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.

4.9.3 Landscaping

Planters adjacent to a building or structure should be avoided wherever possible or be properly designed (e.g., lined with a membrane and properly outlet), to reduce the penetration of water into the adjacent footing subgrades and thereby reduce moisture related damage to the foundation. Planting areas at grade should be provided with appropriate positive drainage. Wherever possible, exposed soil areas should be above adjacent paved grades to facilitate drainage. Planters should not be depressed below adjacent paved grades unless provisions for drainage, such as multiple depressed area drains, are constructed. Adequate drainage gradients, devices, and curbing should be provided to prevent runoff from adjacent pavement or walks into the planting areas. Irrigation methods should promote uniformity of moisture in planters and beneath adjacent concrete flatwork. Overwatering and underwatering of landscape areas must be avoided. Irrigation levels should be kept to the absolute minimum level necessary to maintain healthy plant life.

Area drain inlets should be maintained and kept clear of debris in order to properly function. The building owner should also be made aware that excessive irrigation of neighboring properties can cause seepage and moisture conditions on adjacent lots.

The impact of heavy irrigation or inadequate runoff gradients can create perched water conditions. This may result in seepage or shallow groundwater conditions where previously none existed. Maintaining adequate surface drainage and controlled irrigation will significantly reduce the potential for nuisance-type moisture problems. To reduce differential earth movements such as heaving and shrinkage due to the change in moisture content of foundation soils, which may cause distress to a structure and associated improvements, moisture content of the soils surrounding the structure should be kept as relatively constant as possible.

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 2019 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;
- During drilling and backfilling of holes in bottom of infiltration system;
- During precise grading;
- Preparation of building pads and other concrete-flatwork subgrades, and prior to placement of aggregate base or concrete;
- After building and wall footing excavation and prior to placement of steel reinforcement and/or concrete;
- Preparation of pavement subgrade and placement of aggregate base; and
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

5.0 LIMITATIONS

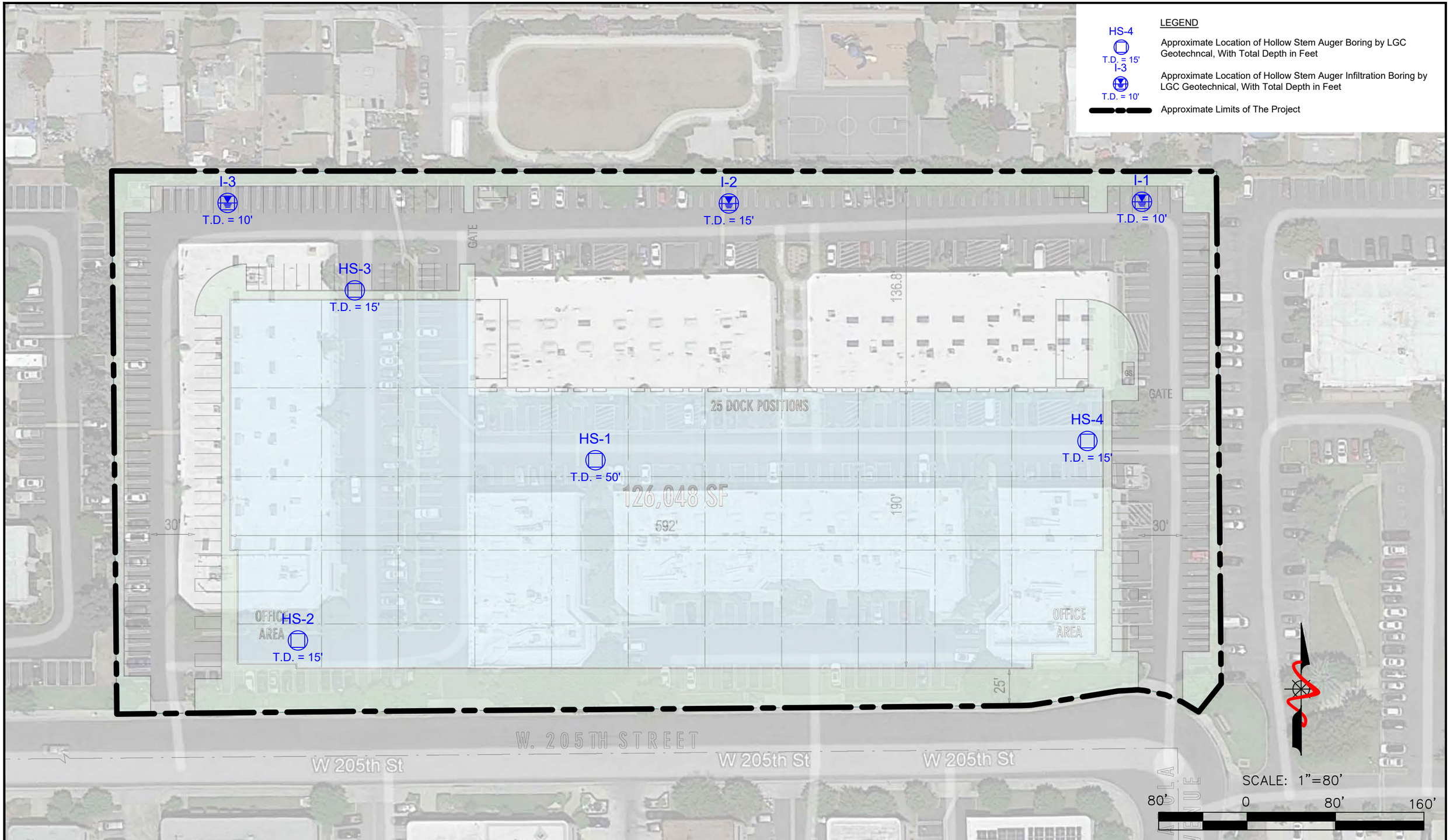
Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included 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. **131 Calle Iglesia, Ste. 200** **San Clemente, CA 92672** **TEL (949) 369-6141 FAX (949) 369-6142**	**FIGURE 2** **Boring Location Map**

PROJECT NAME	EPD - Torrance
PROJECT NO.	22070-01
ENG. / GEOL.	RLD
SCALE	1" = 80'
DATE	June 2022

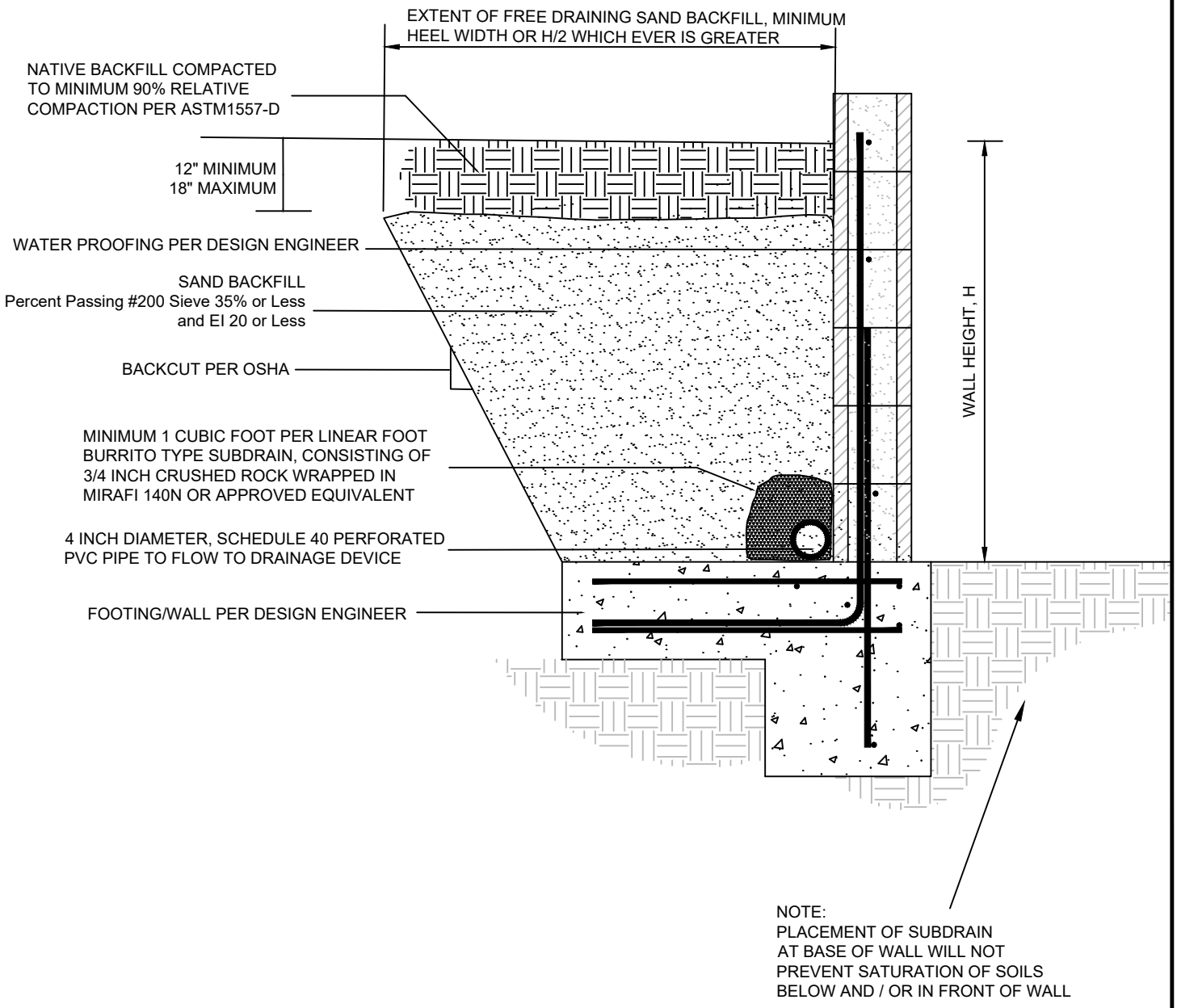


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FIGURE 3
Retaining Wall Backfill Detail

PROJECT NAME	*EPD - Torrance*
PROJECT NO.	*22070-01*
ENG. / GEOL.	*RLD*
SCALE	*Not to Scale*
DATE	*June 2022*

Appendix A
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APPENDIX A

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Appendix B
Boring & Geotechnical Trench Logs

Geotechnical Boring Log Borehole HS-1

Date: 5/11/2022 | **Drilling Company:** Martini Drilling

Project Name: EPD - Torrance | **Type of Rig:** Truck Mounted

Project Number: 22070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~70' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						@0' - 3" of Asphalt over 4" of Base **@~7" to T.D. - Quaternary Old Alluvium (Qoa):**	-#200 CR DS EI MD
			R-1	5 12 34	114.2	16.6	CL	@2.5' - Sandy CLAY: light brown, moist, hard	
65	5		SPT-1	10 18 22		15.2	ML	@5' - Sandy SILT: light brown, moist, hard	
			R-2	8 18 30	112.5	9.8	SM	@7.5' - Silty SAND: light reddish brown, moist, dense	
60	10		SPT-2	4 4 4		13.5		@10' - Silty SAND: light brown, very moist, medium dense	-#200
55	15		R-3	4 10 18	96.2	9.7		@15' - Silty SAND: light yellowish brown, moist, medium dense	-#200
50	20		SPT-3	6 8 8		9.8		@20' - Silty SAND: light yellowish brown, moist, medium dense	-#200
45	25		R-4	8 19 33	100.8	8.8		@25' - Silty SAND: pale reddish brown, moist, dense	
40	30								

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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: 6/4/2022

Geotechnical Boring Log Borehole HS-1

Date: 5/11/2022 | **Drilling Company:** Martini Drilling

Project Name: EPD - Torrance | **Type of Rig:** Truck Mounted

Project Number: 22070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~70' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		SPT-4	5 12 15		19.9	ML	@30' - Sandy SILT: light brown, very moist, hard	
35	35		R-5	7 50/5"	94.1	5.1	SP	@35' - SAND: light brown, slightly moist, very dense	
30	40		SPT-5	8 19 33		5.9	ML	@40' - Sandy SILT: pale olive brown, slightly moist, hard	
25	45		R-6	7 12 19	82.9	38.0		@45' - SILT: light brown, very moist, very stiff	
20	50		SPT-6	8 16 27		9.4	SM	@50' - Silty SAND: olive brown, moist, very dense	
15	55							Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 5/11/2022	
10	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.

