APPENDIX F
HYDROLOGY ANALYSIS AND LID PLAN

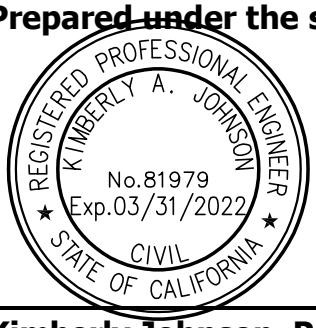
PRELIMINARY HYDROLOGY ANALYSIS

PROPOSED SELF STORAGE
NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
SAN GABRIEL, CA.

Prepared by:

Blue Peak Engineering, Inc.
18543 Yorba Linda Blvd., #235
Yorba Linda, CA 92886
(562) 537-6038

Prepared under the supervision of Blue Peak Engineering, Inc:



Kimberly Johnson, P.E. **Date 06/04/2020**

Table of Contents

Section I Introduction

This report has been prepared to analyze the hydrological effects of the proposed site development and to calculate the flow into the adjacent streets.

Section II Project Description

The site is located at NEC of San Gabriel Blvd. and Commercial Avenue in the City of San Gabriel in California. The proposed Self Storage project is a development of an existing fully developed site at the north east corner of San Gabriel Blvd and Commercial Avenue, in the City of San Gabriel.

The site will be developed with a 3 story (above grade) and 1 story (below grade) self-storage building, with a square footage of 35,065 per floor, totaling a 140,206 square foot building. A drive aisle with parking will be provided, as well as site landscape. Refer to the HYD-2 Post Hydrology Exhibit provided in the Appendix.

Section III Criteria and Allowable Q

The hydrology report will follow the Los Angeles County Hydrology Manual guidelines dated January 2006. The proposed project will infiltrate the low flow, recharging the groundwater, while the high-flow will sheet flow out the parkway drain into Commercial Ave.

There is no proposed connection to the existing County of Los Angeles storm drain main 0573-Extension Line D in Commercial Avenue.

Section IV Existing Condition Drainage Patterns

The existing site drains from the northwest corner to the southeast corner of the site towards the corner of Commercial Ave and S. Gladys Ave. The existing side is developed with no visible onsite drainage devices implemented on site.

Section V Proposed Condition Drainage Patterns

The proposed development will maintain the existing drainage pattern and continue to drain from the northwest corner to the southwest corner of the site. The proposed development will implement the required stormwater BMPs at the southeast corner of the site. The high-flow will bypass the BMPs and continue to sheet flow out via parkway drain into Commercial Avenue. There will be no increase in the pre to post development site runoff for the 25-year storm event.

Section VI Water Quality Considerations

As described above, the proposed project will comply with the Los Angeles County Low Impact Development standards. An infiltration drywell BMP is being proposed at the southeast corner of the site. Please refer to the HYD-2 Post Hydrology Exhibit provided in the Appendix. The site is designed to sheet flow the runoff via v-gutter to the proposed project low point, where a curb inlet will collect the low-flow and pipe it to the infiltration drywell BMP. The low-flow will infiltrate and recharge the groundwater. . The high-flow will bypass the infiltration drywell BMP at the curb inlet surface level, and discharge via parkway drain directly into Commercial Drive, tributary to Rubio Wash. The proposed development will match existing development drainage pattern and runoff rate.

Per the project Low Impact Development report, the required mitigated 85th percentile flow rate and volume is 0.405 cfs and 4,907 cf. The proposed drywell infiltration system described above has been sized accordingly to treat this required flow rate. Refer to the LID calculation within the Appendix for reference.

Section VII Calculations

The calculations provided below are using the Los Angeles County Hydrology Manual and the Rational Method. Additional the Hydrologic Maps and Soil Type Maps from the LAC Hydrology Manual were utilized which can also be referenced in the Appendix.

Soil Type= 6
50-Year Isohyet= 6.85 in

For the predevelopment condition Lot 10 and 11 are landscape area that results in a 8,763 sq.ft. In the post-development the proposed landscape results in 10,965 sq.ft.

EXISTING CONDITION
Below is a table summary for the calculated 25-year 24-hour storm event for the existing undeveloped site condition.

	Total Area (ac)	Impervious Area (ac)	Pervious Area (ac)	Peak Flow (cfs)
E-1	1.75	1.55	0.20	5.15

PROPOSED CONDITION

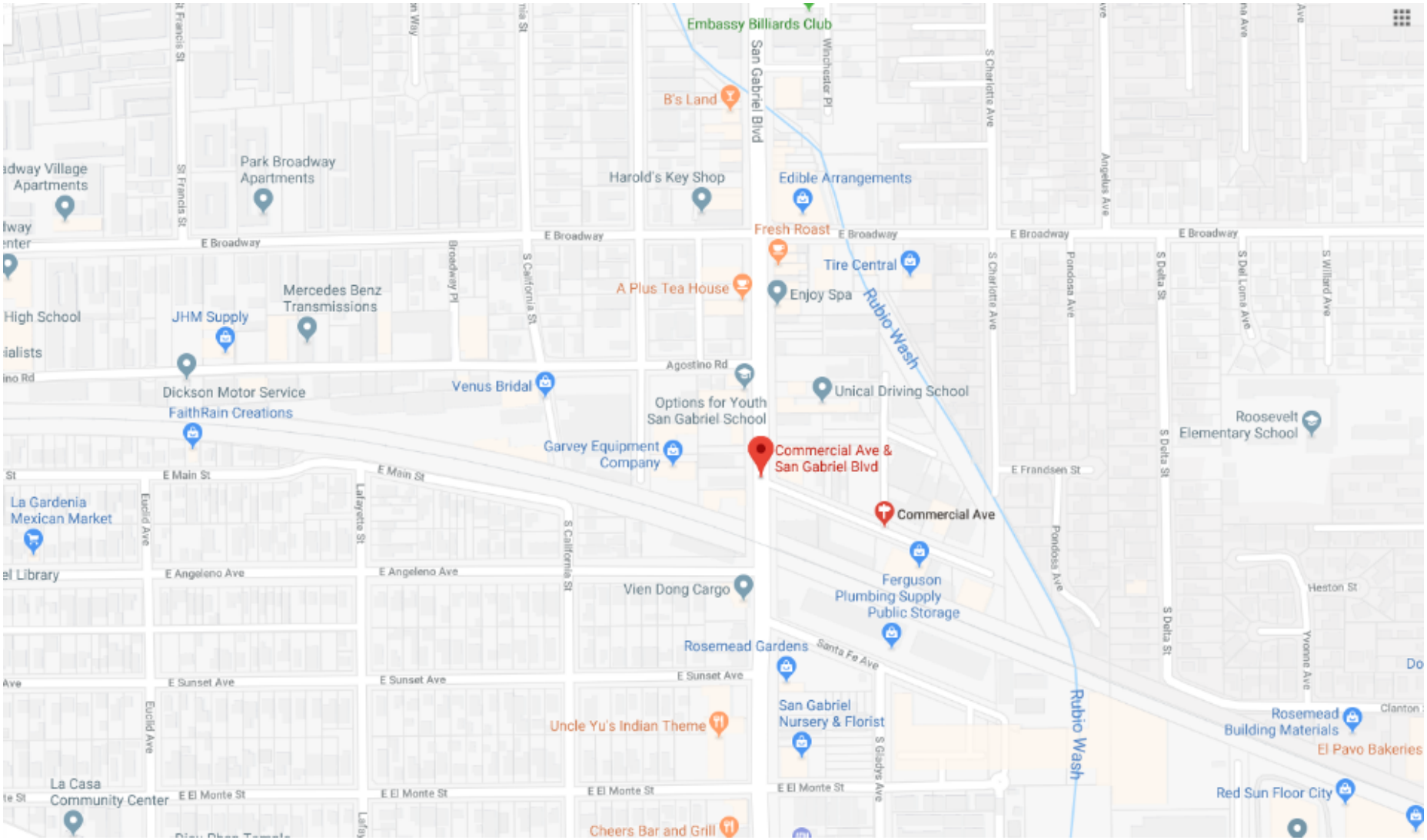
Below is a table summary for the calculated 25-year 24-hour storm event for the proposed developed site.

	Total Area (ac)	Impervious Area (ac)	Pervious Area (ac)	Peak Flow (cfs)
A	1.75	1.50	0.25	5.14

Section VIII Conclusion

In conclusion and per the proposed design described above, the site will not increase the runoff from Pre to Post Development. The existing drainage pattern will be observed, with the ultimate outfall into Commercial Avenue, tributary to Rubio Wash which is concrete lined. There will be no negative impacts downstream on Commercial Avenue or the existing 66" storm drain main in Commercial Ave. or the Rio Hondo Wash. There will be a small reduction in runoff from 5.15 cfs pre development to 5.14 cfs post development.

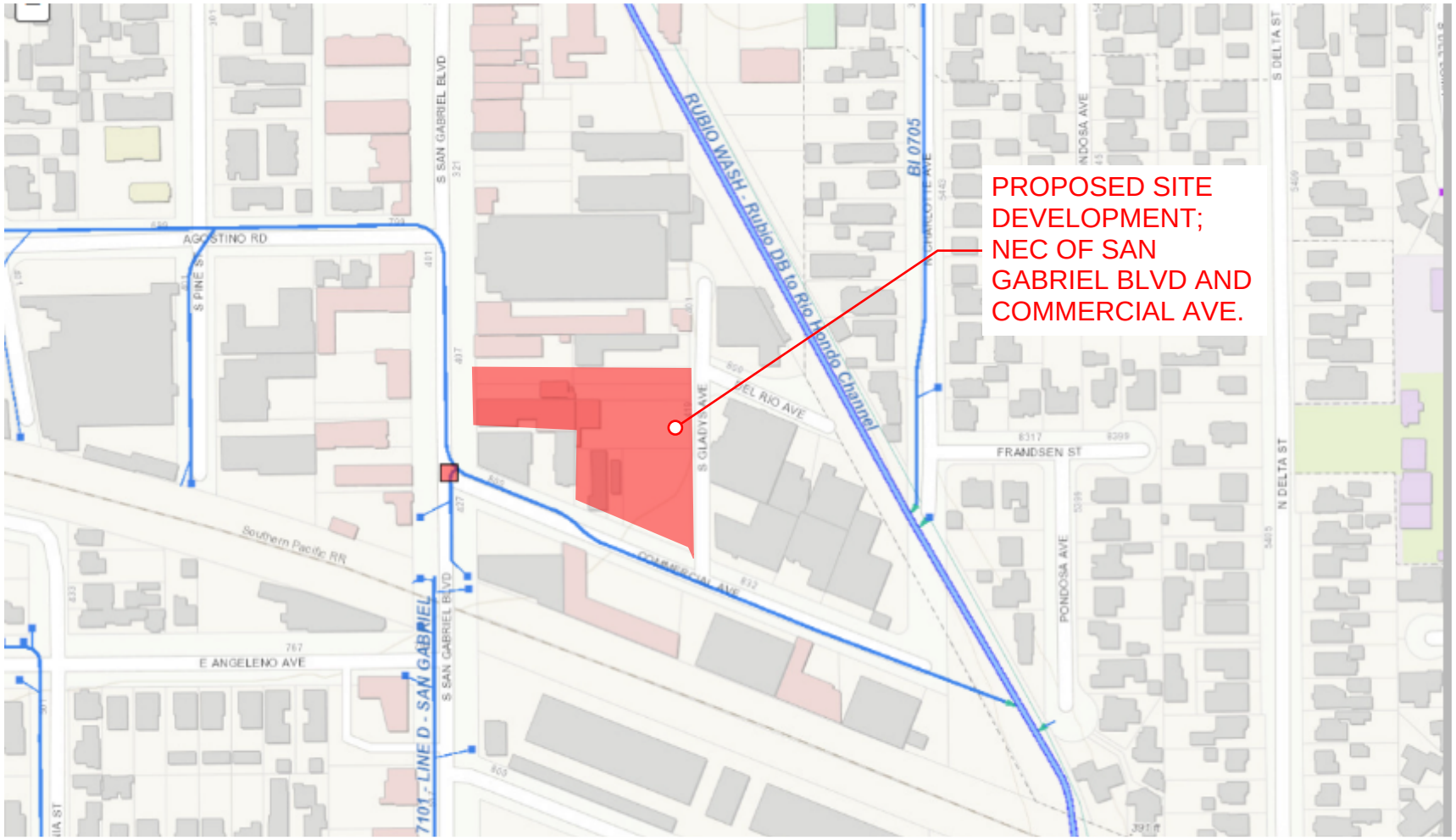
APPENDIX
Exhibits

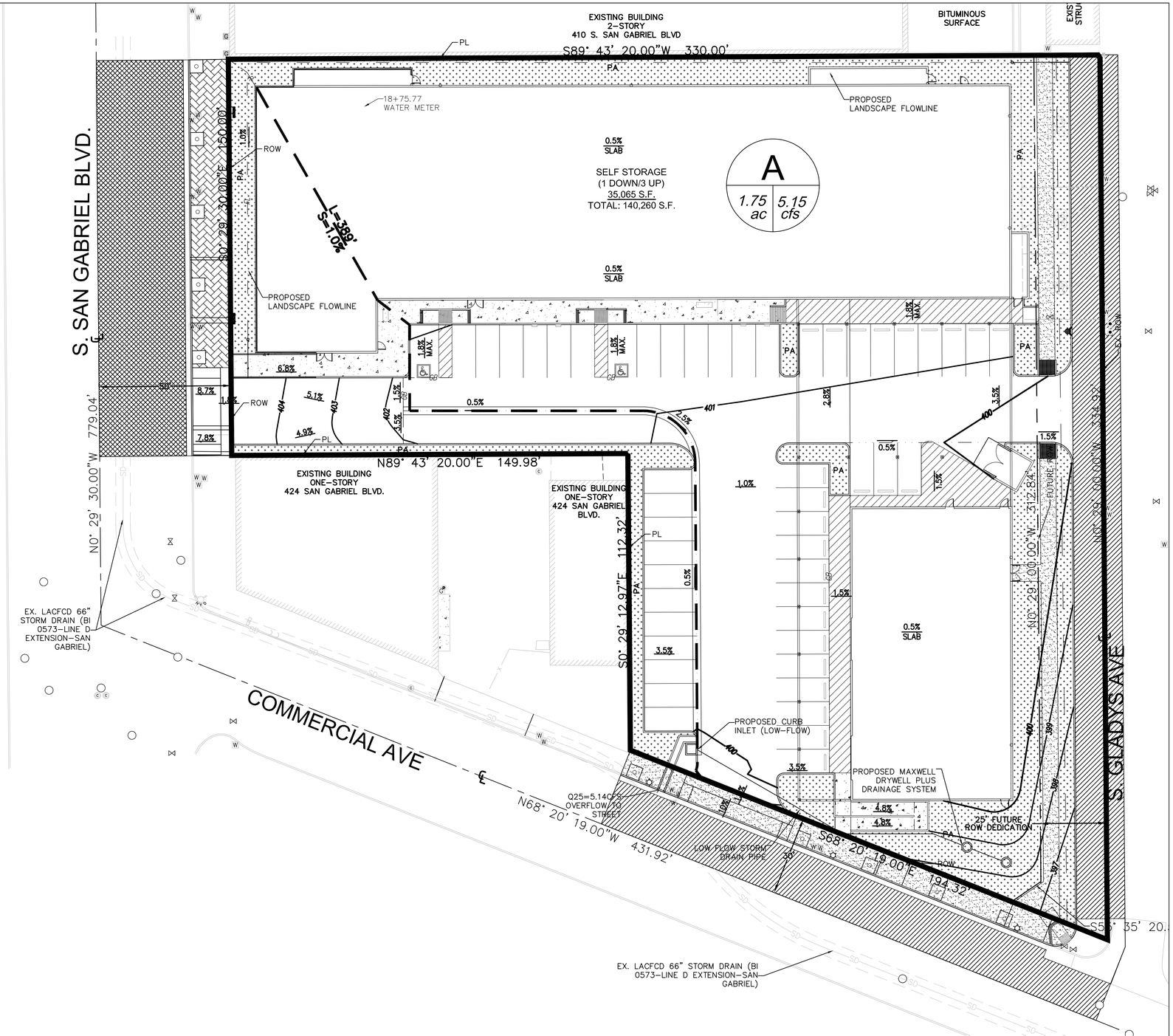


Vicinity Map

NTS

VICNITY MAP WITH REFERENCE TO THE LOS ANGELES COUNTY STORM DRAIN MAPS





25-YEAR STORM CALCULATION SUMMARY:

LID CALCULATIONS (LID CALCULATIONS)		
AREA ID	AREA (ACRES)	$Q_{(25)}$ CFS
A	1.75	5.14

THE 25-YEAR STORM EVENT WILL BYPASS THE PROPOSED BMP AND SHEET FLOW OUT DRIVEWAY INTO COMMERCIAL AVE., MATCHING PRE DEVELOPMENT CONDITION.

LEGEND

- DRAINAGE AREA
- AREA — DRAINAGE CALLOUT
- FLOW PATH
- V-GUTTER

SCALE: 1"=20'

DIGALERT

CALL BEFORE YOU DIG
1-800-227-2600
AT LEAST
2 WORKING DAY
NOTICE REQUIRED

BLUE PEAK ENGINEERING, INC.
18543 YORBA LINDA BL. #235
YORBA LINDA, CA 92886
714.749.3077
714.281.1640 FAX

DRAWING ISSUE RECORD

DATE	DESCRIPTION
–	–

REVISION RECORD

NO.	DATE	DESCRIPTION
–	–	–

PROJECT NAME

PROPOSED SELF STORAGE
NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
SAN GABRIEL, CALIFORNIA

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
KIMBERLY A. HOWDEN
No. 84974
Exp. 09/30/2022
CIVIL
STATE OF CALIFORNIA

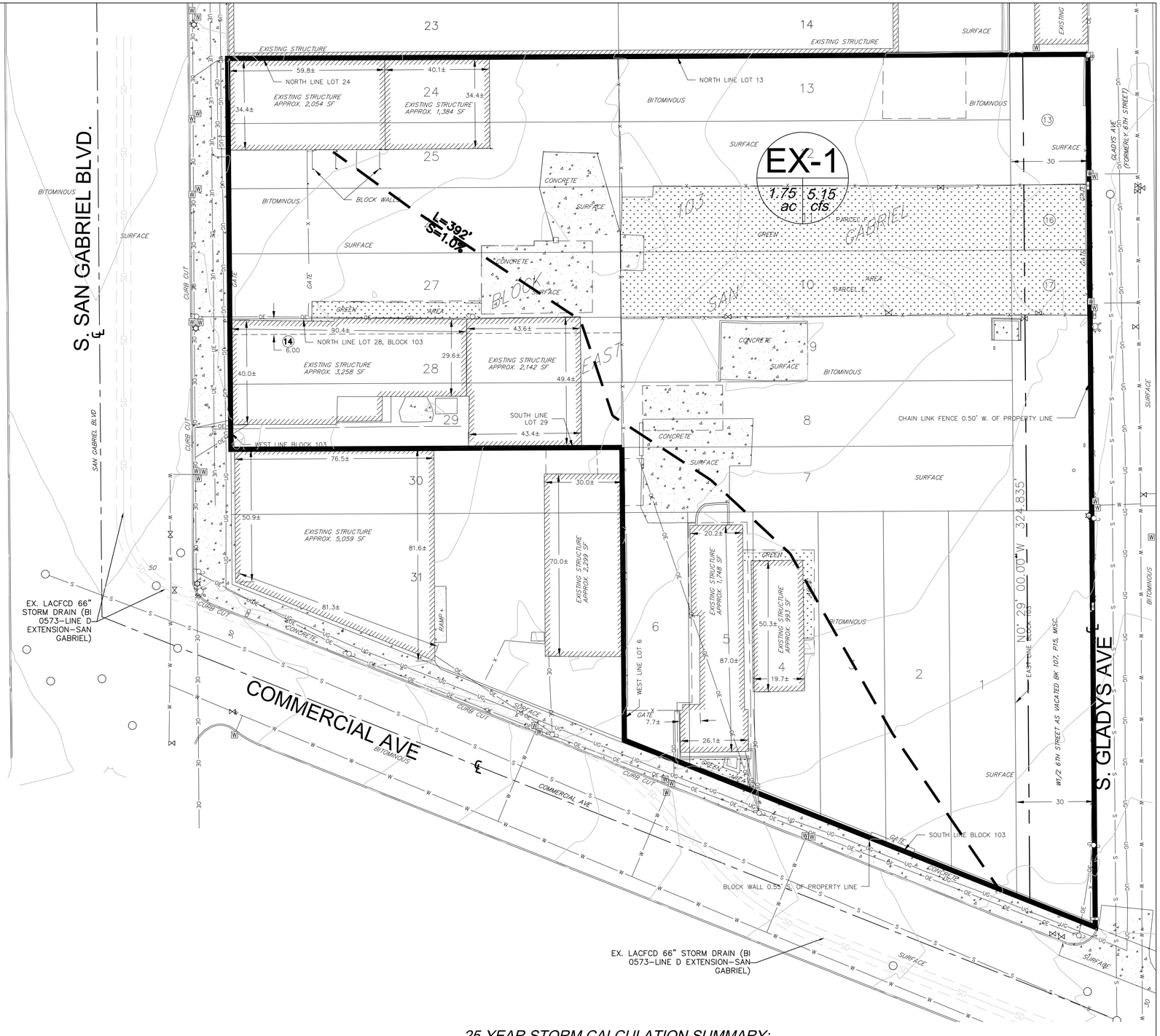
SHEET TITLE

PRELIMINARY POST-HYDROLOGY PLAN

SHEET NUMBER

HYD-2

DATE: 10/31/2019



25-YEAR STORM CALCULATION SUMMARY:

LID CALCULATIONS (LID CALCULATIONS)		
AREA ID	AREA (ACRES)	$Q_{(25)}$ CFS
EX–1	1.75	5.15

LEGEND

- DRAINAGE AREA
- AREA — DRAINAGE CALLOUT
- FLOW PATH

20 10 0 20 40

SCALE: 1"=20'

DIGALERT

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DRAWING ISSUE RECORD

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–	–

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NO.	DATE	DESCRIPTION
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PROJECT NAME

PROPOSED SELF STORAGE

NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
SAN GABRIEL, CALIFORNIA

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
ALBERT A. JOHNSON
No. 51971
03/31/2021
CIVIL
STATE OF CALIFORNIA

SHEET TITLE

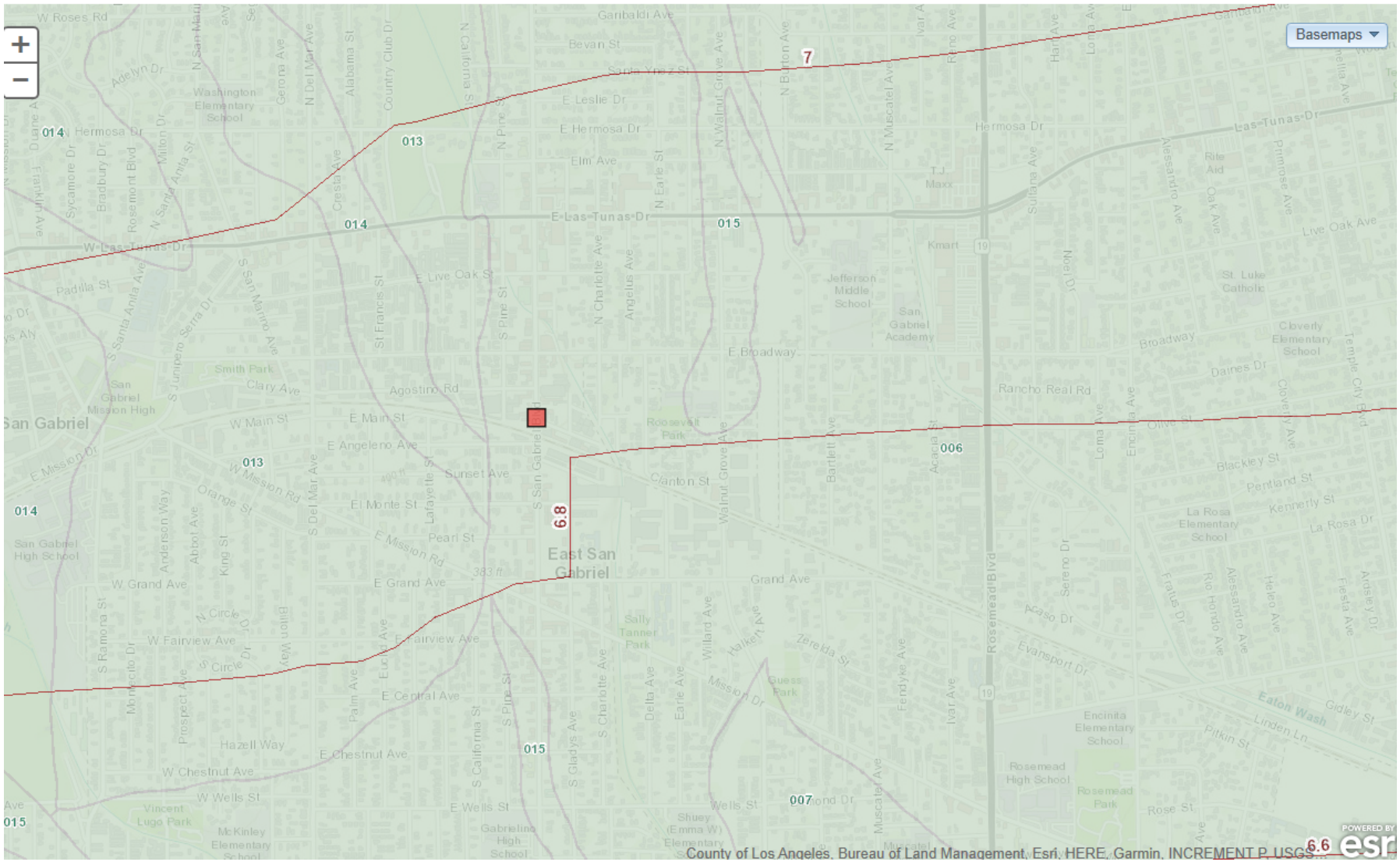
PRELIMINARY
PRE-HYDROLOGY
EXHIBIT

SHEET NUMBER

HYD-1

DATE: 10/31/2019

LA COUNTY-50 Year Storm Event and Soil Map



Peak Flow Hydrologic Analysis

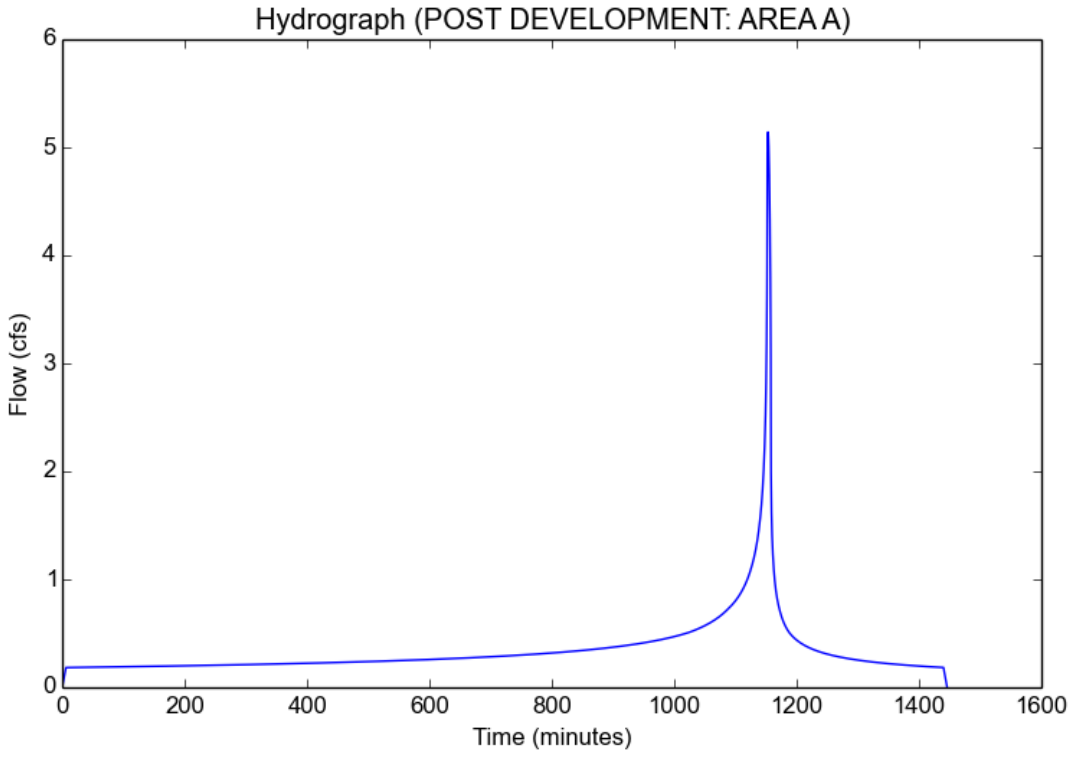
File location: D:/Dropbox/0706-1784 Capital-San Gabriel/Hydrology/Calculations/Project - AREA-25 Year Post.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	POST DEVELOPMENT
Subarea ID	AREA A
Area (ac)	1.75
Flow Path Length (ft)	389.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	6.85
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.0143
Peak Intensity (in/hr)	3.2936
Undeveloped Runoff Coefficient (Cu)	0.8429
Developed Runoff Coefficient (Cd)	0.892
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	5.1414
Burned Peak Flow Rate (cfs)	5.1414
24-Hr Clear Runoff Volume (ac-ft)	0.6996
24-Hr Clear Runoff Volume (cu-ft)	30476.0273