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TEST TYPES:

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EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-2

Date: 5/11/2022 | **Drilling Company:** Martini Drilling

Project Name: EPD - Torrance | **Type of Rig:** Truck Mounted

Project Number: 22070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~71' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
70	0	B-1						@0' - 3" of Asphalt over 4" of Base **@~7" to T.D. - Quaternary Old Alluvium (Qoa):**	
			R-1	18 20 32	117.8	10.1	SM	@2.5' - Silty SAND: dark brown, moist, dense	
65	5		SPT-1	2 3 5		14.5	CL	@5' - Sandy CLAY: brown, moist, stiff	
			R-2	7 15 50/5"	104.4	25.0		@7.5' - CLAY: pale brown, very moist, hard	
60	10		SPT-2	6 6 5		9.9	SM	@10' - Silty SAND: light brown, moist, medium dense	
55	15		R-3	9 16 27	104.9	9.0		@15' - Silty SAND: light brown, moist, dense	
50	20							Total Depth = 16.5' Groundwater Not Encountered Backfilled with Cuttings on 5/11/2022	
45	25								
	30								

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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: 6/4/2022

Geotechnical Boring Log Borehole HS-3

Date: 5/11/2022	**Drilling Company:** Martini Drilling
Project Name: EPD - Torrance	**Type of Rig:** Truck Mounted
Project Number: 22070-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: 69' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
65	0	B-1						@0' - 3" of Asphalt over 4" of Base **@~7" to T.D. - Quaternary Old Alluvium (Qoa):**	
			R-1	14 23 33	101.8	5.8	SM	@2.5' - Silty SAND: light brown, slightly moist, dense	
60	5		SPT-1	6 10 11		10.9	CL/ML	@5- SILT/CLAY: brown, moist, very stiff	
			R-2	16 20 39	109.8	17.8	CL	@7.5' - CLAY: pale brown, moist, hard	
55	10		SPT-2	8 16 26		17.8		@10' - CLAY: pale brown, moist, hard	
50	15		R-3	10 20 50/5"	96.5	2.8	SM	@15' - Silty SAND: light yellowish brown, slightly moist, very dense	
45	20							Total Depth = 16.5' Groundwater Not Encountered Backfilled with Cuttings on 5/11/2022	
	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: 6/4/2022

Geotechnical Boring Log Borehole HS-4

Date: 5/11/2022	**Drilling Company:** Martini Drilling
Project Name: EPD - Torrance	**Type of Rig:** Truck Mounted
Project Number: 22070-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~70' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						@0' - 3" of Asphalt over 4" of Base **@~7" to T.D. - Quaternary Old Alluvium (Qoa):**	
			R-1	8 15 31	111.9	17.1	SM	@2.5' - Silty SAND: light brown, very moist, dense	
65	5		SPT-1	6 10 12		17.1	CL	@5' - Sandy CLAY: brown, moist, very stiff	
			R-2	8 19 29	108.0	19.5		@7.5' - CLAY: light brown, very moist, hard	AL CN
60	10		SPT-2	6 9 17		18.4	ML	@10' - Sandy SILT: pale brown, very moist, hard	
55	15		R-3	18 31 36	110.8	10.7		@15' - Sandy SILT: olive, moist, hard	
								Total Depth = 16.5' Groundwater Not Encountered Backfilled with Cuttings on 5/11/2022	
50	20								
45	25								
40	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: 6/4/2022

Geotechnical Boring Log Borehole I-1

Date: 5/11/2022	**Drilling Company:** Martini Drilling
Project Name: EPD - Torrance	**Type of Rig:** Truck Mounted
Project Number: 22070-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~68' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
65	0							@0' - 3" of Asphalt over 4" of Base **@~7" to T.D. - <u>Quaternary Old Alluvium (Qoa):</u>**	
	5		SPT-1	3 7 10		15.6	CL	@5' - Sandy CLAY: pale brown, moist, very stiff	
60			SPT-2	6 10 15		18.3		@8: CLAY: pale brown, very moist, hard	
	10							Total Depth = 10' Groundwater Not Encountered 3" Perforated Pipe with Filter Sock Installed, Surrounded by Gravel, and Presoaked on 5/11/2022 Pipe Removed and Boring Backfilled on 5/12/2022	
55									
	15								
50									
	20								
45									
	25								
40									
	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: 6/4/2022

Geotechnical Boring Log Borehole I-2

Date: 5/11/2022 | **Drilling Company:** Martini Drilling

Project Name: EPD - Torrance | **Type of Rig:** Truck Mounted

Project Number: 22070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~68' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
65	0							@0' - 2" of Asphalt over 4" of Base **@~0.5' to T.D. - Quaternary Old Alluvium (Qoa):**	
60	5		SPT-1	2 3 4		22.6	ML	@5' - Sandy SILT: pale brown, very moist, stiff	
55	10		SPT-2	5 8 11		4.5	SM	@13' - Silty SAND: light yellowish brown, slightly moist, medium dense	-#200
50	15							Total Depth = 15' Groundwater Not Encountered 3" Perforated Pipe with Filter Sock Installed, Surrounded by Gravel, and Presoaked on 5/11/2022 Pipe Removed and Boring Backfilled with on 5/12/2022	
45	20								
40	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: 6/4/2022

Geotechnical Boring Log Borehole I-3

Date: 5/11/2022	**Drilling Company:** Martini Drilling
Project Name: EPD - Torrance	**Type of Rig:** Truck Mounted
Project Number: 22070-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~69' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By RNP
Sampled By RNP
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
69	0							@0' - 3" of Asphalt over 4" of Base **@~7" to T.D. - <u>Quaternary Old Alluvium (Qoa):</u>**	
65	5		SPT-1	2 4 8		20.0	CL	@5' - Sandy CLAY: pale brown, very moist, very stiff	
			SPT-2	5 11 9		13.3	SM	@8' - Silty SAND: yellowish brown, very moist, medium dense	
60	10							Total Depth = 10' Groundwater Not Encountered 3" Perforated Pipe with Filter Sock Installed, Surrounded by Gravel, and Presoaked on 5/11/2022 Pipe Removed and Boring Backfilled on 5/12/2022	
55	15								
50	20								
45	25								
40	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: 6/4/2022

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 and/or trenches. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from undisturbed or disturbed samples.

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 this test are presented in the table below.

Sample Location	Expansion Index	Expansion Potential*
HS-1 @ 1-5 feet	37	Low

* ASTM D4829

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
HS-1 @ 1-5 feet	Sandy Clay	50
HS-1 @ 10 feet	Silty Sand	31
HS-1 @ 15 feet	Silty Sand	21
HS-1 @ 20 feet	Silty Sand	22
I-2 @ 13 feet	Silty Sand	13

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 plot is provided in this Appendix.

Sample Location	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	USCS Soil Classification
HS-4 @ 7.5 feet	40	22	18	CL

Direct Shear: One direct shear test was performed on remolded samples, which was soaked for a minimum of 24 hours prior to testing. The samples were tested under various normal loads using a motor-driven, strain-controlled, direct-shear testing apparatus (ASTM D3080). The plot is provided in this Appendix.

Consolidation: One consolidation tests 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 curve is provided in this Appendix.

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 (%)
HS-1 @ 1-5 feet	Light Yellowish-Brown Sandy Clay	121.0	11.0

Laboratory Testing Procedures and Test Results

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method (CTM) 422. The results are presented below.

Sample Location	Chloride Content, ppm
HS-1 @ 1-5 feet	185

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (CTM 417). The soluble sulfate content is used to determine the appropriate cement type and maximum water-cement ratios. The test results are presented in the table below.

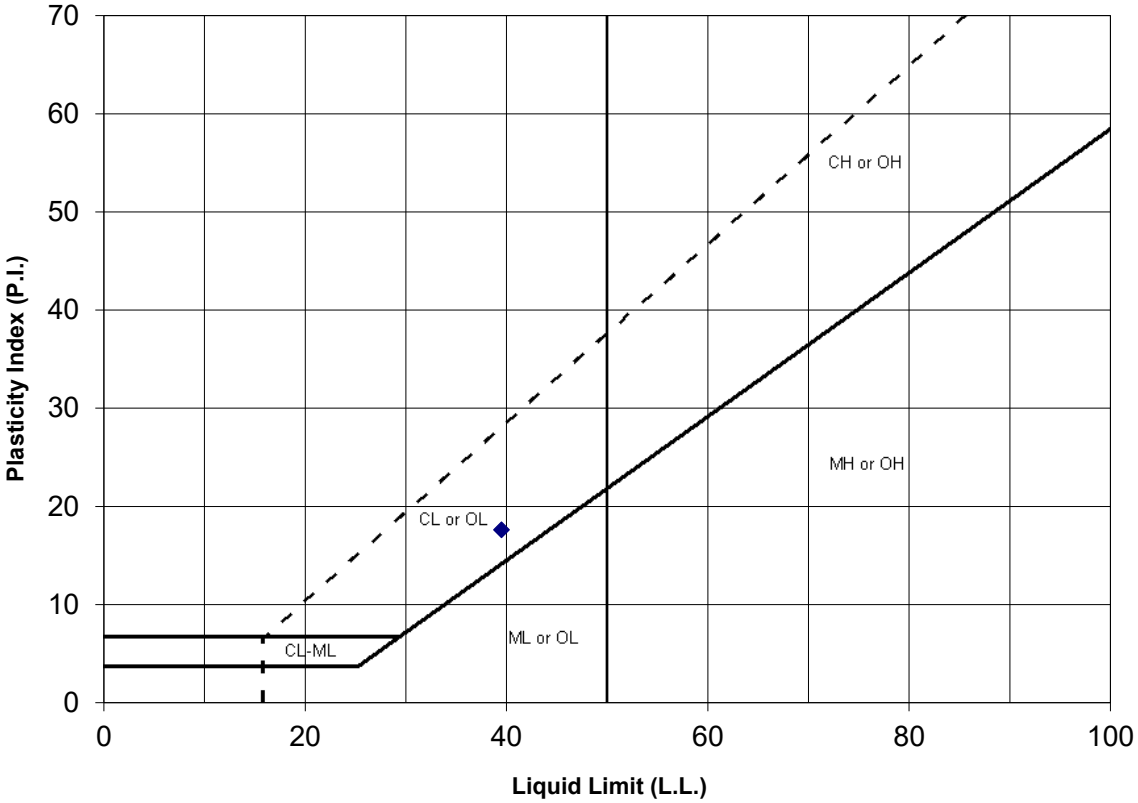
Sample Location	Sulfate Content (ppm)	Sulfate Exposure Class *
HS-1 @ 1-5 feet	85	S0

*Based on ACI 318R-14, Table 19.3.1.1

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The results are presented in the table below.