Peak Flow Hydrologic Analysis

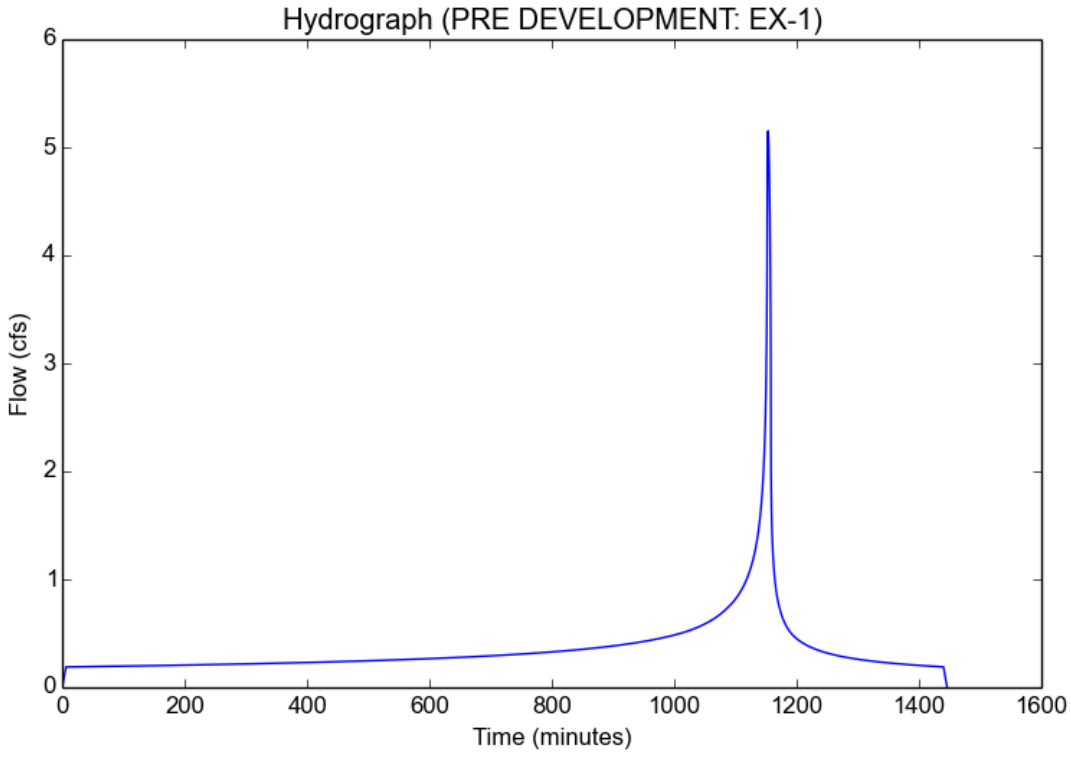
File location: D:/Dropbox/0706-1784 Capital-San Gabriel/Hydrology/Calculations/Project - EX-1.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	PRE DEVELOPMENT
Subarea ID	EX-1
Area (ac)	1.75
Flow Path Length (ft)	392.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	6.85
Percent Impervious	0.89
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.0143
Peak Intensity (in/hr)	3.2936
Undeveloped Runoff Coefficient (Cu)	0.8429
Developed Runoff Coefficient (Cd)	0.8937
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	5.1512
Burned Peak Flow Rate (cfs)	5.1512
24-Hr Clear Runoff Volume (ac-ft)	0.7175
24-Hr Clear Runoff Volume (cu-ft)	31252.8278



Peak Flow Hydrologic Analysis

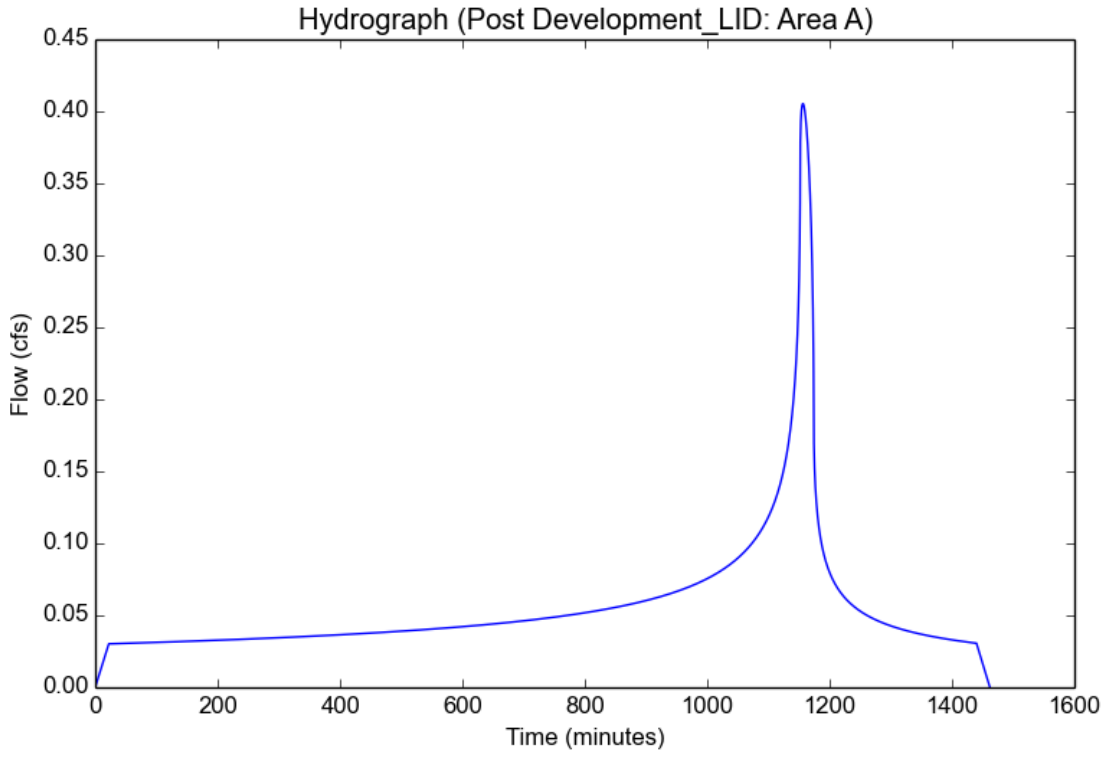
File location: D:/Dropbox/0706-1784 Capital-San Gabriel/Hydrology/Calculations/Project - AREA-85th Percentile.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Post Development_LID
Subarea ID	Area A
Area (ac)	1.75
Flow Path Length (ft)	389.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	0.95
Percent Impervious	0.9
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.95
Peak Intensity (in/hr)	0.2825
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.82
Time of Concentration (min)	22.0
Clear Peak Flow Rate (cfs)	0.4054
Burned Peak Flow Rate (cfs)	0.4054
24-Hr Clear Runoff Volume (ac-ft)	0.1127
24-Hr Clear Runoff Volume (cu-ft)	4907.7301



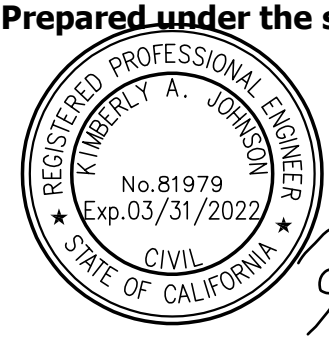
PRELIMINARY LOW IMPACT DEVELOPMENT PLAN (LID)

PROPOSED SELF STORAGE
NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
SAN GABRIEL, CA.

Prepared for:
1784 Capital Holdings LLC
8777 North Gainey Center Dr. #191
Scottsdale, Arizona 85258

Prepared by:
Blue Peak Engineering, Inc.
18543 Yorba Linda Blvd., #235
Yorba Linda, CA 92886
(562)537-6038

Prepared under the supervision of Blue Peak Engineering, Inc:



Kimberly Johnson, P.E **Date 06/08/2020**

OWNER'S CERTIFICATION

Low Impact Development Plan
for
Self-Storage Building
APN 5373-025-024, -003, -004, -005, -006, -007, -008, -009, -025, -023, -021

This Low Impact Development Plan (LID) for **Self Storage Building** has been prepared for **Capital Holdings, LLC by BLUE PEAK ENGINEERING**. This LID is intended to comply with the requirements of the City of **San Gabriel,** County of Los Angeles, requiring the preparation of a project specific LID.

I certify under penalty of law that this document and all attachments were prepared under my jurisdiction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for the gathered information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Los Angeles County MS4 Permit, and the intent of the stormwater and urban runoff NPDES Permit and Waste Discharge Requirements for the County of Los Angeles, Los Angeles County Flood Control District and the incorporated Cities of Los Angeles County under the jurisdiction of the Los Angeles Regional Water Quality Control Board. A copy of this LID will be maintained at the project site/office.

This LID will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this LID. At least one copy of the approved and certified copy of this LID shall be available on the subject property in perpetuity. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the LID.

Owner/Engineer of Record's Signature	Company
Printed Name/Title	Company Address
Telephone No.	Date

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Appendices

I. PROJECT DESCRIPTION

1. Project Information

Project Owner: **1784 Capital Holdings LLC**
8777 North Gainey Center Dr. #191
Scottsdale, Arizona 85258

Project Address: **NEC San Gabriel Blvd and Commercial Ave.**

2. Permits

Applicable permits for this project:

City of San Gabriel Grading Permit
City of San Gabriel Building & Safety Permit
City of San Gabriel Sewer Connection Permit/ Los Angeles County Sanitation District Permit
Los Angeles Flood Control Storm Drain Connection Permit

3. Project Description

a.	**Existing Land Use:**	**Developed**
b.	**Proposed Land Use:**	**Commercial**
c.	**Project size/disturbed area:**	**1.75 acres**
d.	**Formation of HOA:**	**No**

The proposed Self Storage project is a development of an existing fully developed site at the north east corner of San Gabriel Blvd and Commercial Avenue, in the City of San Gabriel.

The site will be developed with a 3 story (above grade) and 1 story (below grade) self-storage building, with a square footage of 35,065, totaling a 140,206 square foot building. A drive aisle with parking will be provided, as well as site landscape.

The new development will completely remove all existing site development.

The project also includes construction of site BMP's as described herein.

A torrent Maxwell drywell plus system is proposed at the south corner of the private property, near the intersection of Glady's and Commercial Avenue. The site is designed to sheet flow via v-gutter to the proposed project low-point where a curb inlet basin is located. The curb inlet basin will convey the low-flow runoff via a hydraulic sized low-flow pipe and will discharge into the proposed drywell plus systems. All high-flow will bypass and discharge via parkway drain into Commercial Ave, tributary to the Rubio Wash.

No connections to any storm drain mains are proposed.

4. Site Description

The site is located at NEC of Commercial Ave and San Gabriel Blvd.
.

	Total Area (ac)	Impervious Area (ac)	Pervious Area (ac)	Peak Flow (cfs)
Existing Site	1.75	1.575	0.175	5.15
Proposed Site	1.75	1.575	0.175	5.15

Hydromodification:
Based on the peak flow rates established above for the project (25-yr storm), post-developed peak runoff rates are equal to the pre-development peak runoff rates, therefore, hydromodification is not required.

However, based on the exemptions listed in section 8.2 of the Los Angeles County LID Manual, projects are exempt if the project "discharges directly or through a storm drain into concrete or otherwise engineered channel (i.e. channelized or armored with rip-rap, shotcrete), which, in turn, discharge into receiving water that is not susceptible to hydromodifications impacts." As listed below in the receiving waters portion below, this project directly discharges into a concrete storm drain, tributary to a concrete channel.

Receiving Water:	**-Rubio Wash** **-Rio Hondo, Reach 2**
Known Water Quality Impairments 303(d) list:	Rubio Wash (None) **Rio Hondo, Reach 2 (Coliform Bacteria, Cyanide,**
Expected Pollutants of Concern:	Grease & Oil, Trash, Sediment
TMDL:	Trash and Metals

The project is not located in an Environmentally Sensitive Area (ESA) or an Area of Special Biological Significance (ASBS).

The BMP selected for this project will serve to treat pollutants of concern for this project and will not have any adverse impacts on the development of the site. The required treatment volume will satisfy Low Impact Development requirements for the project. Calculations for required treatment volumes are provided in Appendix D.

Pollutant of Concern Summary Table

Pollutant Type	Expected	Potential	Listed for Receiving Water
Bacteria/Virus	X		Coliform Bact.,
Heavy Metals	X		Copper, Lead,
Nutrients	X		Nutrients
Pesticides		X	Not Listed
Organic Compounds		X	Not Listed
Sediments	X		Sediment
Trash & Debris	X		Trash
Oxygen Demanding Substances		X	Not Listed
Oil & Grease	X		Not Listed
Other—specify pollutant(s):		X	

II. Best Management Practices

1. Minimize storm water runoff/runoff rate, minimize project's impervious footprint, conserve natural areas:

MAXIMIZE THE PERMEABLE AREA
The project has maximized the permeable area by adding landscaping in areas not needed for parking, building or sidewalks.

REDUCE RUNOFF COEFFICIENT BY ALTERNATIVE METHODS
The project will use a Modular Wetland System, therefore no alternative materials or surfaces are proposed.

CONSERVE NATURAL AREAS
The project cannot conserve natural areas as there are no natural areas within the project's limits.

CONSTRUCT IMPROVEMENTS WITH MINIMUM WIDTHS
The project's improvements, such as drive aisles, parking stalls and sidewalk widths are proposed at the minimum required.

2. Minimize directly connected impervious areas:

DRAIN ROOFTOPS TO ADJACENT LANDSCAPING
All building roof down drains will discharge to adjacent landscape, or discharge at grade and sheet flow to required BMP.

DRAIN IMPERVIOUS SURFACES TO LANDSCAPING
All impervious surfaces sheet flow and discharge into the proposed Modular Wetland System.

INCREASE THE USE OF VEGETATED SWALES
Landscape has been designed to convey the runoff via flowline in the landscape area.

DISCHARGE FIRST FLUSH TO VEGETATED SWALES
The first flush will discharge into the Modular Wetland System.

3. Protect slope and channels:

No slopes or channels are proposed or existing for this project.

4. Provide storm drain system stenciling and signage:

Stenciling is included on the BMP/Grading plan for the inlets.

5. Properly design outdoor material storage areas:

No outdoor storage areas are proposed for this project.

6. Properly design trash storage areas:

Trash storage areas have been properly designed to protect trash and eliminate any possible contamination.

7. Subterranean parking/storage:

The project does not include subterranean parking however does include a below grade self storage level.

Source Control Non-Structural BMPs

Number	BMP and Objective	Included
	Routine Non-Structural BMPs	
N1	**Education for Property Owners, Tenants and Occupants:** Practical information materials shall be provided to the employees on general good housekeeping practices that contribute to the protection of storm water quality. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Appendix G contains sample educational materials that will be provided by the facility operator to new employees. The Owner/Developer is responsible for maintaining and updating educational materials with current general housekeeping practices.	YES
N2	***Activity Restrictions:*** These restrictions will include, at a minimum, the following: 1. Professionals under contract should perform landscape maintenance. Use of pesticides and fertilizers shall be applied at the minimum rate recommended by the manufacturer. - Only persons properly trained in the application of such products shall apply pesticides and fertilizers. - Unused pesticides and fertilizers shall be stored in watertight containers in areas not exposed to rainfall or runoff. 2. Leaf blowers shall be used to direct debris toward accessible collection areas for pickup. Debris shall **not** be directed into the street or storm drains. 3. No hosing off into storm drains or adjacent property will be allowed. 4. Cleanup of spills shall be confined to using mop and bucket only. Use absorbent materials on small spills and dispose of them per local regulations. Contact the local waste company for proper disposal of contaminated materials.	YES

Number	BMP and Objective	Included
N3	***Common Area Landscape Management:*** The Owner/Developer will be responsible through its employees or maintenance contractors for ensuring that ongoing maintenance and use of fertilizers and pesticides of the on-site landscaping be consistent with the County Water Conservation Resolution and County Management Guidelines or City of Long Beach equivalent regulations. - Prevent soil erosion by properly replacing and maintaining ground cover as necessary. - Avoid over-watering of landscape areas.	YES
N4	***BMP Maintenance:*** The Owner/Developer will be responsible through its employees and/or maintenance contractors for implementing each non-structural BMP and schedule cleaning of all BMP structural facilities. An employee(s) shall be designated to maintain the site BMP's. The assigned personnel shall perform the necessary inspections and maintenance for the BMP's on the project. Inspections shall occur monthly and shall be recorded in a log book. See Section III for the suggested maintenance schedule.	YES
N5	***Title 22 CCR Compliance:*** The Owner/Developer will ensure that its employees will comply with Title 22 of the California Code of Regulations (CCR) and relevant sections of the California Health and Safety Code, Ch. 6.5, regarding hazardous waste management as enforced by Orange County Department of Environmental Health, on behalf of the State. Per Title 22, hazardous waste must be identified and permitted through the local permitting agency. There is no known hazardous waste material stored or generated on site. The Owner/Developer is responsible for notifying the local permitting agency if this status changes.	NO
N6	**Local Water Quality Permit Compliance:** The project complies with water quality permits issued by the City to ensure clean storm water discharges.	YES
N7	**Spill Contingency Plan:** None on site	NO
N8	**Underground Storage Tank Compliance:** None on site	NO
N9	**Hazardous Materials Disclosure Compliance:** None on site	NO

Number	BMP and Objective	Included
N10	**Uniform Fire Code Implementation:** The Owner/Developer must comply with Article 80 of the Uniform Fire Code, which requires the project Owner/Developer to keep on file with the local Fire Department and update annually information on the types and quantities of hazardous materials associated with on-site uses, if any. There are no hazardous materials planned for this project.	NO
N11	***Common Area Litter Control:*** The Owner/Developer will implement trash management and litter control procedures aimed at reducing pollution of drainage water. It will consist of daily maintenance of parking lots and outside areas and requiring employees to deposit trash in waste containers with spill prevention features. The trash enclosure waste containers will be emptied weekly by a local commercial trash hauling company.	YES
N12	***Employee Training:*** The Owner/Developer will provide educational training for the employees in the proper use, handling and cleanup of all waste materials, pesticides, fertilizers, etc. while on the job. Qualified and experienced individuals shall provide training to each employee prior to allowing him/her to handle hazardous materials. The Owner/Developer shall provide employees with practical information materials to the facility employees on general good housekeeping practices that contribute to the protection of storm water quality. Also see Education for Property Owners and Occupants.	YES

N13	**Housekeeping of Loading Docks:**	YES
N14	***Drainage Facility Inspection:*** Inspection procedures, schedules, and responsibilities are established for drainage facilities to ensure regular cleaning, inspection, and maintenance. Inspection/Cleaning should take place in the late summer/early fall prior to the start of the rainy season.	YES
N15	***Street Sweeping Private Streets and Parking Lots:*** Street sweeping frequency and responsible parties are identified and regular sweeping is conducted to reduce pollution of drainage water. Sidewalks, parking lots, driveways, etc. shall be swept on a weekly basis, at minimum.	YES
N17	**Retail Gasoline Outlets:** None on site	NO
Source Control Structural BMPs (numbers correspond to the California BMP Handbook)		
SD-10	**Site Design and Landscape Planning:** Landscape planning methodologies are incorporated into project design to maximize water storage and infiltration opportunities and minimize surface and groundwater contamination from storm water.	YES
SD-11	**Roof Runoff Controls:** Not included in this project.	NO
SD-12	**Efficient Irrigation:** Project plans include application methods to minimize irrigation water discharged into storm water drainage systems.	YES
SD-13	**Storm Drain System Signs:** Stencils or affixed signs a placed adjacent to storm drain inlets to prevent waste dumping at storm drain inlets.	YES
SD-20	**Pervious Pavements:**	YES
SD-21	**Alternative Building Materials:** None	NO
SD-30	**Fueling Areas:** None on site.	NO

SD-31	**Maintenance Bays and Docks:**	NO
SD-32	**Trash Storage Areas:**	YES
SD-33	**Vehicle and Equipment Washing Areas:** None on site.	NO
SD-34	**Outdoor Material Storage Areas:** None on site.	NO
SD-35	**Outdoor Work Areas:** None on site.	NO
SD-36	**Outdoor Processing Areas:** None on site.	NO
SC-41	***Building & Ground Maintenance:*** Prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.	YES
SC-43	**Parking/Storage Area Maintenance:** Minimize the release of trash, oil, grease, etc. into the storm drain system. Educational materials and training are provided for employees to assist in proper maintenance and housekeeping practices.	YES
SC-44	**Drainage System Maintenance:** Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.	YES

LID BMP's

A Modular Wetland System will be installed at the site low-point and is designed treat the first flush of stormwater. The high flow will bypass the proposed BMP at a surface level and discharge directly into Commercial Ave.

See Appendix D for calculations and sizing.

The Modular Wetland System should be inspected quarterly starting at the first of October prior to the wet season. Trash and debris should be removed. See additional maintenance requirements in Section III.

III. Implementation, Maintenance and Inspection Responsibility for BMPs (O&M Plan)

Responsible Party Information:
Ms. Brigid Skoog
1784 Capital Holdings LLC
8777 North Gainey Center Dr. #191
Scottsdale, Arizona 85258
bskoog@1784holdings.com
480.250.0284

Table 5 Frequency Inspection Matrix

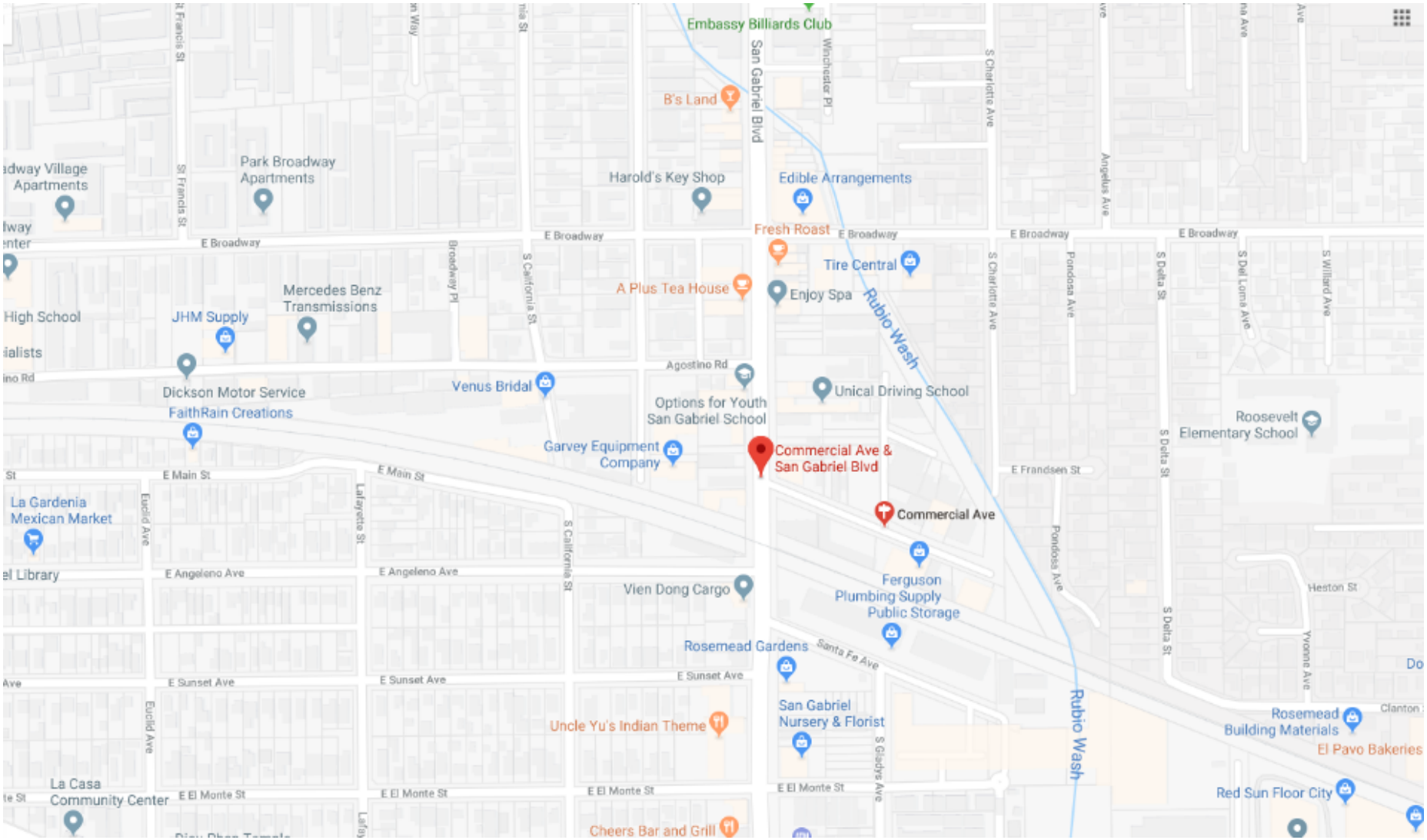
BMP	Responsible Party	Maintenance Activity	Inspection/Maintenance Frequency
Source Control BMPs (Structural and Nonstructural)			
Education for Property Owners, Tenants and Occupants	Owner	Educate employees on impacts of discharging pollutants into the storm drains.	Initially and again on a yearly basis.
Activity Restriction	Owner	Restrictions on outdoor washing and trash dispensing	Weekly
Common Area Landscape Management	Owner	Landscaping management	Weekly
BMP Maintenance	Owner	Landscaping and BMP maintenance	Weekly and as necessary – for treatment BMPs see below
Common Area Litter Control	Owner	Trash management and litter control and landscape maintenance	Weekly
Employee Training	Owner	Educate employees on impacts of discharging pollutants into the storm drains.	Initially and again on a yearly basis.
Street Sweeping Private Streets and Parking Lots	Owner	Street sweeping	Weekly
Efficient Irrigation Systems & Landscape Design	Owner	Landscaping management & design	Weekly
Modular Wetland System	Owner	See manufacturer's specifications below	Quarterly starting in October or if problem occurs as defined in the table below.

Refer to Appendix H for Operation and Maintenance Manual.

Funding

Funding will be provided for the continued maintenance of all BMPs via maintenance funding from the Owner.

APPENDIX A – Location Map



Vicinity Map

NTS

APPENDIX B – Soils Report and Infiltration Letter

COAST GEOTECHNICAL, INC.

1200 West Commonwealth, Fullerton, CA 92833 ▪ Ph: (714) 870-1211 ▪ Fax: (714) 870-1222 ▪ email: coastgeotec@sbcglobal.net

May 31, 2020 (revised June 4, 2020) W.O. 565718-04

Mr. Kelly McKone
1784 Capitol Holdings, LLC
8777 North Gainey Drive, Suite 191
Scottsdale, AZ 85250

Subject: Initial Infiltration Study for Proposed Commercial Development at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California

References:

1. Geotechnical Engineering Investigation for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California; by COAST GEOTECHNICAL, W.O. 565718-01, dated January 16, 2019.

2. Geotechnical Assessment of Stockpiled Import Material at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California; by COAST GEOTECHNICAL, W.O. 565718-02, dated September 25, 2019.

3. Response to Outside Geotechnical Review Sheet for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California; by COAST GEOTECHNICAL, W.O. 565718-03, dated May 5, 2020.

Gentlemen:

Submitted herewith is an initial infiltration feasibility study performed for a proposed commercial development, located at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, in the City of San Gabriel. This report completes our work scope for the project outlined in our proposal dated May 18, 2020. The report was revised on June 4, 2020 to correct an error in calculation of the infiltration rate correction factor.

PURPOSE

Urbanization impacts the water resources by decreasing the amount of stormwater that infiltrates into the subsurface soils, and by increasing the potential for conveyance of pollutants into watersheds and flood control system. Low impact development stormwater infiltration is a strategy that is used to mitigate some of these hydrological impacts.

Based on proposed site development, recommendations of the project geotechnical report, and input from the project civil engineer, the use of deep infiltration disposal is proposed for the southeast corner of the development, within a proposed landscape area.

WORK SCOPE

The project work scope consisted of the following:

1. Location of one boring drilled six inches in diameter to a depth of fourteen feet.
2. Geotechnical logging of the boring.
3. Pre-saturation and infiltration testing of the boring.
4. Analysis of data.
5. Preparation of this report

SITE DESCRIPTION

The project site is composed of multiple addresses identified as 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue in the City San Gabriel, and is shown on the Site Vicinity Map, Figure 1.

Developed commercial property to the north, Gladys Avenue to the east, Commercial Avenue and developed property to the south, and developed property and San Gabriel Avenue to the west bind the property.

The combined properties form an "L" shaped parcel which is generally level. The properties are developed with commercial structures, asphalt paving, hardscape, and landscape. Current usage is as a commercial bus facility, office space, storage, and plumbing repair. Adjacent lots are developed with similar usages.

A depiction of the subject property with a proposed development layout, prepared by Blue Peak Engineering, is presented on Figure 2 and has been utilized for depiction of the infiltration testing location.

SITE LITHOLOGY

Earth materials encountered within the exploratory boreholes were visually logged by a representative of COAST GEOTECHNICAL, Inc. The materials were classified as artificial fill and native alluvial deposits.

Artificial fills encountered consisted of dark brown sandy silt, moist, and soft to firm. Artificial fills are not suitable as a material for infiltration.

The underlying alluvial soil consisted of medium brown to dark brown silty sand, moist, medium dense, grades with depth to slightly oxidized to oxidized brown to buff, medium to coarse grained sands, damp to

moist, medium dense to dense, with zones of small pebbles to weathered granitic rock fragments and stringers of silt.

Description of soils from the infiltration test boring is found on the test field log, Plate A.

Logs of exploratory borings placed during past site geotechnical work are attached as Plates B through E.

Locations of test borings are plotted on Figure 2.

GROUNDWATER

Based on a groundwater map from the Seismic Hazard Evaluation Open File Report for the El Monte Quadrangle historic high groundwater is shown at about 100 feet below ground surface. This map is appended as Figure 3.

Borings placed during exploration for site geotechnical work did not encounter groundwater within the drilled depth of 31.5 feet below existing ground surface.

Our opinion is that an anticipated historic ground water depth of 100 feet is appropriate.

The bottom of the proposed infiltration system shall be ten feet above the anticipated groundwater depth.

PERCOLATION TESTING

Percolation testing was performed in accordance with acceptable guidelines. The borehole percolation test method was utilized.

The location of the percolation test boring is shown on appended Figure 2.

The test boring was drilled six inches in diameter and fourteen feet in depth. The boring was sleeved with a three inch diameter pipe with the bottom three feet of pipe slotted. The bottom of the pipe was capped. The annulus of the boring was backfilled with pea gravel to above top of the slotted pipe.

Testing of the boring was conducted on May 29, 2020 and consisted of the required presoak, determination of test period, and testing.

The boring was presoaked by adding water to the boring to above the slotted pipe for a one hour period. The presoak water added to the boring dissipated completely prior to 30 minutes elapsing.

To determine the test interval that was used to measure the water drop readings during percolation testing, the test hole was filled with water to the top of slotted pipe. Water remained in the test hole after ten minutes but was dissipated by thirty minutes allowing a time interval of ten minutes to be used.