Sample Location	pH	Minimum Resistivity (ohms-cm)
HS-1 @ 1-5 feet	8.13	1,490

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-4	R-2	7.5'	-	40	22	18	CL

LGC Geotechnical, Inc.

ATTERBERG LIMITS
(ASTM D 4318)

Project Number: 22070-01
Date: May-22

Torrance

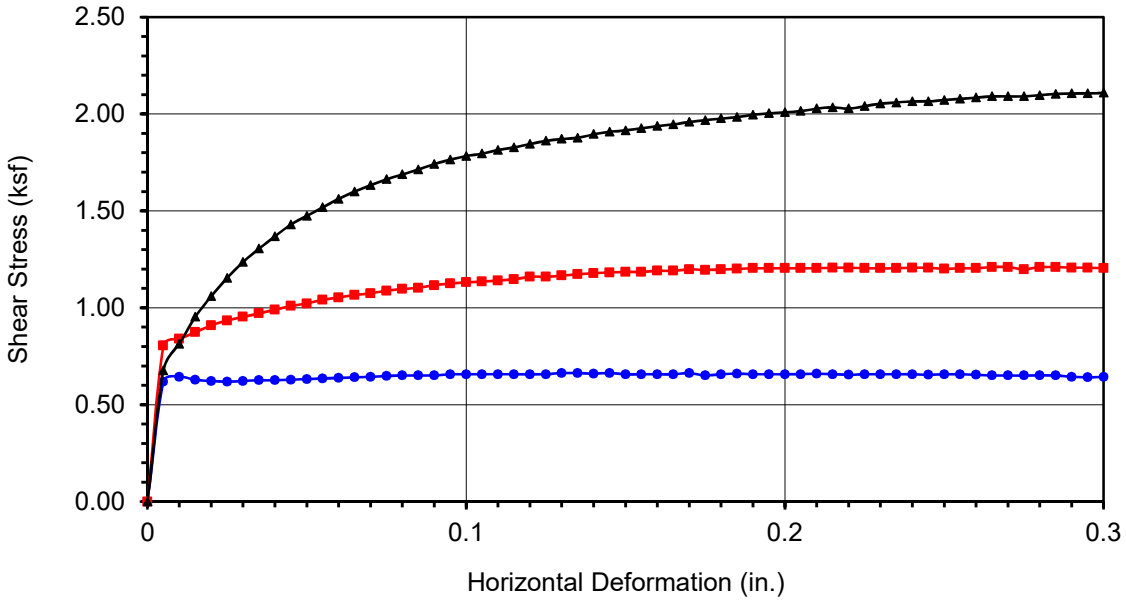
DIRECT SHEAR TEST

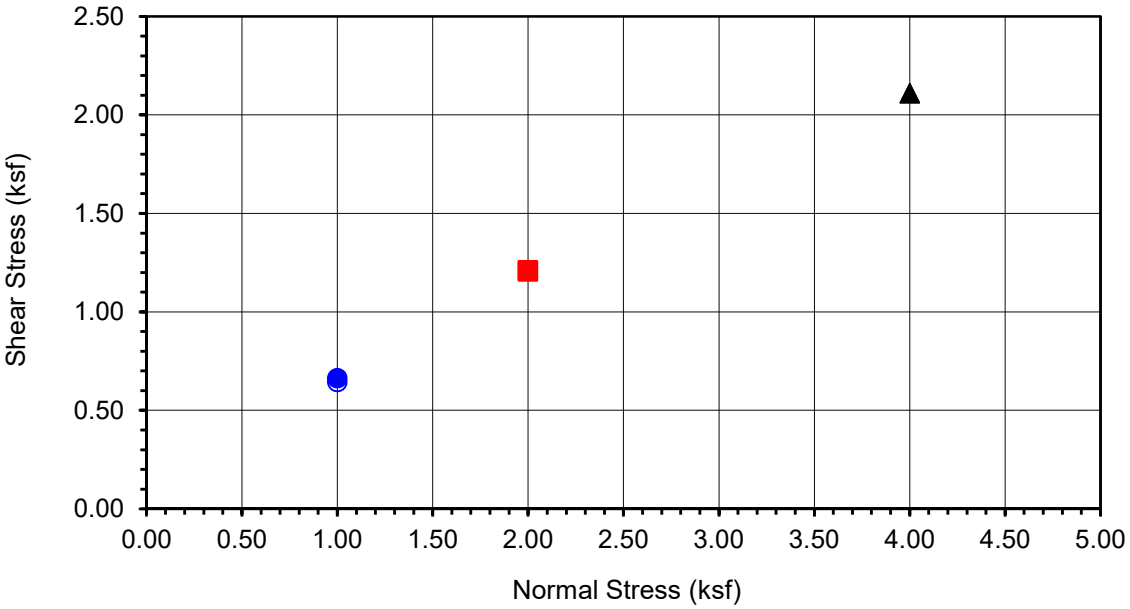
Consolidated Drained - ASTM D 3080

Project Name:	Torrance	Tested By:	G. Bathala	Date:	05/31/22
Project No.:	22070-01	Checked By:	J. Ward	Date:	06/07/22
Boring No.:	HS-1	Sample Type:	Ring		
Sample No.:	B-1	Depth (ft.):	1-5		

Soil Identification: Light yellowish brown sandy lean clay s(CL)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	191.25	191.56	191.92
Weight of Ring(gm):	45.34	45.40	45.58
Before Shearing			
Weight of Wet Sample+Cont.(gm):	172.74	172.74	172.74
Weight of Dry Sample+Cont.(gm):	161.71	161.71	161.71
Weight of Container(gm):	61.74	61.74	61.74
Vertical Rdg.(in): Initial	0.2463	0.2558	0.0000
Vertical Rdg.(in): Final	0.2453	0.2636	-0.0295
After Shearing			
Weight of Wet Sample+Cont.(gm):	215.37	219.63	213.29
Weight of Dry Sample+Cont.(gm):	191.82	197.43	192.98
Weight of Container(gm):	61.74	67.69	63.78
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**HS-1**
Sample No.	**B-1**
Depth (ft)	**1-5**
Sample Type: Ring	
Soil Identification: Light yellowish brown sandy lean clay s(CL)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 0.663	■ 1.210	▲ 2.109
Shear Stress @ End of Test (ksf)	○ 0.644	□ 1.204	△ 2.109
Deformation Rate (in./min.)	0.0017	0.0017	0.0017
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	11.03	11.03	11.03
Dry Density (pcf)	109.3	109.5	109.6
Saturation (%)	54.9	55.2	55.4
Soil Height Before Shearing (in.)	1.0010	0.9922	0.9705
Final Moisture Content (%)	18.1	17.1	15.7

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 22070-01

Torrance

05-22

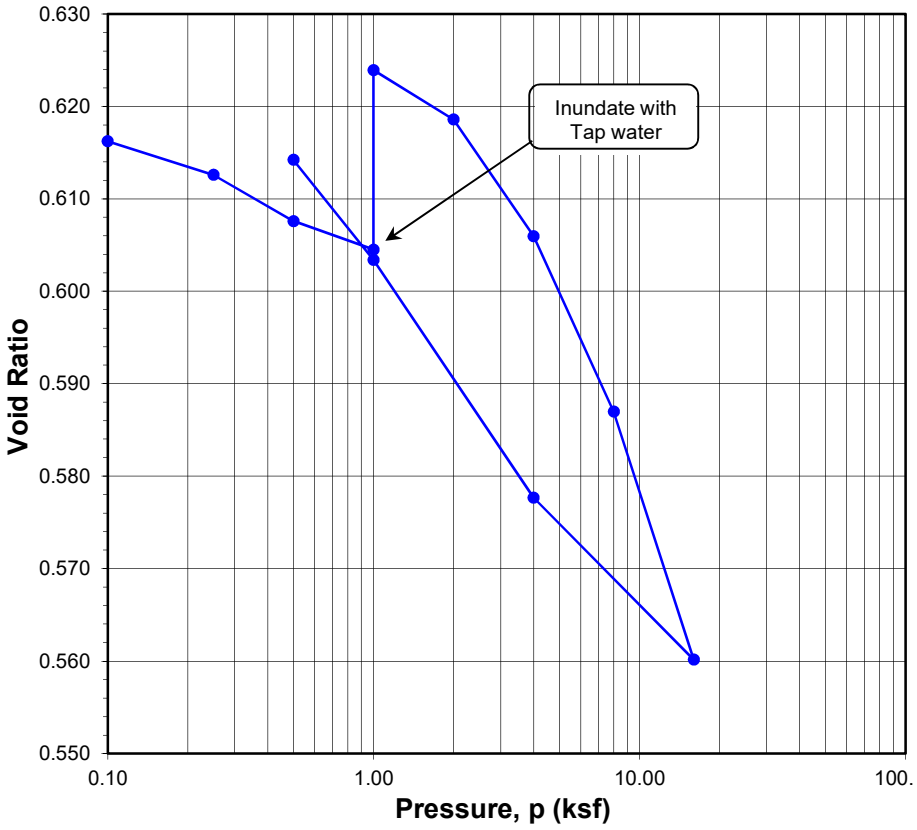
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project Name: Torrance
Project No.: 22070-01
Boring No.: HS-4
Sample No.: R-2
Soil Identification: Light olive brown lean clay (CL)

Tested By: G. Bathala Date: 05/25/22
Checked By: J. Ward Date: 06/07/22
Depth (ft.): 7.5
Sample Type: Ring

Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	201.49
Weight of Ring (g)	45.24
Height after consol. (in.)	0.9987
Before Test	
Wt.Wet Sample+Cont. (g)	202.45
Wt.of Dry Sample+Cont. (g)	179.17
Weight of Container (g)	66.08
Initial Moisture Content (%)	20.6
Initial Dry Density (pcf)	107.8
Initial Saturation (%)	93
Initial Vertical Reading (in.)	0.3076
After Test	
Wt.of Wet Sample+Cont. (g)	264.56
Wt. of Dry Sample+Cont. (g)	235.61
Weight of Container (g)	61.74
Final Moisture Content (%)	22.51
Final Dry Density (pcf)	107.1
Final Saturation (%)	100
Final Vertical Reading (in.)	0.3022
Specific Gravity (assumed)	2.79
Water Density (pcf)	62.43

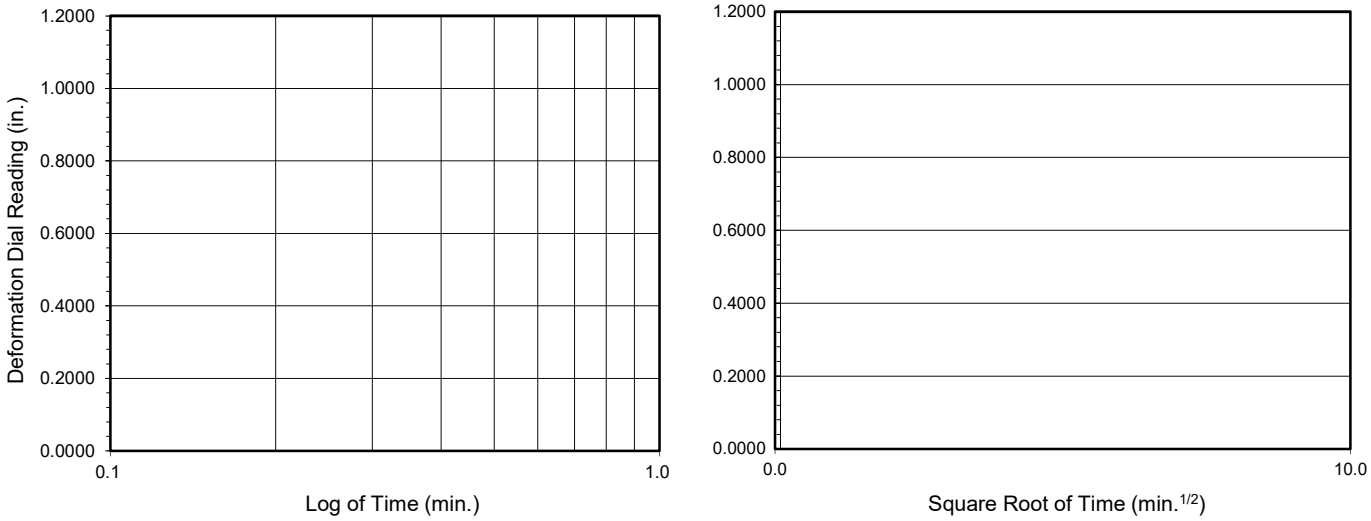


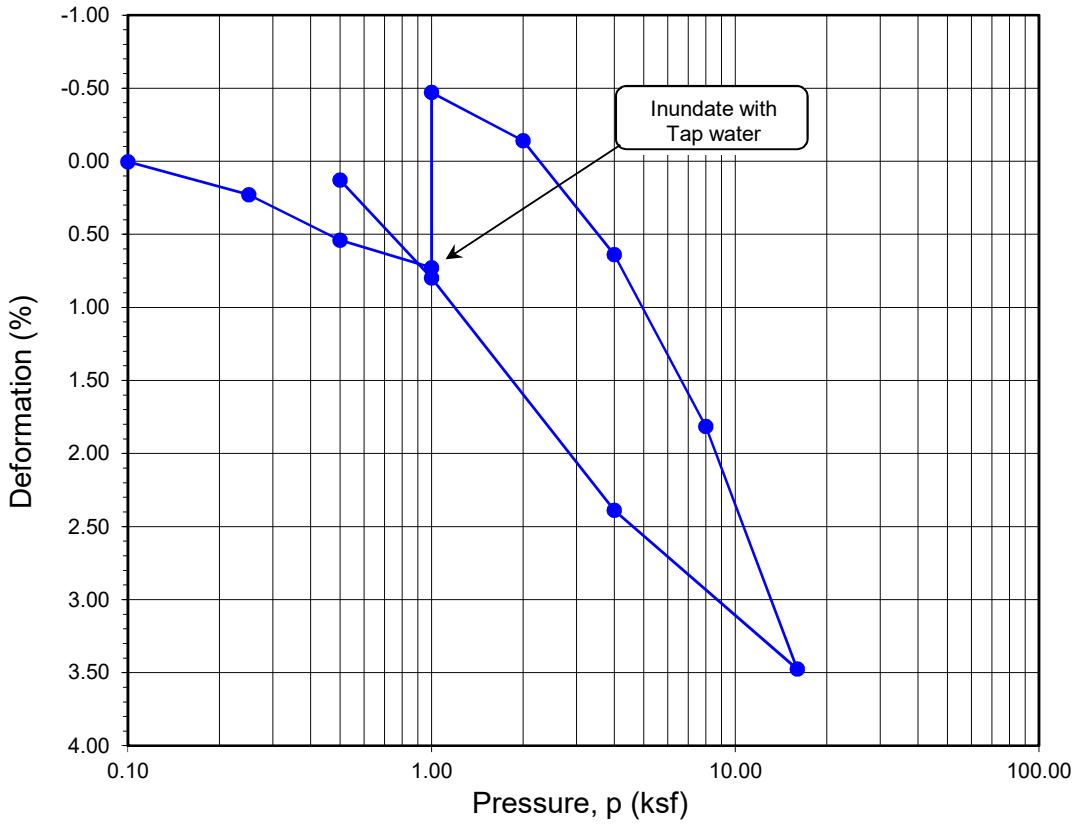
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.3076	1.0000	0.00	0.00	0.616	0.00
0.25	0.3048	0.9972	0.05	0.28	0.613	0.23
0.50	0.3011	0.9935	0.11	0.65	0.608	0.54
1.00	0.2983	0.9907	0.20	0.93	0.605	0.73
1.00	0.3103	1.0027	0.20	-0.27	0.624	-0.47
2.00	0.3059	0.9983	0.31	0.17	0.619	-0.14
4.00	0.2967	0.9891	0.45	1.09	0.606	0.64
8.00	0.2834	0.9758	0.61	2.43	0.587	1.82
16.00	0.2648	0.9572	0.81	4.29	0.560	3.48
4.00	0.2770	0.9694	0.67	3.06	0.578	2.39
1.00	0.2947	0.9871	0.49	1.29	0.603	0.80
0.50	0.3022	0.9946	0.41	0.54	0.614	0.13

Time Readings

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

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-4	**R-2**	**7.5**	**20.6**	**22.5**	**107.8**	**107.1**	**0.616**	**0.614**	**93**	**100**

Soil Identification: Light olive brown lean clay (CL)

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 22070-01

Torrance

06-22

Appendix D
Infiltration Results

Infiltration Test Data Sheet

LGC Geotechnical, Inc
131 Calle Iglesia Suite A, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: EPD - Torrance
Project Number: 20070-01
Date: 5/12/2022
Location: I-1

Test hole dimensions (if circular)	
Boring Depth (feet)*:	10
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):	

Pre-Soak /Pre-Test

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)	Comments
Pre-Test	8:26	9:26	60.0	5.24	5.33	0.09	
Pre-Test	9:29	9:59	30.0	5.31	5.35	0.04	

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Surface Area of Test Section (feet ^2)	Raw Percolation Rate (in/hr)
1	10:02	10:32	30.0	5.30	5.33	0.03	10.16	0.0
2	10:35	11:05	30.0	5.33	5.36	0.03	10.10	0.0
3	11:08	11:38	30.0	5.36	5.38	0.02	10.05	0.0
4	11:41	12:11	30.0	5.38	5.40	0.02	10.00	0.0
5	12:14	12:44	30.0	5.40	5.42	0.02	9.96	0.0
6	12:47	13:17	30.0	5.42	5.44	0.02	9.92	0.0
7								
8								
9								
10								
11								
12								

Measured Infiltration Rate	**0.0**
Feasibility Factor of Safety	See Report
Feasibility Infiltration Rate	**See Report**

Sketch:

Notes:

Based on Guidelines from: LA County dated 06/2021

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc
131 Calle Iglesia Suite A, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: EPD - Torrance
Project Number: 20070-01
Date: 5/12/2022
Location: I-2

Test hole dimensions (if circular)	
Boring Depth (feet)*:	15
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):	

Pre-Soak /Pre-Test

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)	Comments
Pre-Test	8:30	9:30	60.0	9.12	14.24	5.12	
Pre-Test	9:33	10:03	30.0	11.19	14.08	2.89	

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Surface Area of Test Section (feet ^2)	Raw Percolation Rate (in/hr)
1	10:06	10:36	30.0	11.53	14.10	2.57	4.93	4.4
2	10:39	11:09	30.0	11.59	12.89	1.30	6.13	1.8
3	11:12	11:42	30.0	11.48	12.45	0.97	6.71	1.2
4	11:45	12:15	30.0	11.51	12.45	0.94	6.67	1.2
5	12:18	12:48	30.0	11.60	12.55	0.95	6.48	1.2
6	12:51	13:21	30.0	11.45	12.37	0.92	6.82	1.1
7	13:25	13:55	30.0	11.41	12.31	0.90	6.93	1.1
8	13:58	14:28	30.0	11.50	12.40	0.90	6.74	1.1
9								
10								
11								
12								

Measured Infiltration Rate	**1.1**
Feasibility Factor of Safety	See Report
Feasibility Infiltration Rate	**See Report**

Sketch:

Notes:

Based on Guidelines from: LA County dated 06/2021

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc
131 Calle Iglesia Suite A, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: EPD - Torrance
Project Number: 20070-01
Date: 5/12/2022
Location: I-3

Test hole dimensions (if circular)	
Boring Depth (feet)*:	10
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):	

Pre-Soak /Pre-Test

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)	Comments
Pre-Test	8:34	9:30	60.0	4.91	5.06	0.15	
Pre-Test	9:37	10:03	30.0	5.11	5.2	0.09	