During the test period the boring was filled with water to the same level as that used during the presoak. The water drop was measured over a time interval of ten minutes. The boring was then refilled to a similar starting height and the drop measured again over thirty minutes. This was repeated eight times.

Test data recorded is presented on Plate F.

INFILTRATION RATE

The percolation rate determined from the last timed interval is used in calculating an infiltration rate.

The percolation rate obtained from field testing was converted to an infiltration rate utilizing a formula in County Guidelines as follows:

BORING 1

Infiltration Rate = (Pre-adjusted percolation rate)/ (Reduction Factor)
Reduction Factor = (((2d1)-Δd) / DIA) + 1

d1 = Initial Water Depth (in.)
Δd = Water level drop of final period or stabilized rate (in.)
DIA = diameter of boring(in.)

Reduction Factor = (((2*36)-32) / 6) + 1

= 7.67

Infiltration Rate = 192/7.67

= 25 in//hr

The rate is opinioned appropriate for the earth materials tested, and for those materials found from seven to eight feet below existing ground surface to the depths of exploration.

The County requires that correction factors CFv and CFs be applied to the infiltration rate obtained..

Correction factor CFv is based on site variability, number of tests, and thoroughness of subsurface investigation and can range from 1 to 3. Our opinion is that CFv value of 1 is appropriate.

Correction factor CFs is based on long-term siltation, plugging and maintenance and can range from 1 to 3. Our opinion is that CFs value of 1 is appropriate based on the property owner following LID/NPDES maintenance guidelines, and the installation of the system in accordance with design guideline

A corrected infiltration rate of 25 inch/hour may be utilized for design.

OPINION

It is our opinion that this report presents an accurate and complete disclosure of all facts that are known and relate to site infiltration rates.

Our opinion is that the infiltration of waters at the depth and location tested will not have adverse affects on site improvements from expansive soils or settlement; will not increase pore water pressures affecting liquefaction potential of the site, and will not affect offsite property.

The client is advised that an infiltration system does require long term maintenance and that infiltration rates will decrease over time as the system clogs with various materials, affecting its performance.

Life expectancy of a system varies widely dependent on usage, construction and maintenance. Coast Geotechnical, Inc. makes no warranty or guarantee of the system or length of effectiveness.

COAST GEOTECHNICAL, INC. shall be consulted during system construction to verify that earth material conditions are similar to those tested.

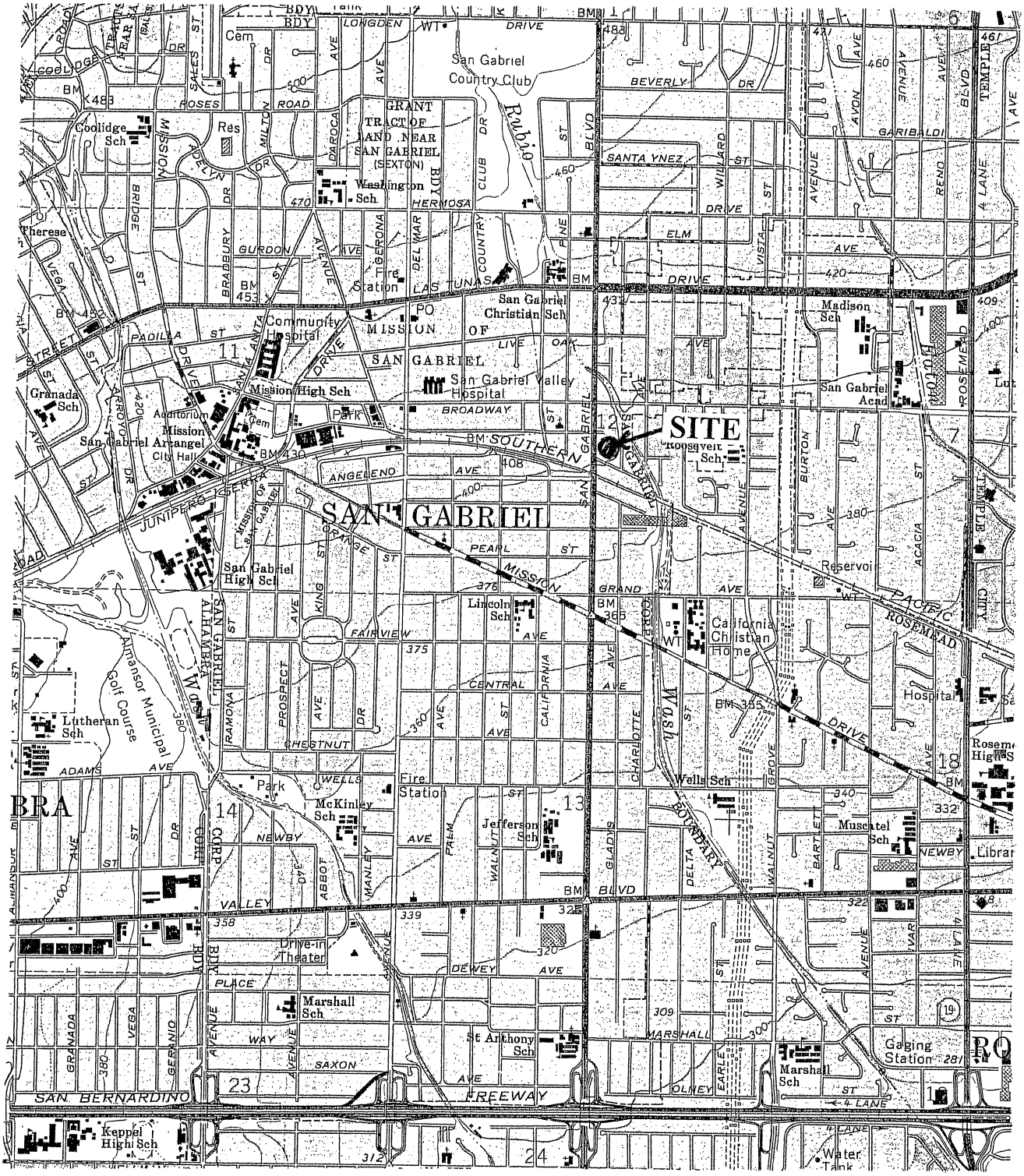
We appreciate this opportunity to be of service to you.

Respectfully submitted:
COAST GEOTECHNICAL, INC.

Todd D. Houseal
CEG 1914 Expires 4/30/22

REGISTERED GEOLOGIST
TODD D. HOUSEAL
No. 1914
CERTIFIED
ENGINEERING
GEOLOGIST
OF CALIFORNIA

SITE VICINITY MAP

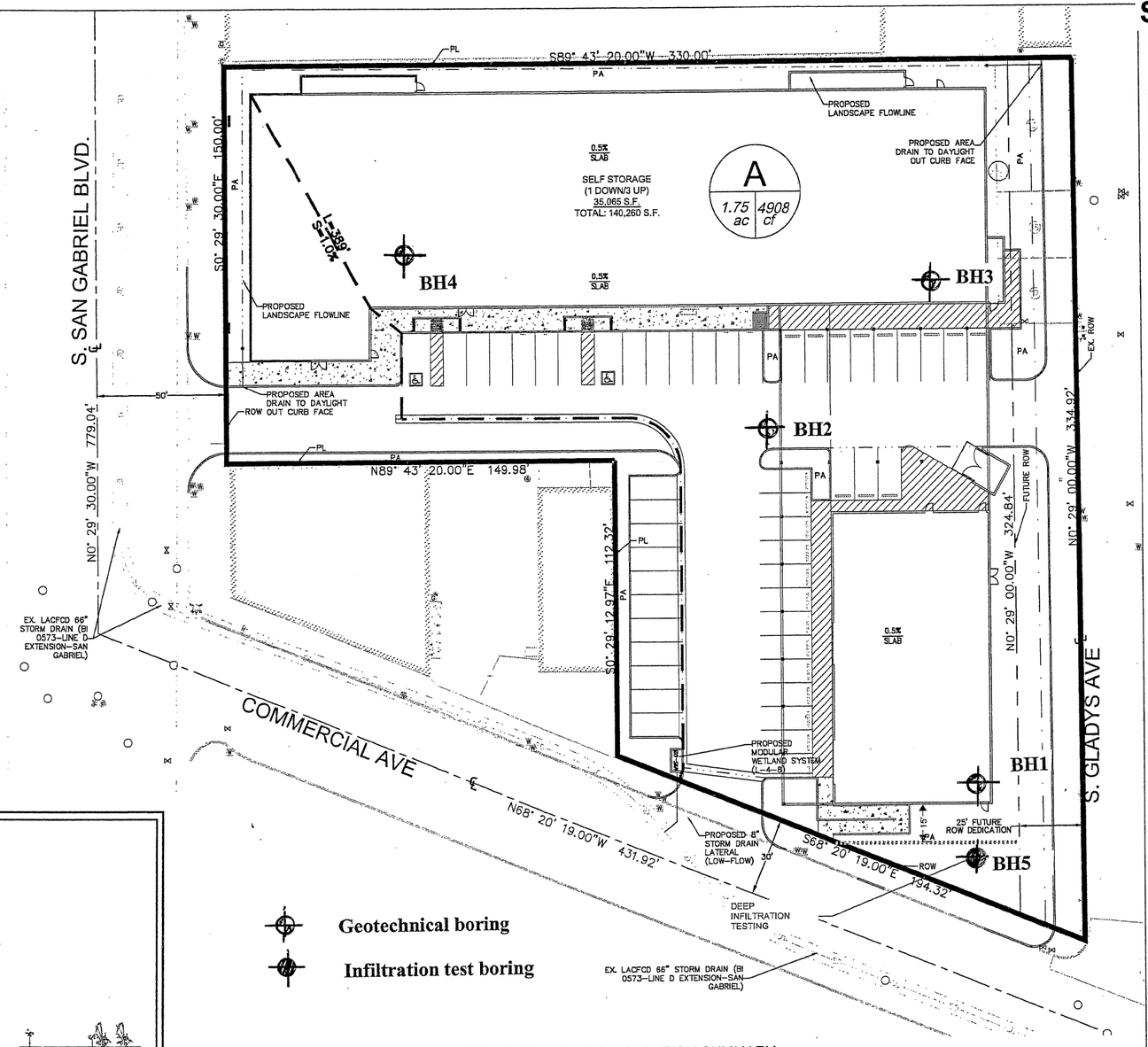


El Monte USGS Topographic Map

COAST GEOTECHNICAL, INC.

W.O. 565718 **Figure 1**

SITE PLAN



Geotechnical boring

Infiltration test boring

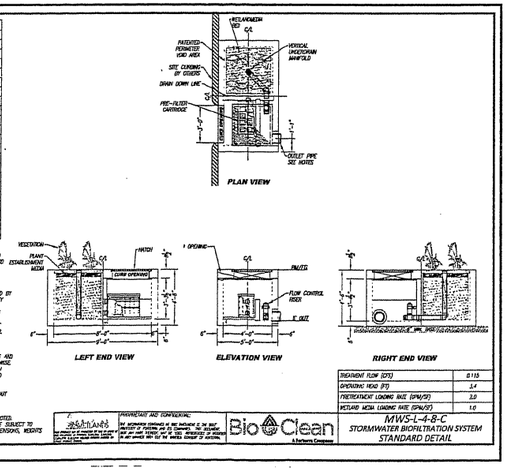
SITE SPECIFIC DATA			
PROJECT NUMBER			
ORDER NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	POTENTIAL	OPEN PLANTER	POTENTIAL
FRAME & COVER	36" Ø 36"	N/A	N/A
RETAINED VOLUME (CF)			TBD
ORIFICE SIZE DIA. (INCHES)			TBD
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS 6" COMPACTED CRUSHED ROCK BASE UNLESS SPECIFIED BY ENGINEER OF RECORD. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT CHANGES RECOMMENDED BASE SPECIFICATIONS.
3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH MODS' SURFACE OF CONCRETE. PIPES CHANGE INTERNAL BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIECES, HARDWARE, & SEALANT. CONTRACTOR TO ENSURE ALL GASKETS ARE PROPERLY SEATED & WATERTIGHT. GASKETS SHALL BE LUBRICATED WITH SILICONE GASKET LUBRICANT UNLESS SPECIFIED OTHERWISE.
5. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
6. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS SCALING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



TREATMENT FLOW (CFS)	0.113
GRADIENT HEAD (FT)	1.4
PRETREATMENT LOADING RATE (GPM/SF)	3.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-4-8-C
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Bio Clean — A Fortnarm Company

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF BIO CLEAN. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BIO CLEAN IS PROHIBITED. RECIPIENT AGREES BY ACCEPTANCE OF THIS DRAWING THAT IT WILL NOT BE USED IN ANY MANNER DETRIMENTAL TO BIO CLEAN.

DIGALERT
CALL BEFORE YOU DIG
1-800-227-2600
AT LEAST
2 WORKING DAY
NOTICE REQUIRED

CITY STANDARD CURB MARKER (NDW 3 IN X 5.25 IN ROUNDED CORNER RECTANGLES (OR CITY APPROVED EQUAL) INSTALL MARKER AT EVERY CURB ADJACENT TO INLETS.

STORM DRAIN MARKER

85TH PERCENTILE CALCULATION SUMMARY:

LID CALCULATIONS (LID CALCULATIONS)

AREA ID	AREA (ACRES)	Q_{DES} CFS	V_{DES} CF
A	1.75	0.41	4,908

THE MODULAR WETLAND SYSTEM (MWS) MODEL # MWS-L-4-8 TREATMENT CAPACITY IN 48 HOURS IS 5,036 CU.FT. > 4,908 CU.FT. —> OKAY

LEGEND

DRAINAGE AREA

AREA — DRAINAGE CALLOUT

20 10 0 20 40

Scale 1" = 50ft.

BLUE PEAK ENGINEERING, INC.
16545 YORBA LINDA BL.
YORBA LINDA, CA 92
714.749.3077
714.281.1640 FAX

DRAWING ISSUE RECORD
DATE DESCRIPTION

REVISION RECORD
NO. DATE DESCRIPTION

PROJECT NAME

PROPOSED SELF STORAGE
NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
SAN GABRIEL, CALIFORNIA

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER ROBERT A. JOSEPH No. 84494 EXP. 06/30/2020 CIVIL STATE OF CALIFORNIA

SHEET TITLE
PRELIMINARY LID PLAN

SHEET NUMBER
3

DATE: 10/31/2019

COAST GEOTECHNICAL, INC. | **W.O. 565718** | **Figure 2**

HISTORIC HIGH GROUNDWATER MAP

Open-File Report 98-15

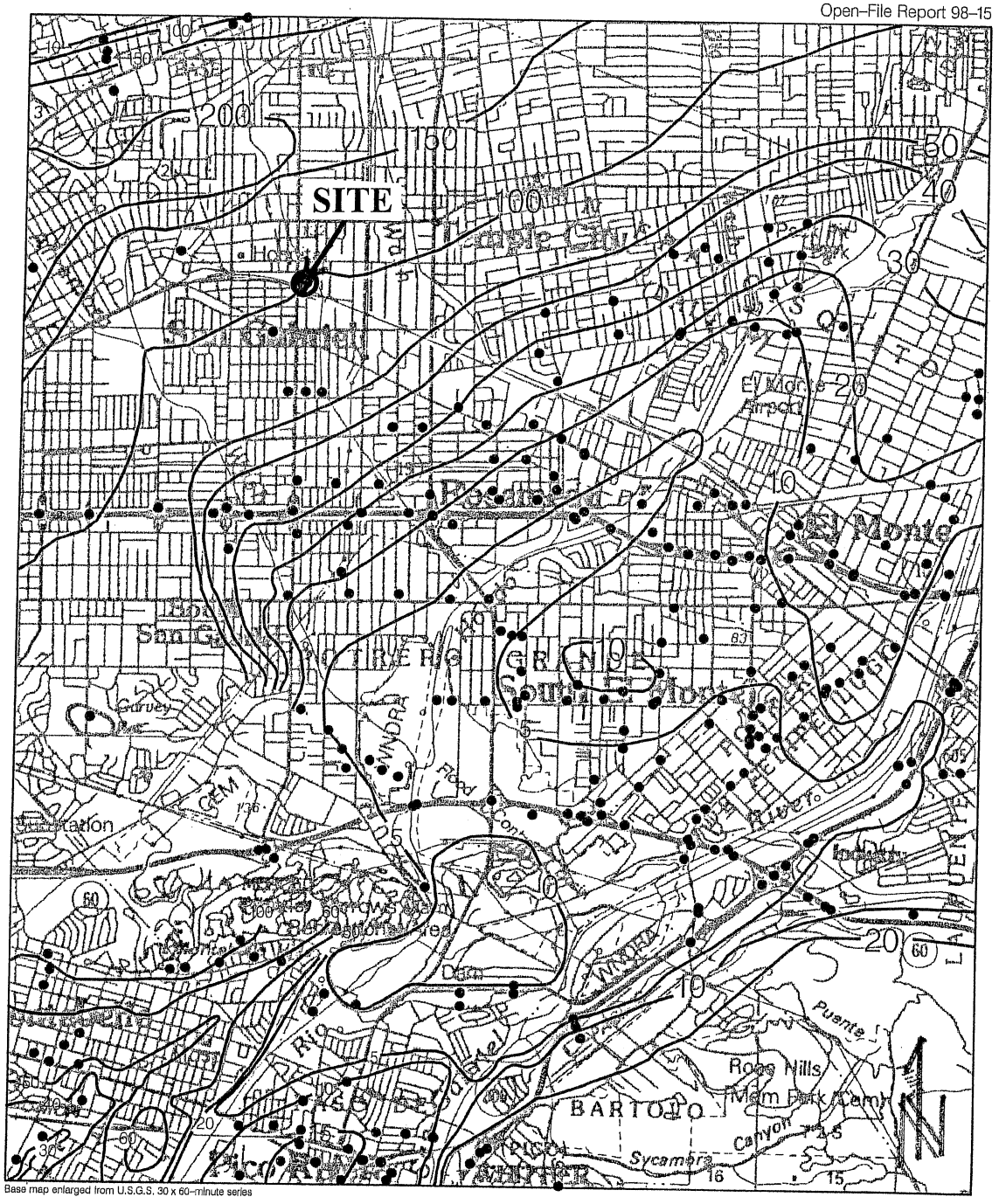


Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, El Monte Quadrangle.

● Borehole Site

~ 30 ~ Depth to ground water in feet

ONE MILE
SCALE

COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 3

FIELD LOG OF BORING NO. 5

Project Name: 1784 Capitol Heights W.O. SL-5718 Log by: TDH

Method: Auger. Start: Finish: Date: 5/29/20

Wt. Of Kelly Bar: Drop

Samples			Blows			Depth	DESCRIPTION
Type	Yd pcf	m %	6"	6"	6"	(FT)	
							3" Asphalt
							Medium Brown Fine to medium grained sand,
							slightly silty, occasional semi rounded pebbles to
						4	cobbles, medium dense, moist
							(Native)
							(SM)
						8	Oxidized brown to yellow brown with depth,
							fine to medium grained to medium to coarse
							grained sand, semi rounded gravel to small
						12	cobbles, damp to moist, medium dense
							(Native)
							(SP)
							EOB @ 14' - No Caving - No H_2O
						16	
						20	

COAST GEOTECHNICAL, INC. **PLATE A**

SUMMARY OF BORING NO. 1

Date: 12/12/2018 Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U B	Depth (Ft.)	Description	Color	Apparent Density
					Artificial FILL: SAND --- fine to medium-grained, silty, clayey, moist	Reddish Brown	Loose
3/4/5	113	7.5			NATIVE: SAND --- slightly silty, slightly clayey, scattered small rocks, moist	Reddish Dark Brown	Loose to Medium Dense
3/5/7	117	8.9		5			
7/12/23	121	9.1		10	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Reddish Brown	Medium Dense
					SAND --- medium-grained, silty, gravels, moist	Tan Buff	Medium Dense
23/30/50	118	2.3		15	SAND --- medium to coarse-grained, slightly silty, gravels, small rocks, damp	Tan Buff Rust Orange	Very Dense
20/35/45	120	2.9		20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Very Dense
12/16/30	108	3.4		25	SAND --- fine to medium-grained, slightly silty, scattered small rocks, damp	Tan Rust Buff Orange	Dense
26/47/47	109	6.1		30	SAND --- fine to medium-grained, slightly silty, moist	Orange Buff Brown Tan	Very Dense
				35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel , California

Work Order 565718

Plate B (Revised)

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 2

Date: 12/12/2018 Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U B	Depth (Ft.)	Description	Color	Apparent Density
					Artificial FILL: SAND --- fine to medium-grained, silty, scattered rocks and concrete debri,moist	Dark Brown Reddish	Medium Dense
					NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Dark Brown	Medium Dense
12/14/14	127	7.6		5	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Tan Buff	Medium Dense
17/30/50	120	3.0		10	SAND --- medium to coarse-grained, silty, gravels, scattered rocks, moist	Tan Buff Rust	Medium Dense
					SAND --- coarse-grained, slightly silty, scattered	Tan Buff Rust	Dense
18/38/33	124	6.3		15	SAND --- coarse-grained, slightly silty, rocks, damp	Tan Buff Rust Pink	Dense
19/30/18	120	3.7		20	SAND --- coarse-grained, slightly silty,rocks, damp	Tan Buff Rust	Dense
28/50/50	121	3.5		25	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Brown	Very Dense
14/25/26	102	8.0		30	SAND --- medium to coarse-grained, slightly silty, gravel, silty, moist	Orange Buff Brown Tan	Dense
				35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel , California

Work Order 565718

Plate C (Revised)

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 3

Date: 12/12/2018 Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U	Samples B	Depth (Ft.)	Description	Color	Apparent Density
						Artificial FILL: SAND --- fine-grained, silty, rootlets, moist	Dark Brown	Medium Dense
						NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Brown	Medium Dense
7/9/11	111	2.8	■		5	SAND --- fine to medium-grained, silty, scattered rocks, damp	Tan Buff	Medium Dense
18/27/40	124	2.0	■		10	SAND --- medium to coarse-grained, silty, gravels, very rock, damp	Buff Rust Tan	Dense
16/38/42	119	4.1	■		15	SAND --- coarse-grained, slightly silty, gravel, rocks, damp	Buff Rust Orange Tan	Very Dense
15/30/35	113	7.6	■		20	SAND --- coarse-grained, slightly silty, very rocky, moist	Buff Orange Brown Rust	Dense
15/26/36	111	9.8	■		25	SAND --- coarse-grained, slightly silty, rocky, moist	Brown Orange Buff Rust	Dense
12/25/45	104	8.3	■		30	SILT --- sandy, moist	Dark Brown Reddish	Hard
					35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel, California

Work Order 565718

Plate D (Revised)

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 4

Date: 12/12/2018 Elevation: E.G.

Blow Counters	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U	Samples B	Depth (Ft.)	Description	Color	Apparent Density
						Artificial FILL: SAND --- fine-grained, silty, clayey,moist	Dark Brown	Loose
2/3/3	112	8.1	■			NATIVE: SAND --- fine-grained, silty, slightly clayey, scattered small rocks, damp to moist	Dark Reddish Brown	Loose
4/5/9	117	8.8	■		5	SAND --- fine to medium-grained, silty, clayey, rocky, moist	Reddish Brown	Loose to Dense
						SAND --- medium to coarse-grained, silty, rocky, damp	Tan Buff	Dense
9/27/28	127	2.5	■		10	SAND --- medium to coarse-grained, silty, very rocky, gravels, damp	Tan Buff Rust Pink	Dense
13/33/50	116	5.0	■		15	SAND --- coarse-grained, silty, rocky, damp	Tan Buff Orange Rust	Very Dense
15/28/40	117	4.5	■		20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Dense
22/30/50	119	3.4	■		25	SAND --- coarse-grained, slightly silty rocky, damp	Buff Rust Brown	Very Dense
17/22/50	118	7.2	■		30	SAND --- fine to medium-grained, silty, moist	Dark Brown Rust Buff	Dense
					35	End of boring at 31.5 feet No groundwater No caving by California split spoon sampler		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabriel , California

Work Order 565718

Plate E (Revised)

COAST GEOTECHNICAL, INC.

PERCOLATION TEST DATA BORING 5

Percolation Test Data Sheet

Project:	San Gabriel	Project No:	565718	Date:	5/29/20
Test Hole No:	5	Tested By:	TDH		
Depth of Test Hole, D_T:	14'	USCS Soil Classification:	SM/SP		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=	6"	Sides (if rectangular)=			

Presoak test data

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	8	830	30	132	—	36	Y
2	830	9	30	132	—	36	Y

Percolation test data

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (in./hr.)
1	911	921	10	132	167	35	210
2	921	931	10	132	166	34	204
3	931	941	10	132	166	34	204
4	941	951	10	132	165	33	198
5	951	1001	10	132	165	33	198
6	1001	1011	10	132	164	32	192
7	1011	1021	10	132	164	32	192
8	1021	1031	10	132	164	32	192
9							
10							
11							
12							
13							
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COMMENTS:

COAST GEOTECHNICAL, INC.

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COAST GEOTECHNICAL, INC.

Geotechnical Engineering Investigation

for

Proposed Self Storage Facility

at

414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California

BY:

COAST GEOTECHNICAL, INC.
W. O. 565718-01, dated January 16, 2019

FOR:

Mr. Kelly McKone
1784 Capitol Holdings, LLC
8777 North Gainey Drive, Suite 191
Scottsdale, AZ 85250

COAST GEOTECHNICAL, INC.

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January 16, 2019 W.O. 565718-01

Mr. Kelly McKone
1784 Capitol Holdings, LLC
8777 North Gainey Drive, Suite 191
Scottsdale, AZ 85250

Subject: Geotechnical Engineering Investigation for Proposed Self Storage Facility at 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue, San Gabriel, California

Dear Mr. McKone:

Pursuant to your request, a geotechnical engineering investigation has been performed at the subject site. The purposes of the investigation were to determine the general engineering characteristics of the near surface earth materials on and underlying the site and to provide recommendations for the design of foundations and underground improvements.

The conclusions and recommendations contained in this report are based upon our understanding of the proposed development and analyses of the data obtained from our field and laboratory testing programs.

This report completes our scope of geotechnical engineering services authorized by you in our executed proposal dated November 11, 2018.

PROJECT DESCRIPTION

It is our understanding the proposed development will consist of the demolition of the existing site improvements and construction of a two story over basement self storage facility. Structural loads are anticipated to be moderate.

A preliminary site development plan available at the time our site work was performed is appended on Figure 3. Modifications to the conclusions and recommendations presented herein may be needed as the project progresses through design and permitting.

PROJECT WORK SCOPE

The purpose of our services was to evaluate the project near subsurface conditions and to provide geotechnical engineering conclusions and recommendations relative to the proposed development. Our scope of services consisted of the following:

1. A cursory reconnaissance of the site and surrounding areas.

2. Excavation of four exploratory borings to determine the subsurface earth materials and groundwater conditions.

3. Collection of representative bulk and/or undisturbed earth material samples for laboratory analysis.

4. Laboratory analyses of soil samples including determination of in-situ and maximum density, in-situ and optimum moisture content, shear strength characteristics, expansion potential, consolidation, R-value, and chemical analysis.

5. Preparation of this report presenting results of our investigation and recommendations of the proposed development.

SITE CONDITIONS

The project site is composed of multiple addresses identified as 414-420 South San Gabriel Boulevard, 815-827 Commercial Avenue, and 415-423 Gladys Avenue in the City San Gabriel California, and is shown on the Site Vicinity Map, Figure 1.

Developed commercial property to the north, Gladys Avenue to the east, Commercial Avenue and developed property to the south, and developed property and San Gabriel Avenue to the west bind the property.

The combined properties form an "L" shaped parcel which is generally level. The properties are developed with commercial structures, asphalt paving, hardscape, and landscape. Current usage is as a commercial bus facility, office space, storage, and plumbing repair. Adjacent lots are developed with similar usages.

A depiction of onsite and offsite properties, and a proposed development layout, prepared by RKAA Architects is presented on Figure 3 and has been utilized for presentation of site geotechnical data. This depiction is for geotechnical use only and is not intended as, nor shall be utilized as, a survey.

GEOTECHNICAL RECORD SEARCH

Geotechnical records were searched at the City of San Gabriel based on address. Records were not found.

Records were found through the State of California Geotraker GIS site showing an underground storage tank (UST) was removed circa 1999. A site plan, by The Tyree Organization, showing the location of the UST is attached in Appendix C. No documentation was found addressing the backfill of the UST excavation; as such, earth materials in this area are considered undocumented and will require mitigation during site earthwork. Environmental aspects of these records were not within our expertise and or project work scope.

Readers of this report are advised that a record search is not an exact science; it is limited by time and resource constraints, incomplete records, ability of custodian of records to locate files, and

where records are located is only a limited interpretation of other consultant's work. Readers of this report should perform their own review of records to arrive at their own interpretations and conclusions.

AIR PHOTO REVIEW

A review of available air photos through NETR Online from 1948 through 2014 showed apparent residential usage from 1948 to 1953, residential and commercial usage in 1964 through 1980, and essentially what is present today after that. Readers are advised that specific usages and impact to the project are not discernible in the air photos reviewed.

REGIONAL GEOLOGY

Regionally, the site is located within the Peninsular Range geomorphic province, near the boundary of the Transverse Range geomorphic province and is shown on a regional geology map prepared by Thomas Dibblee (Geologic Map of the El Monte and Baldwin Park Quadrangle, 1999), a portion of which is attached as Figure 2. This map shows the site to be mapped as being underlain by alluvial deposit (Qae).

The alluvial soils are derived from materials eroded from the adjacent San Gabriel Mountain range. The alluvial soils occur as interlayered episodes of stream erosion and subsequent alluvial deposition. The alluvial soils generally consist of a mixture of sand, silt, and gravels.

FIELD INVESTIGATION

The field investigation was performed on December 12, 2018 consisting of the excavation of four exploratory borings, placed by a hollow stem auger drill rig, at the locations shown on the attached Site Geotechnical Map, Figure 3. As excavations progressed, a representative from this office visually classified the earth materials encountered, and secured representative samples for laboratory testing.

Pushing or driving a sampling spoon into the earth material obtained undisturbed samples for detailed testing in our laboratory. A solid barrel-type spoon was used having an inside diameter of 2.5 inches with a tapered cutting tip at the lower end and a ball valve at the upper end. The sampler is driven into the soil at the bottom of the borehole by means of hammer blows. The hammer blows are given at the top of the drilling rod. The hammer weighs 140 lbs. For each blow, the hammer drops a distance of 30 inches.