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Surface Area of Test Section (feet ^2)	Raw Percolation Rate (in/hr)
1	10:10	10:40	30.0	5.21	5.29	0.08	10.30	0.1
2	10:43	11:13	30.0	5.29	5.37	0.08	10.13	0.1
3	11:16	11:46	30.0	5.37	5.45	0.08	9.96	0.1
4	11:49	12:19	30.0	5.45	5.54	0.09	9.78	0.1
5	12:22	12:52	30.0	5.54	5.61	0.07	9.62	0.1
6	12:55	13:25	30.0	5.56	5.61	0.05	9.60	0.0
7	13:29	13:59	30.0	5.57	5.63	0.06	9.56	0.1
8	14:02	14:32	30.0	5.55	5.61	0.06	9.61	0.1
9	14:35	15:05	30.0	5.53	5.59	0.06	9.65	0.1
10								
11								
12								

Measured Infiltration Rate	**0.0**
Feasibility Factor of Safety	See Report
Feasibility Infiltration Rate	**See Report**

Sketch:

Notes:

Based on Guidelines from: LA County dated 06/2021

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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

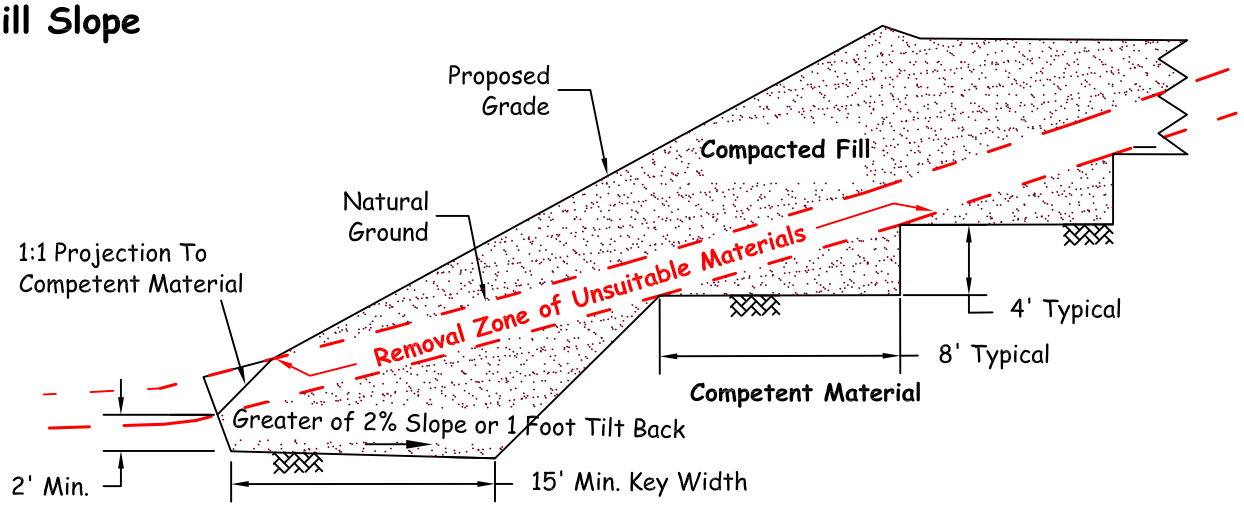
the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

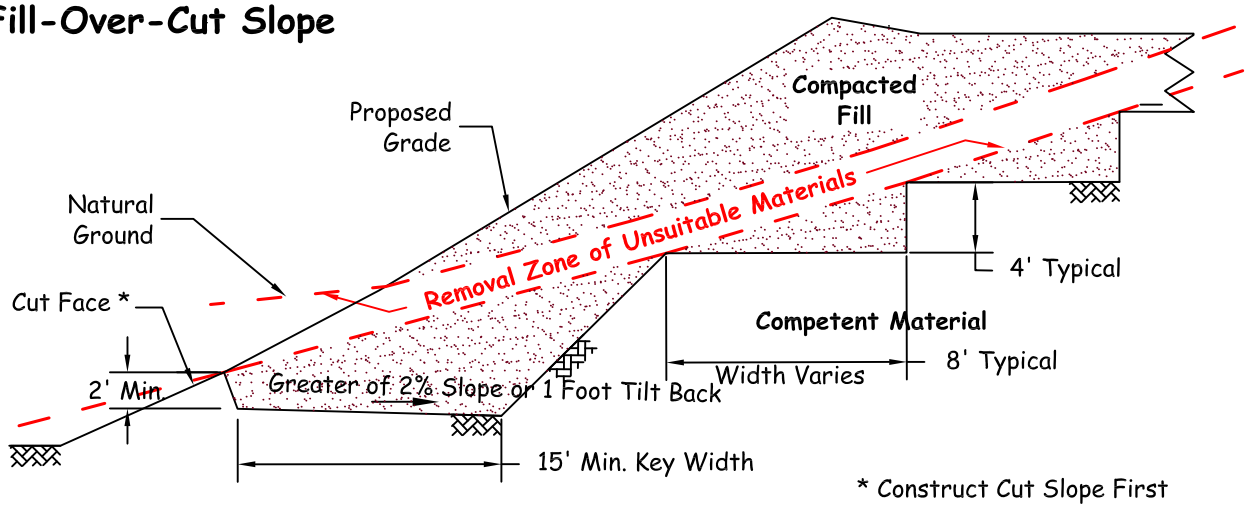
7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

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

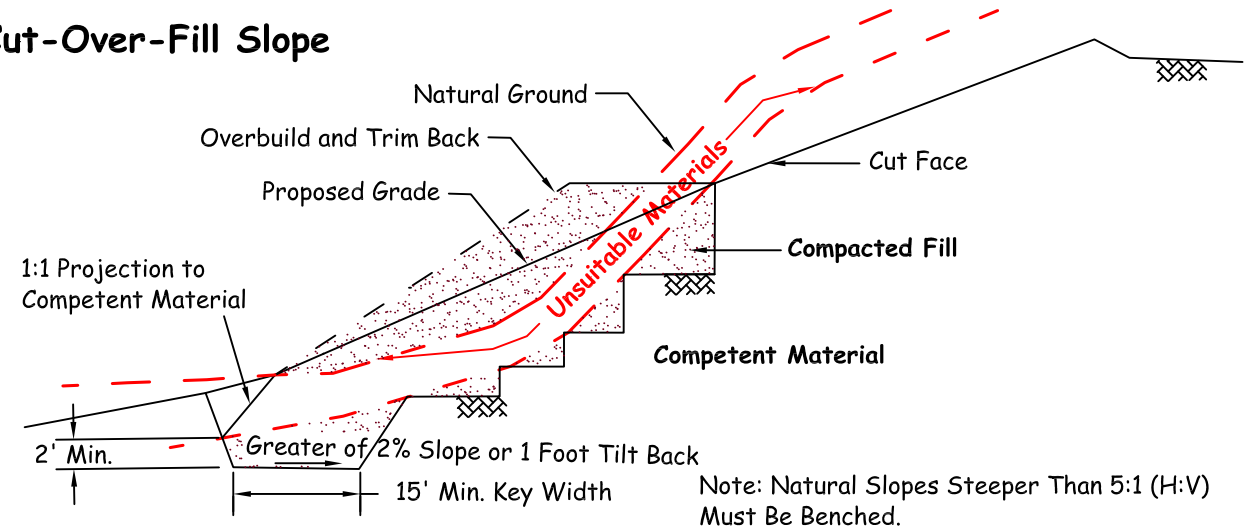


Fill-Over-Cut Slope



* Construct Cut Slope First

Cut-Over-Fill Slope



Note: Natural Slopes Steeper Than 5:1 (H:V) Must Be Benched.

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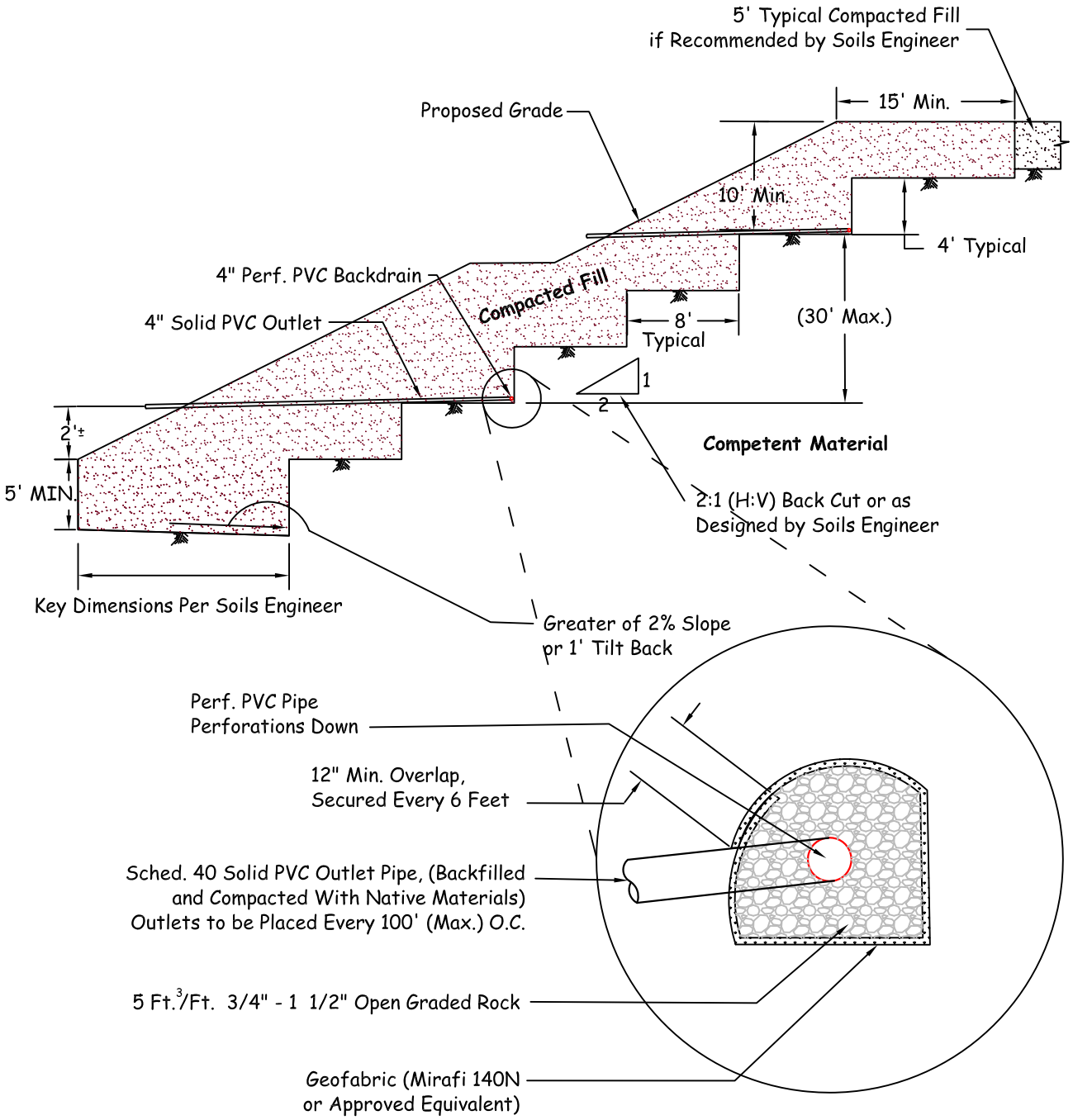
KEYING AND BENCHING