The barrel is lined with thin brass rings, each one inch in length. The spoon penetrated into the soil below the depth of the boring approximately eighteen inches. The end portion of this sample was retained for testing. All samples in their natural field condition were sealed in airtight containers and transported to the laboratory.

EARTH MATERIALS

Earth materials encountered within the exploratory boreholes were visually logged by a representative of COAST GEOTECHNICAL, Inc. The materials were classified as artificial fill and native alluvial deposits.

Artificial fills encountered consisted of dark brown sandy silt, moist, and soft to firm. Artificial fills are opinioned undocumented and require mitigation for support of future improvements and or fills.

The underlying alluvial soil consisted of medium brown to dark brown silty sand, moist, medium dense, grades with depth to slightly oxidized to oxidized brown to buff, medium to coarse grained sands, damp to moist, medium dense to dense, with zones of small pebbles to weathered granitic rock fragments and stringers of silt.

Descriptions of the earth materials encountered are presented on the attached Boring Logs, Plates B through E. The data presented on these logs is a simplification of actual subsurface conditions encountered and applies only at the specific boring locations and the date excavated. It is not warranted to be representative of subsurface conditions at other times and locations.

GROUNDWATER

Groundwater was not encountered in the borings placed; however, zones of perched waters are known to exist in the area within isolated lenses of granular soils.

The historic high groundwater map found in USGS Open File Report 98-15 shows historic high groundwater to be at a depth of near 100 feet. This map is appended as Figure 5.

Groundwater is not anticipated to affect the proposed construction as currently understood; although, localized saturated pockets of permeable soils could cause nuisance seepage during grading and or basement construction.

SEISMICITY

Southern California is located in an active seismic region. Moderate to strong earthquakes can occur on numerous faults. The United States Geological Survey, California Division of Mines and Geology, private consultants, and universities have been studying earthquakes in Southern California for several decades. Early studies were directed toward earthquake prediction estimation of the effects of strong ground shaking. Studies indicate that earthquake prediction is not practical and not sufficiently accurate to benefit the general public. Governmental agencies are shifting their focus to earthquake resistant structures as opposed to prediction. The purpose of the code seismic design parameters is to prevent collapse during strong ground shaking. Some damage should be expected.

Within the past 48 years, Southern California and vicinity have experienced an increase in seismic activity beginning with the San Francisco earthquake in 1971. In 1987, a moderate earthquake struck the Whittier area and was located on a previously unknown fault. Ground shaking from this

event caused substantial damage to the City of Whittier, and surrounding cities. The January 17, 1994, Northridge earthquake was initiated along a previously unrecognized fault below the San Fernando Valley. The energy released by the earthquake propagated to the southeast, northwest, and northeast in the form of shear and compression waves, which caused the strong ground shaking in portions of the San Fernando Valley, Santa Monica Mountains, Simi Valley, City of Santa Clarita, and City of Santa Monica.

Southern California faults are classified as: active, potentially active, or inactive. Faults from past geologic periods of mountain building, that do not display any evidence of recent offset, are considered "inactive" or "potentially active". Faults that have historically produced earthquakes or show evidence of movement within the past 11,000 years are known as "active faults". Known active faults have been placed on Alquist-Priolo Maps published by the State of California. There are no known active faults within the subject property. Nearby causative faults are as follows.

- *Northridge Fault.* The Northridge fault is an inferred deep thrust fault that is considered the eastern extension of the Oak Ridge fault. The Northridge Thrust is located beneath the majority of the San Fernando Valley and is believed to be the causative fault of the 1994 Northridge earthquake. This thrust fault is not exposed at the surface and does not present a potential surface fault rupture hazard. However, the Northridge Thrust is an active feature that could generate future earthquakes. The most recent earthquake of regional significance in Southern California affecting the community of Hollywood was the 1994 Northridge Earthquake, a magnitude 6.7 earthquake that occurred in the San Fernando Valley. The epicenter of this blind thrust fault earthquake was located 11.4 miles below the surface, near the Saticoy Street and Reseda Boulevard intersection in Reseda on a previously unmapped fault. Major structural failures along Los Angeles County freeways occurred, including the collapse of the Interstate 10 (I-10), (a major transportation route to Hollywood)overpass at La Cienega Boulevard.

- *Santa Monica Fault.* The Santa Monica Fault is a part of the Transverse Ranges Southern Boundary fault system, a west-trending system of reverse faults that extend for more than 125 miles along the southern edge of the Transverse Ranges (Dolan et al., 2000a). It extends east from the coastline in Pacific Palisades through Santa Monica and West Los Angeles and merges with the Hollywood fault at the West Beverly Hills Lineament in Beverly Hills. It is considered active with evidence of recent movement along the fault with the potential of generating an earthquake with a maximum moment magnitude (Mw) of 6.6 (Petersen et al., 1996).

- *Hollywood Fault.* The Hollywood fault extends east-northeast for a distance of 17 kilometers through Beverly Hills, West Hollywood, and Hollywood to the Los Angeles River. It is truncated on the west by the north-northwest striking West Beverly Hills Lineament, which marks a left step of ¾ mile between the Santa Monica fault and the Hollywood fault (Dolan et al., 2000a). This fault is considered active, and is thought to be capable of generating an earthquake with a maximum moment magnitude (Mw) of 7.1 (Petersen et al., 1996).

- *San Gabriel Fault.* The San Gabriel fault trends northwest-southeast through the San Gabriel Mountains and is approximately 87 miles in length. The fault is comprised of a series east-west trending faults with a right-lateral strike-slip and with a dip steep to the north. The most recent surface rupture was in the Holocene Epoch. Estimated slip rate is 1 to 5 millimeters per year (mm/yr). There are no estimations on the maximum credible magnitude of future earthquakes,

but the recurrence interval varies per fault section and is likely to be more active on the western portions of the fault.

- *Raymond Fault.* The Raymond fault is an east-northeast trending, left-lateral fault with minor reverse slip. The structure forms the western boundary of the San Gabriel Basin with the Raymond Groundwater Basin. The fault has a slip rate between 0.10 and 0.22 mm/yr. This fault extends a total of 16.2 miles. The most recent surface rupture was during the Holocene Epoch. The most recent major earthquake associated with this fault was the Pasadena Earthquake of 1988, which occurred at a depth 9.6 miles below ground with a 5.0 magnitude. The interval between major ruptures is estimated to be 4,500 years.

SEISMIC HAZARDS

The potential hazards to be evaluated with regard to seismic conditions include fault rupture, landslides triggered by ground shaking, soil liquefaction, earthquake-induced vertical and lateral displacements, earthquake-induced flooding due to the failure of water containment structures, seiches, and tsunamis.

Fault Rupture

The project is not located within a currently designated Alquist-Priolo Earthquake Zone. No known active faults are mapped within the site. Based on this consideration, the potential for surface fault rupture at the site is considered to be remote.

Ground Shaking

The site is located in a seismically active area that has historically been affected by moderate to occasionally high levels of ground motion, and the site lies in relatively close proximity to several active faults; therefore, during the life of the proposed development, the property will probably experience moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Design of structures is typically to maintain structural integrity not to prevent damage. Earthquake insurance is available where the damage risk is not acceptable to the client.

Seismic Induced Landslide

Earthquake-induced landslide zones were delineated by the State of California using criteria adopted by the California State Mining and Geology Board. Under those criteria, earthquake-induced landslide zones are areas meeting one or more of the following:

1. Areas known to have experienced earthquake-induced slope failure during historic earthquakes.

2. Areas identified as having past landslide movement, including both landslide deposits and source areas.

3. Areas where CDMG's analyses of geologic and geotechnical data indicate that the geologic materials are susceptible to earthquake-induced slope failure.

Based on the Seismic Hazard Zone Map published by the State of California, El Monte Quadrangle (March 25, 1999), appended as Figure 4, the site is not mapped as being in an area subject to potential seismic induced landslides. Impact to the subject site from a seismic induced landslide is considered remote.

Seismic Induced Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, non-cohesive granular soils exhibit severe reduction in strength and stability when subjected to high-intensity ground shaking. The mechanism by which liquefaction occurs is the progressive increase in excess pore pressure generated by the shaking associated with the seismic event and the tendency for loose non-cohesive soils to consolidate. As the excess pore fluid pressure approaches the in-situ overburden pressure, the soils exhibit behavior similar to a dense fluid with a corresponding significant decrease in shear strength and increase in compressibility. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density, non-cohesive sandy soils; and 3) high-intensity ground motion.

Seismic Hazard Zone Maps published by the State of California have been prepared to indicate areas that have a potential for seismic induced liquefaction hazards. The Seismic Hazard Zone Map for the El Monte Quadrangle (March 25,1999), appended as Figure 4, shows that the site is not mapped as being in an area subject to potential liquefaction hazards. Liquefaction induced damage is not considered probable at the subject site.

Lateral Spreading

The occurrence of liquefaction may cause lateral spreading. Lateral spreading is a phenomenon in which lateral displacement can occur on the ground surface due to movement of non-liquefied soils along zones of liquefied soils. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along sloping ground toward an unconfined area.

The area does not exhibit characteristics common to areas subject to seismic induced lateral spread. Our opinion is that the site is not subject to seismic induced lateral spread.

Earthquake Induced Settlements

Earthquake-induced settlements result from densification of non-cohesive granular soils which occur as a result of reduction in volume during or after an earthquake event. The magnitude of settlement that results from the occurrence of liquefaction is typically greater than the settlement that results solely from densification during strong ground shaking in the absence of liquefaction.

Based on site conditions and the physical characteristics of site earth materials seismic induced settlement is considered to be negligible.

Earthquake-Induced Flooding

The failure of dams or other water-retaining structures as a result of earthquakes and strong ground shaking could result in the inundation of adjacent areas. Due to the lack of a major dam or water-retaining structure located near the site, the potential of earthquake-induced flooding affecting the site is considered not to be present.

Seiches

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Based on the lack of nearby enclosed bodies of water the risk from a seiche event is not present.

Tsunami

Tsunamis are waves generated in large bodies of water as a result of change of seafloor topography caused by tectonic displacement. Based on the elevation of the site the project has no potential to be affected by a tsunami.

GEOTECHNICAL DISCUSSION

Development of the site as proposed is considered feasible from a soil engineering standpoint, provided that the recommendations stated herein are incorporated in the design and are implemented in the field. General comments are as follows.

- Earthwork is anticipated to consist of grade changes to create designed pad elevations and drainage required for the proposed construction.
- Conventional earth moving equipment may be utilized. Removals will be required prior to the placement of any fills and remedial grading will be needed to eliminate any cut fill transitions.
- Care shall be taken during site construction not to remove lateral and or vertical support from adjacent properties.
- Construction cuts that cannot be made within the guidelines of this report will need to be supported with designed shoring. The shoring design would need to take into account removal depths needed for site grading and surcharges.
- The proposed site improvements shall be supported by foundations bearing into fills placed and compacted under the observation and testing of COAST GEOTECHNICAL, Inc.
- Proposed pavement, interior slab areas, and hardscape areas shall be supported by fills placed and compacted under the observation and testing of COAST GEOTECHNICAL, Inc.
- Foundations for proposed site walls and free standing retaining walls may be supported by competent native soils or compacted fills. Where native soils are used for support, designed foundations may need to be deepened and footings bottoms mitigated with moisture and compaction.

- Development of the site as proposed is considered feasible from a soils engineering standpoint, provided that the recommendations stated herein are incorporated in the design and are implemented in the field. The proposed site improvements will not adversely affect adjacent properties and vice versa, provided proper construction techniques are utilized and required geotechnical observations are made.

Recommendations that follow shall be incorporated into the project as needed and are subject to change based on review of future building, foundation, and grading plans.

PROPOSED GRADING

Grading plans were not available at the time this report was prepared. It is anticipated that grading will consist of excavation of the subterranean level (estimated at ten feet below existing grade), excavation and compaction for uniform support of foundations, as wall backfill, and for support of hardscape, and paving materials.

GRADING RECOMMENDATIONS

Foundations for the structure and improvements will derive support from compacted fills placed under the observation and testing of COAST GEOTECHNICAL, Inc.

Unacceptable site earth materials shall be over-excavated down to competent earth material. Competent earth material is determined by the project soil engineer based on physical testing of soil samples obtained during exploration and proposed construction.

Based on in place densities and consolidation tests, soils found at a depth of about four feet below existing grade and deeper have adequate geotechnical properties to provide adequate support of proposed fills and the structure; as such, removals to a depth of four feet below existing grade or to one foot below proposed footing bottoms, whichever is greater, are anticipated for at grade portions of the project, and three feet below proposed subgrade or to one foot below proposed footing bottoms, whichever is greater, are anticipated for the subterranean area; however, field observations made at the time of grading shall determine final removal limits. Areas proposed for asphalt, concrete, or hardscape shall have a minimum of two feet of removal below existing grade or proposed grade, whichever is deeper.

The overexcavation areas shall include areas proposed for foundations, slabs, hardscape, asphaltic concrete or other areas as determined by the geotechnical engineer. The excavations shall extend five feet beyond the structure's outline, except where contained by a designed wall, shoring, or property lines, and three feet beyond the limits of parking, driveway, and hardscape areas.

To provide adequate support along property lines excavations shall be sloped at a 1:1 (H:V) gradient from the excavation bottom up to existing grade. As fill soils are placed the grading contractor shall bench into the 1:1 construction cut to final grade. Where this designed cut cannot be made designed shoring shall be utilized.

Exposed excavation bottoms shall be observed by the geotechnical engineer prior to processing. Field recommendations will be made depending on conditions encountered. Upon approval, the excavation bottoms shall be processed, moisture conditioned approximately to optimum moisture content and compacted to a minimum of 90% relative compaction.

Subsequent fills shall be placed in six to eight inch lifts, moisturized conditioned to approximately optimum moisture content and compacted to a minimum of 90% relative compaction. This process shall be followed to finish grade.

The project is in an area where usage of septic systems and or trash pit disposal was common. If encountered during site earth work the soil engineer shall be notified for recommendations. Typically septic tanks, leach fields, and trash pits are removed and the void backfilled with compacted soil. Seepage pits are typically drilled clean and backfilled with minimum three sack slurry.

Undocumented backfill of a former UST location shall be removed and replaced as documented compacted fill during earthwork operations. The contractor shall be responsible for locating this area during site construction.

During earthwork operations, a representative of COAST GEOTECHNICAL, Inc. shall be present to verify acceptable conditions and that compaction requirements are being obtained.

GENERAL GRADING NOTES

All existing structures shall be demolished and all vegetation and debris shall be stripped and hauled from the site. The entire grading operation shall be done in accordance with the attached "Specifications for Grading".

Any import fill materials to the site shall not have an expansion index greater than 20, and shall be tested and approved by our laboratory. Samples must be submitted 48 hours prior to import.

Grading and/or foundation recommendations are subject to modification upon review of final plans by the Geotechnical Engineer. Please submit plans to COAST GEOTECHNICAL, Inc. when available.

TEMPORARY CUTS

Temporary construction cuts are anticipated for grading and construction of the project. The following recommendations are for unsurcharged conditions, and are subject to modification based on field observations.

Temporary cuts in site earth materials are anticipated to expose artificial fill and alluvial deposits.