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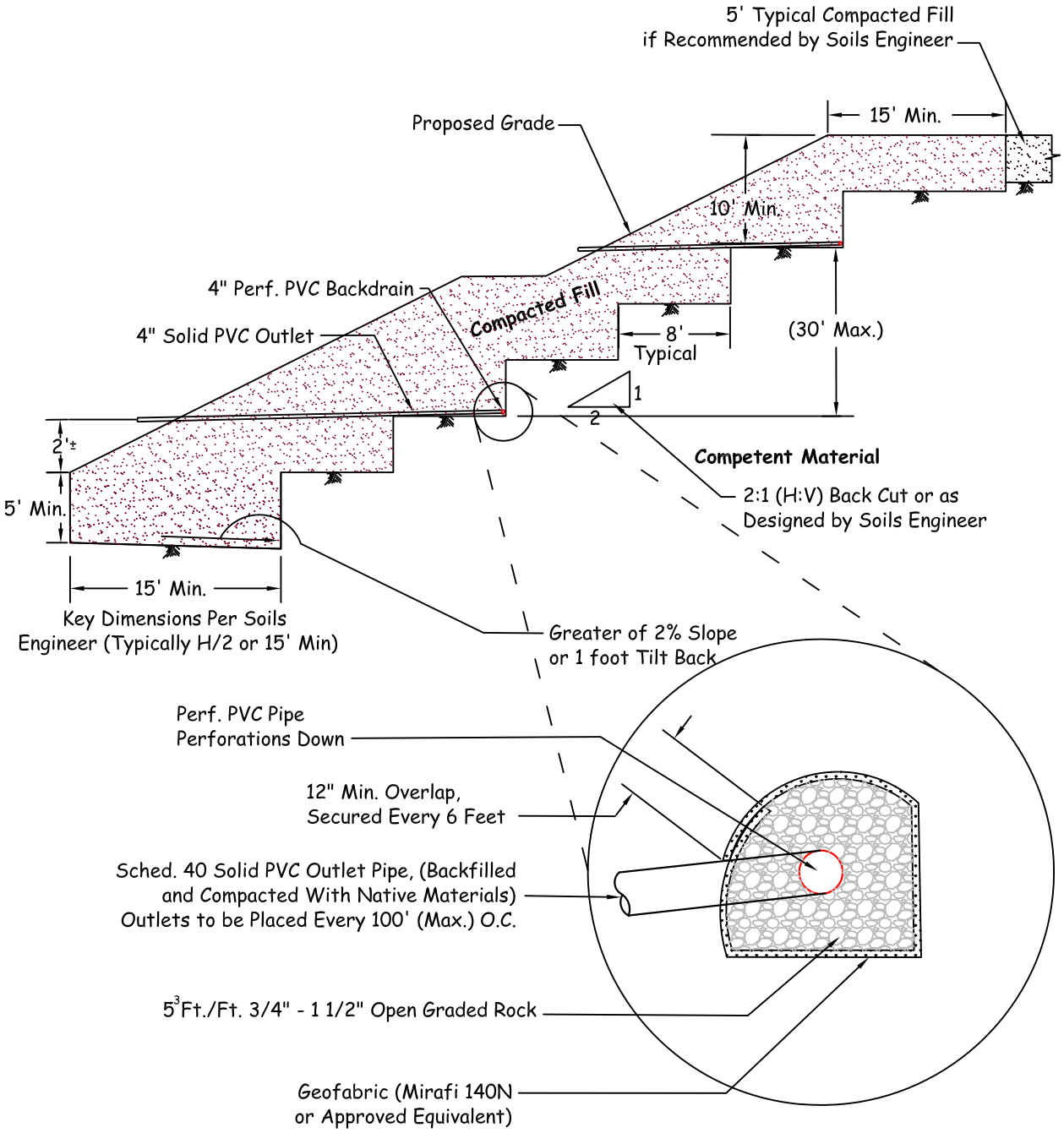
TYPICAL BUTTRESS DETAIL



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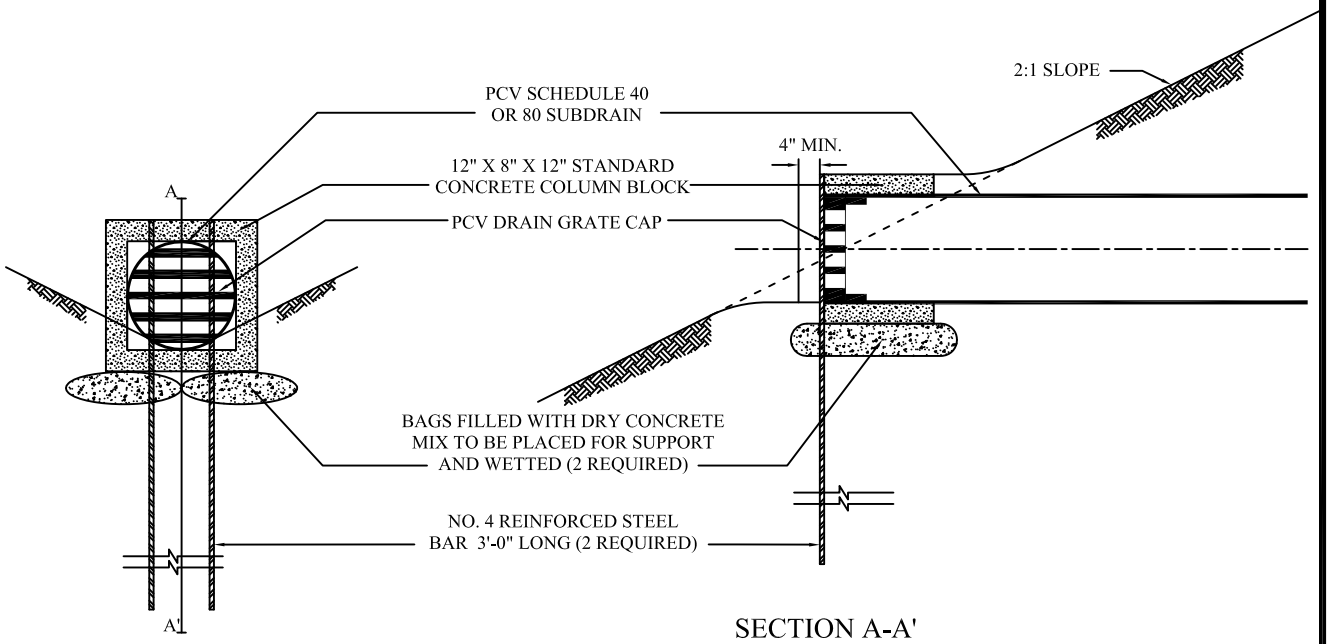
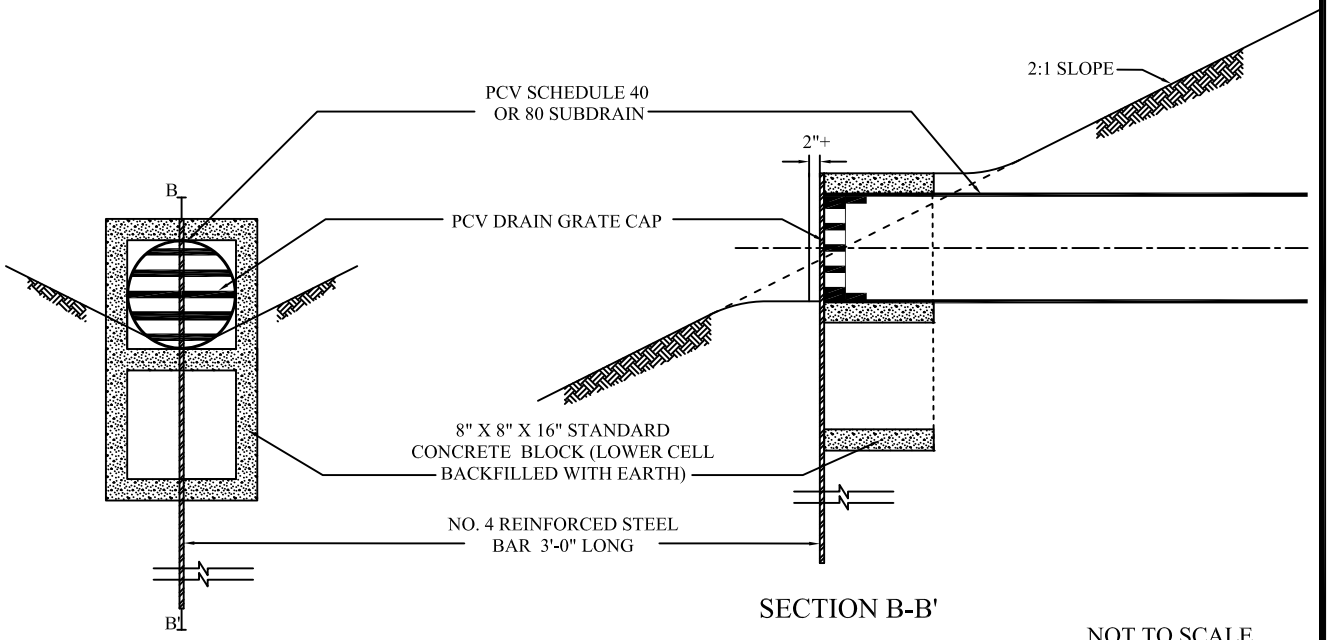
TYPICAL STABILIZATION FILL DETAIL

SUBDRAIN OUTLET MARKER -6" & 8" PIPE



SECTION A-A'

SUBDRAIN OUTLET MARKER -4" PIPE



SECTION B-B'

NOT TO SCALE

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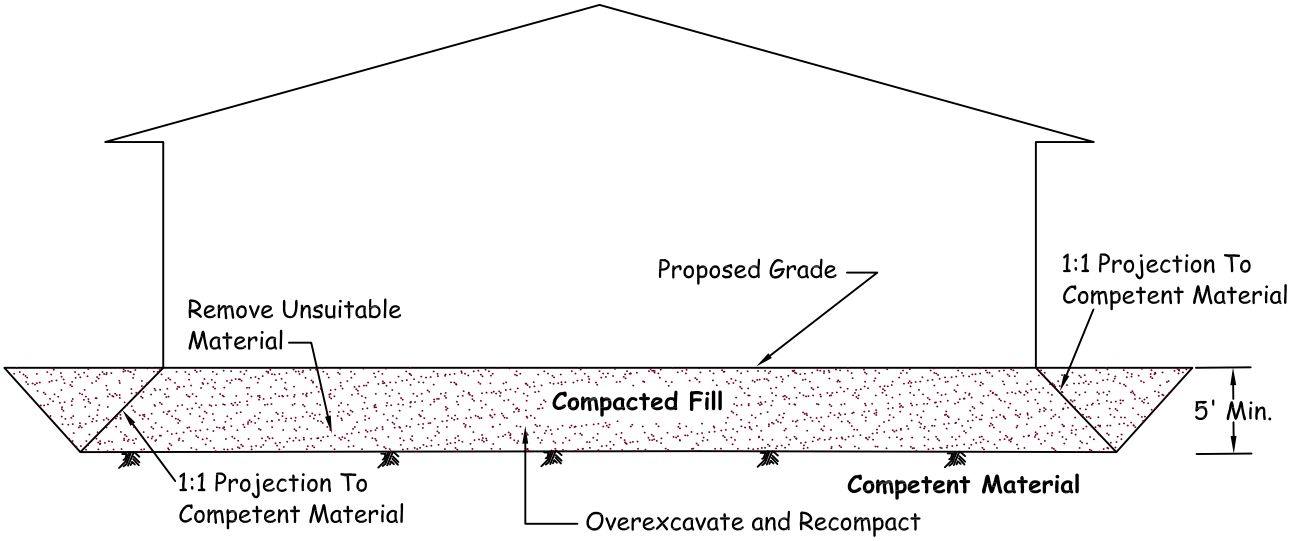
SUBDRAIN OUTLET MARKER DETAIL

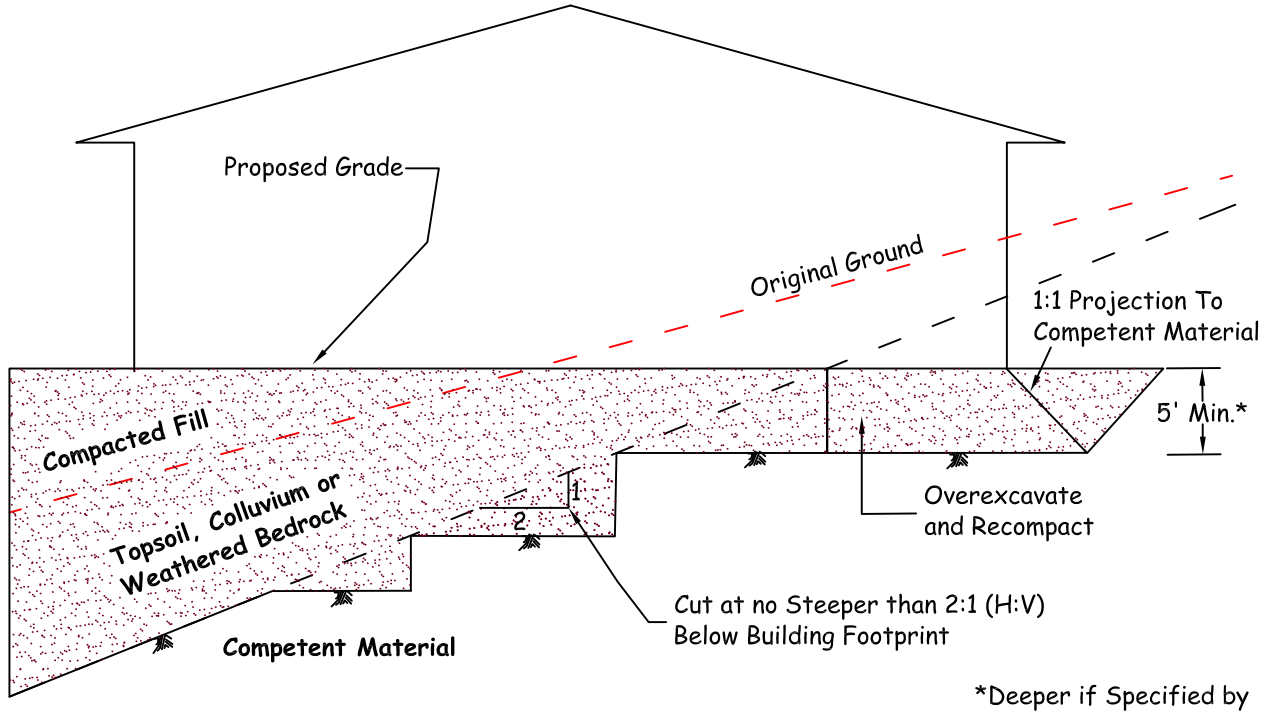
Cut Lot
(Exposing Unsuitable Soils at Design Grade)



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

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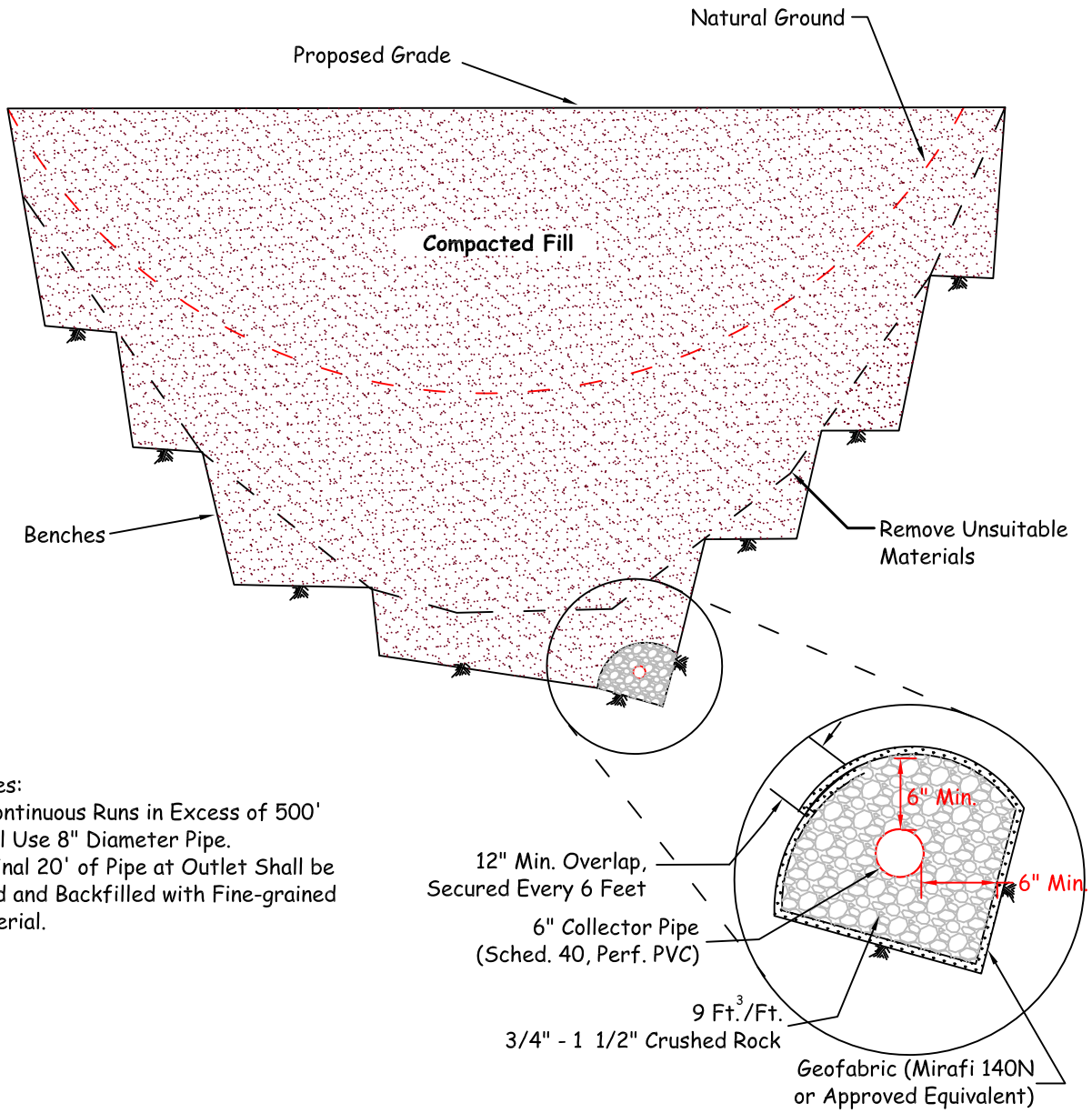
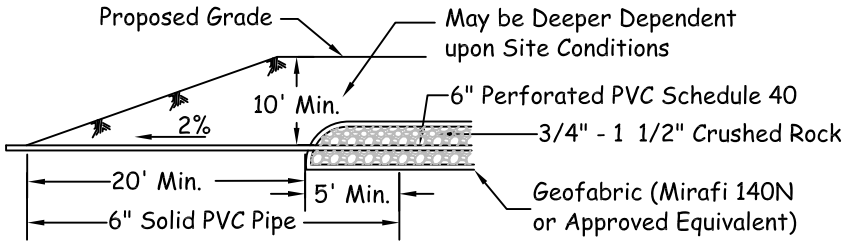
CUT AND TRANSITION LOT OVEREXCAVATION DETAIL



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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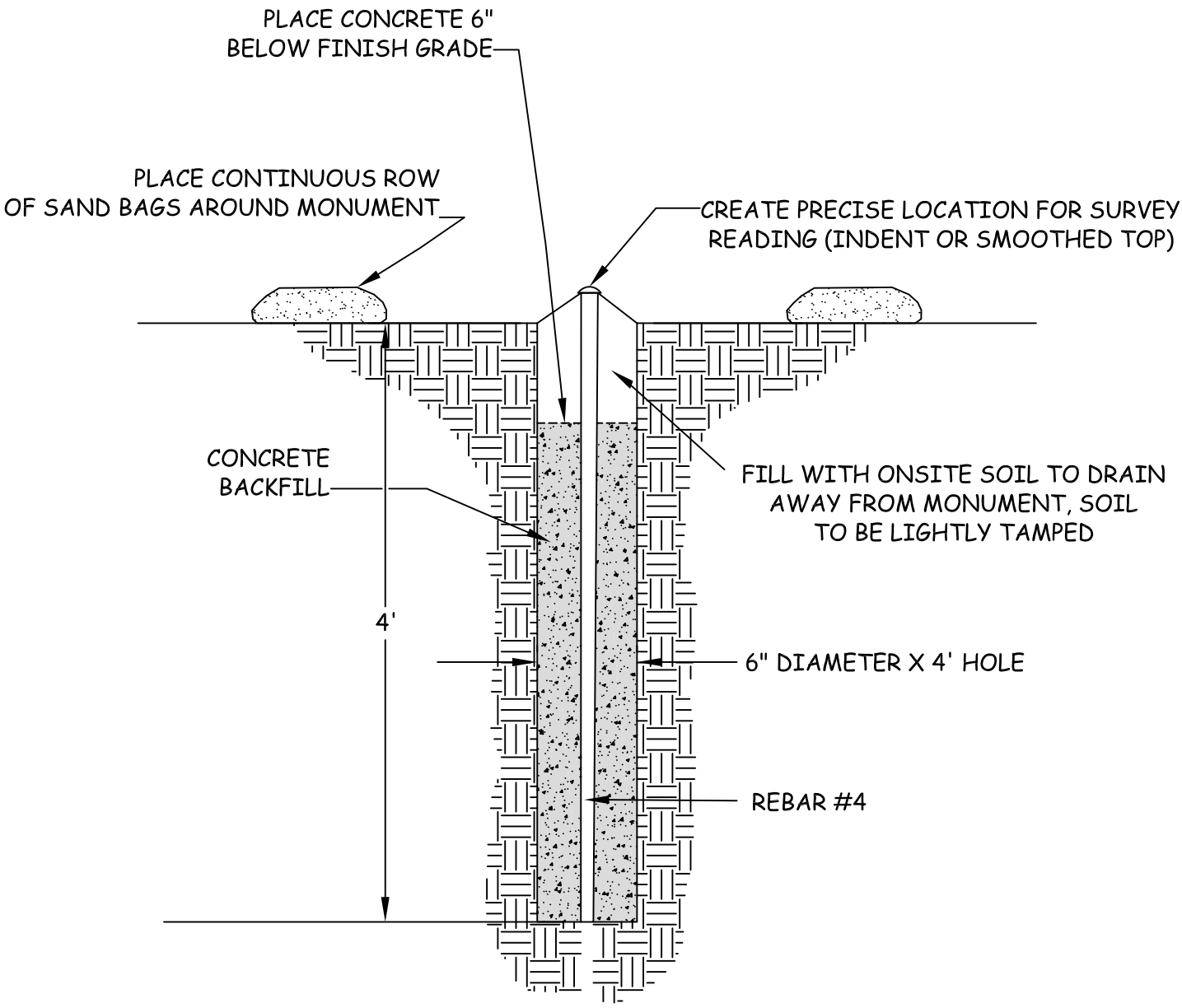
CANYON SUBDRAINS



NO CONSTRUCTION EQUIPMENT WITHIN 25 FEET
OF ANY INSTALLED SETTLEMENT MONUMENTS

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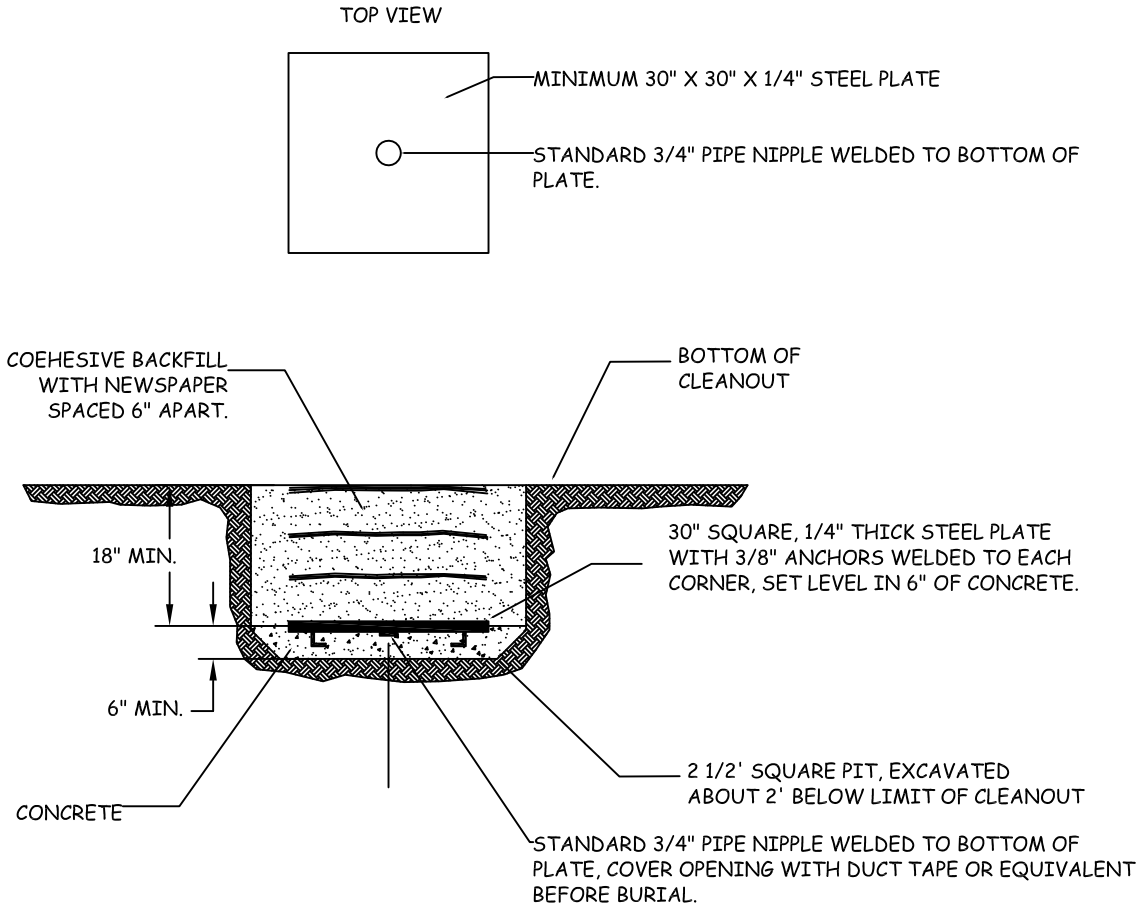
TYPICAL SURFACE SETTLEMENT MONUMENT



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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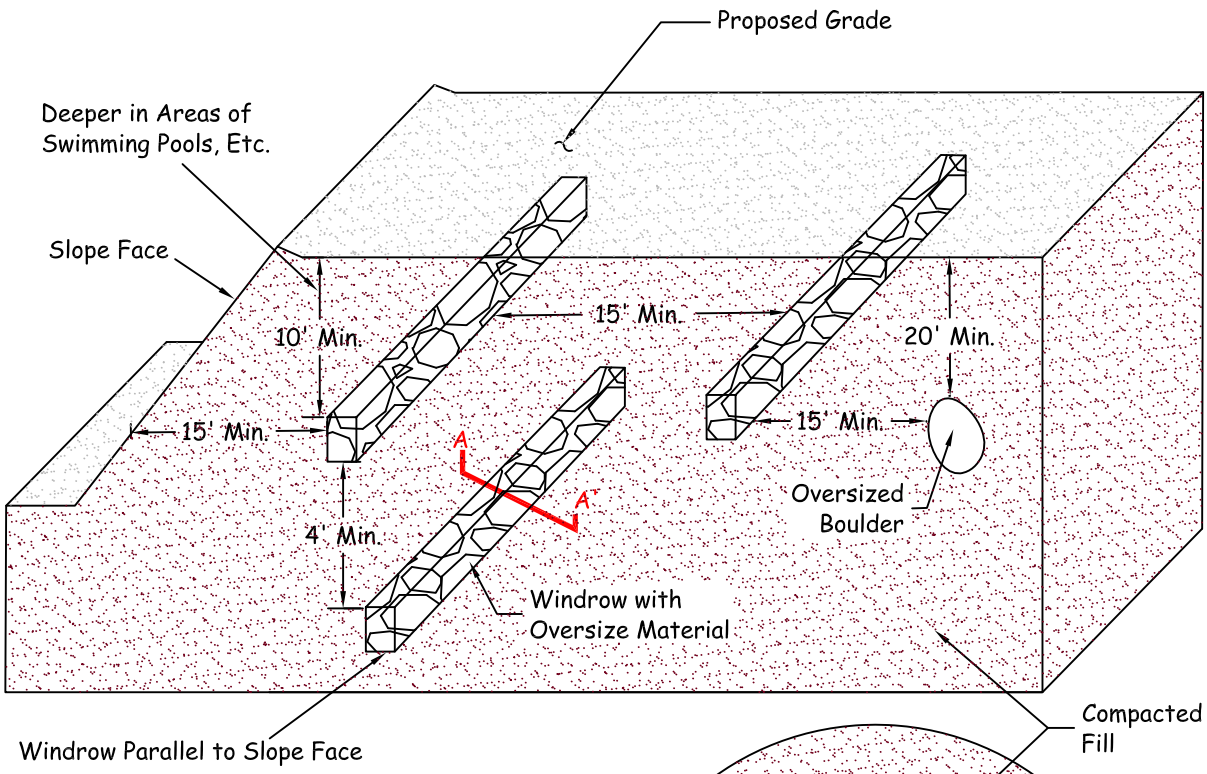
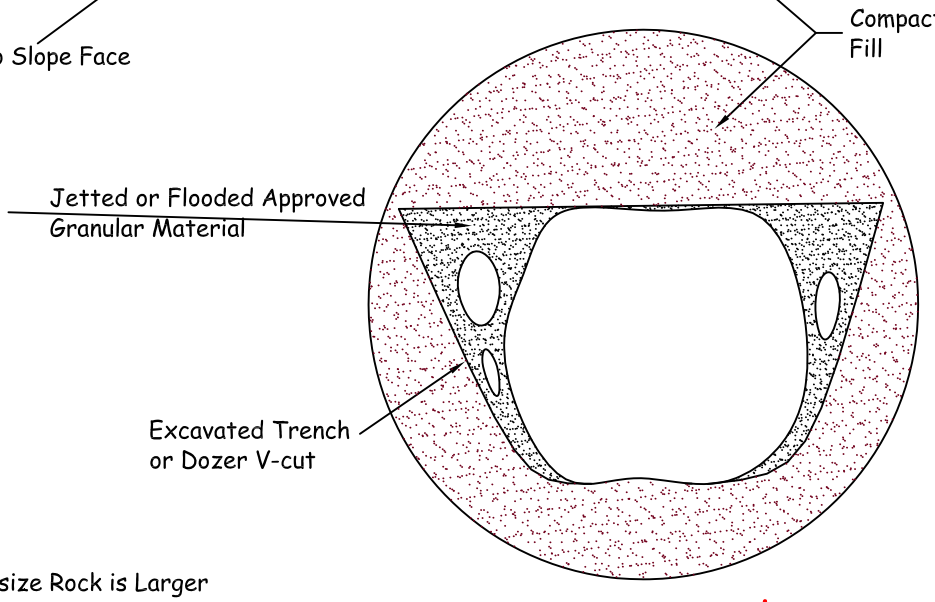
TYPICAL SETTLEMENT PLATE AND RISER





Note: Oversize Rock is Larger
than 8" in Maximum Dimension.

Section A-A'

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OVERSIZE ROCK DISPOSAL DETAIL