Cuts in the existing fill and alluvial soils shall be no steeper than 1:1(H:V).

Tops of 1:1(H:V) construction cuts shall be at least five feet from property line.

Under observation of the soil engineer some short term grading cuts within this 1:1 projection may be made vertical. These cuts shall be performed under the continuous observation of Coast Geotechnical, are usually a result of benching, and are re-supported immediately after placement. Designed cuts may remain open for thirty days upon observation and approval of the soil engineer. In wet seasons the cuts shall be protected from moisture intrusion by covering with plastic and sandbagging. The soils engineer based on field observation has the option of allowing the cuts to remain as is, requiring more conservative cuts, infilling of the excavation, or use of shoring.

Where designed cuts cannot be made due to physical constraints, or local jurisdiction policy prevents them from being used, shoring will need to be used. Shoring should be anticipated to be needed along the building portion near San Gabriel Boulevard, and between the north property line and north building wall.

No cuts shall be allowed which would remove lateral support from adjacent properties, structures, or public right of ways.

The project soil engineer shall observe all cuts at the time of excavation. If adverse conditions are exposed, remedial measures will be recommended and implemented.

OSHA guidelines shall be followed where workers are to enter confined spaces, trench work, or excavations.

SHORING

Final determination of shoring needs will be dependent on review of final site development plans and grading plans. Where shoring is needed the following guidelines shall be utilized:

- Prior to any earthwork activities adjacent properties shall be photo documented and vertical and horizontal monument points established and surveyed to establish a datum. Monument points should be periodically surveyed during construction to establish any movement and should continue until permanent restrained conditions are constructed.

- No vibratory equipment or hammering shall be utilized in shoring installation.

- Shoring shall be designed by a licensed engineer and shall consist of drilled piles and lagging.

- The shoring engineer shall take into account improvements on adjoining properties in determining allowable shoring deflections.

- Temporary shoring may be designed for an active pressure of 37.2 pcf or an at rest pressure of 62.5 pcf, plus any surcharges. It is very important to note that active pressures can only be achieved when movement in earth materials occurs. If movement in the earth material is not acceptable; such as, adjacent to an existing structures, the at-rest pressure should be considered for design purposes.

- In addition to the recommended earth pressure, the upper ten feet of the shoring adjacent to a street or driveway area should be designed to resist a uniform lateral pressure of 100 psf, acting as a result of an assumed 300 psf surcharge behind the shoring due to normal street traffic. If the traffic is kept back at least ten feet from the shoring, the traffic surcharge may be neglected.

- Provided shoring maintains a spacing of three times the diameter of the shoring pile no reduction in passive pressure is needed. The point of fixity for shoring piles shall be at five feet below proposed finish grade.

- Where shoring piles are designed to also carry vertical loads the drilled piles may utilize a skin friction value of 300 psf per square foot of contact with alluvial soils.

- Drilling may encounter granular soil zones. Caving of granular soils is a possibility. Casing may be required.

- Perched water could be encountered. Where significant seepage is found casing may be needed to maintain an open hole.

- The annulus of the drilled hole into which the temporary shoring pile is placed shall be backfilled with a minimum one sack slurry. We do not recommend the use of pea gravel backfill.

- Where temporary shoring is incorporated into a permanent wall the structural engineer shall specify the concerte design for backfill of the annulus.

- Lagging shall be installed as the excavation is made. No more than two feet of unsupported earth material shall be exposed at anytime, unless written field observations by COAST GEOTECHNICAL, Inc. allows otherwise.

- The lagging shall be backfilled with a minimum one sack slurry, and the slurry allowed to set prior to any excavation below the bottom of lagging.

- Shoring shall be designed to accommodate foundation and grading excavations.

- COAST GEOTECHNICAL, Inc. shall observe all phases of shoring installation.

- Shoring plans shall be reviewed by this office.

FOUNDATION DESIGN

The site is within an area subject to seismic events. Under current CBC codes, City policy, and industry standards noncritical structures subject to seismic hazards are designed to protect life and safety. Under this design objective the requirements of protecting life and safety could be met but the structure could be damaged. The damage to the structure could range from minimal to being non-functional. The reduction of risk, for the occurrence of structural damage from a seismic event, is generally associated with the structure's foundation system.

Within this report we will address two foundation designs typically utilized in the area, conventional and mat foundations. Typically a mat foundation is associated with providing

increased protection from seismic events, than that provided by a conventional foundation system. If the risk associated with these foundation systems is not acceptable to the client, the client has the option of utilizing alternate designs that could decrease the risk of damage to the structure to a level they perceive as acceptable.

CONVENTIONAL FOUNDATION

Conventional foundations for the structure may consist of continuous footings or isolated pad footings placed a minimum of 24 inches below lowest adjacent grade bearing into engineered fill soil. Foundations complying with this recommendation may utilize an allowable bearing value of 2,000 psf. This value is for dead plus live load and may be increased 1/3 for total including seismic and wind loads where allowed by Code. Calculations for bearing capacity are presented on Plate J.

Bearing loads may be increased by 200 psf for each increase in foot of width and depth up to a maximum of 3,000 psf.

Where isolated pads are utilized they shall be tied into adjacent foundations in at least two directions with structural grade beams.

All footings shall be reinforced with a minimum of four #5 bars, two top and two bottom. Structural design shall be utilized where more conservative.

Foundation excavations shall be observed by a representative of COAST GEOTECHNICAL, Inc. prior to placement of steel and concrete, to verify compliance with geotechnical recommendations.

MAT FOUNDATION

If a mat slab design is utilized, the structural engineer should design the building's mat foundation thickness and reinforcement requirements based on the anticipated loading conditions. The mat foundation slab should be at least twelve inches thick, with perimeter footings a minimum of 24 inches below the lowest adjacent grade. A modulus of subgrade reaction of 100 pci may be used in the design of the mat foundation. Reinforcement shall be determined by the structural engineer. Calculations for the subgrade reaction are provided on Plate K.

LATERAL DESIGN

Lateral restraint at the base of footings and on slabs may be assumed to be the product of the dead load and a coefficient of friction of .35. Passive pressure on the face of footings may also be used to resist lateral forces. A passive pressure of zero at the surface of finished grade, increasing at the rate of 300 pounds per square foot of depth to a maximum value of 3,000 pounds per square foot, may be used for compacted fill and native soil. If passive pressure and friction are combined when evaluating the lateral resistance, the value of the passive pressure should be limited to 2/3 of the values given above. Calculations for passive pressure is presented on Plates L and M.

SEISMIC DESIGN

Based on the 2016 CBC the following seismic design parameters are provided. These seismic design values were determined utilizing latitude 34.097145 and longitude -118.09052, and data from the USGS Seismic Design Maps through a third party application by SEA. The data output by SEA is appended in Appendix B. A conservative site class D was assigned to site earth materials.

- Site Class = D
- Mapped 0.2 Second Spectral Response Acceleration, Ss = 2.737g
- Mapped One Second Spectral Response Acceleration S_1 = 0.939g
- Site Coefficient from Table 1613A5.3(1), Fa = 1.0
- Site Coefficient from Table 1613A5.3(2), Fv = 1.5
- Maximum Design Spectral Response Acceleration for short period, S_{MS} = 2.737g
- Maximum Design Spectral Response Acceleration for one-second period, S_{M1} = 1.409g
- 5% Design Spectral Response Acceleration for short period, S_{DS} = 1.825g
- 5% Design Spectral Response Acceleration for one-second period, S_{D1} = 0.939g

SETTLEMENT

The maximum total post-construction static settlement is anticipated to be on the order of 3/4-inch. Differential static settlements are expected to be less than 1/2-inch, measured between adjacent structural elements over a distance of forty feet.

SUBSIDENCE AND SHRINKAGE

Subsidence over the site is anticipated to be negligible. Shrinkage of reworked materials should be in the range of 8 to 12 percent.

EXPANSIVE SOILS

Results of expansion tests indicate that the surface soils have a very low expansion potential.

CHEMICAL ANALYSIS

A representative soil sample was analyzed for a corrosion series by Anaheim Test Labs with the following results, soluble chlorides of 68 ppm, minimum resistivity of 8,000 max ohm-cm, a pH of 7.1, and soluble sulfates of 92 ppm.

The client should consult with a corrosion expert to assess if the site soils are adverse to the site improvement proposed.

Based on the CBC and Table 4.3.1 of ACI 318, the sulfate content shows a negligible exposure. Concrete with Type II cement may be utilized. Structural design could dictate a higher strength concrete be utilized.

RETAINING WALL DESIGN

Unrestrained retaining walls may be founded in competent compacted fill utilizing previously stated bearing values. Walls retaining drained earth under static loading may be designed for the following:

Surface Slope of Retained Material Horizontal to Vertical	Equivalent Fluid Pressure Pounds per Cubic Foot
Level	37.2
5 to 1	43.4
4 to 1	45.5
3 to 1	49.8
2 to 1	65.6

Calculations for the stated equivalent fluid pressures are based on the Coulomb theory provided on Plate N. The point of resultant force is at H/3 above the base of the retaining wall, where H is the wall height.

All retaining structures should include appropriate allowances for anticipated surcharge loading, where applicable.

The provided design is based on the use of select onsite or import very low expansive granular earth materials, or gravels, as backfills. The structural engineer shall designate this on his plans. Onsite expansive earth materials may be used as a two foot soil cap to mitigate the infiltration of surface waters into the backfill zone.

Footing excavations require observation and approval by COAST GEOTECHNICAL, Inc.

RESTRAINED WALL DESIGN

Walls restrained from deflection by the structural frame should be designed for "at-rest" earth pressures. For the level backfill conditions, an equivalent fluid pressure of 62.5 pounds per cubic foot, as calculated on Plate O, may be used for static conditions.

The structural engineer shall designate on the foundation plans whether basement walls are designed for restrained or unrestrained conditions. Walls designed as restrained must have the deck or framing in place prior to backfill placement.

All retaining structures should include appropriate allowances for anticipated surcharge loading, where applicable.

The provided design is based on the use of select onsite or import very low expansive granular earth materials, or gravels, as backfills. The structural engineer shall designate this on his plans. Onsite expansive earth materials may be used as a two foot soil cap to mitigate the infiltration of surface waters into the backfill zone.

Footing excavation requires observation and approval by COAST GEOTECHNICAL, Inc.

SEISMIC DESIGN VALUE

Code requires that retaining walls with more than six feet of backfill be designed for a seismic load.

For a retaining wall under earthquake loading the designed equivalent fluid pressure is sensitive to the ground motion value and seismic coefficient (Kh) value utilized in analysis. Regulating jurisdictions in the area differ on how these values are arrived at and some regulating agencies recognize that the calculated ground motion value and the seismic coefficient utilized in analysis of seismic loads are not equivalent and allow the use of a seismic coefficient that is less than the ground motion value.

Where local policy is not present most jurisdictions allow the geotechnical engineer to use their best judgment in arriving at a usable seismic design value. Many jurisdictions allow the use of PGAm as the ground motion value, and 1/3PGAm for use as the seismic coefficient. We concur with the use of this method in design of seismic forces on retaining walls. Based on the USGS Seismic Tool application, the PGAm for the site is 1.031, with 1/3 of that value being 0.344g.

For this project, assessment of seismic loads on retaining walls shall utilize a seismic coefficient (Kh) of 0.344g.

Utilizing a simplified approach for determination of seismic design loads of $\Delta P_{AE} = 3/4\ \gamma\ Kh$, a value of $\Delta P_{AE} = 32.3$ pcf was determined. This seismic design load value shall be added to the static design loads. The client is advised that if through review it becomes evident that the City requires an alternate seismic design analysis that differing design values could be required.

WATERPROOFING

There is an inherent risk with moisture problems when constructing below grade levels. The geotechnical consultant is only responsible for identification of adverse moisture conditions, which could impact below grade rooms at this site. Groundwater conditions are not anticipated. The client should consult with a waterproofing expert for the design of a waterproofing system for the subterranean level and for inspection during construction.

WALL SUBDRAINS

Subdrain systems shall be installed behind retaining and subterranean walls and typically consist of four-inch diameter SCH 40 or SDR 35 perforated pipe surrounded with one cubic foot, per lineal pipe foot, of 3/4-inch gravel. The gravel shall be wrapped in filter fabric. Outlet pipes shall be solid pipe of similar material. A typical subdrain detail is shown on Plate P.

Alternate subdrain systems, such as Miradrain systems, are feasible, but are subject to the review and approval of the soils engineer.

Subdrains for the subterranean walls shall be placed below the elevation of the subterranean floor. Subdrain systems shall be independent of area surface drain and roof drain systems.

Subdrain placement requires the observation and approval by COAST GEOTECHNICAL, Inc.

RETAINING WALL BACKFILL

Retaining wall backfills shall consist of onsite very low expansive onsite earth materials, import materials with a very low expansion index, or gravels. Onsite expansive earth materials may be used as a two foot soil cap to mitigate the infiltration of surface waters into the backfill zone.

Prior to placement of any backfills the area shall be cleaned of loose soils and construction debris. COAST GEOTECHNICAL, Inc. shall observe and approve the area as acceptable prior to any backfill placement.

Retaining wall backfill shall be placed in six to eight inch loose; moisture conditioned lifts and mechanically compacted to a minimum of ninety percent relative compaction. Backfills require testing at two-foot vertical intervals during placement.

If imported gravels are used as backfill material, the gravels shall be separated from on-site soils with filter cloth. Gravel backfill material shall be lubricated with water and compacted as placed. A soil cap, consisting of on-site soils or similar material, shall be placed over any gravel backfill and separated by filter cloth from the underlying material. The soil cap shall be a minimum of two and a half feet in thickness or one foot below footing bottoms, whichever is deeper. Soil cap soils shall be placed in six to eight inch loose lifts, moisture conditioned as needed, and compacted to a minimum of 90% relative compaction.

Compaction of backfill material requires observation and approval by COAST GEOTECHNICAL, Inc. during the backfill operation.

UTILITY LINE BACKFILLS

All utility line backfills, both interior and exterior, shall be compacted to a minimum of 90% relative compaction and shall require testing at a maximum of two-foot vertical intervals.

Where utility lines enter a structure the utility trench shall have an impermeable plug of backfill placed to mitigate the potential migration of waters through the backfill zone underneath the slab.

BASEMENT AND FLOOR SLAB

Concrete slabs supported by engineered fill soil shall be designed utilizing values of 1.0 for C_O, 1.0 for C_S, non plastic soils, and in accordance with publications or methods stated in the CBC or referenced publications.

Minimum geotechnical recommendations for the any basement slab design are six inches actual thickness with #4 bars at twelve-inches on center each way. Structural design for anticipated floor loads may be more conservative.

Minimum geotechnical recommendations for on grade slab design are five inches actual thickness with #4 bars at twelve inches on center each way. Structural design for anticipated floor loads may be more conservative.

The stabilization of expansive soils will be accomplished through moisture conditioning of expansive soils to 3-4% over optimum moisture content during grading and by pre-saturating slabs areas prior to concrete placement in accordance with our Plate A.

Prior to placement of the capillary break or vapor retarder COAST GEOTECHNICAL, Inc. shall test the slab subgrade soils for moisture content. If the subgrade soils do not exhibit the recommendations on Plate A they shall be moisture conditioned to the required depth and content.

The capillary break material shall comply with the requirements of the local jurisdiction and shall be a minimum of four inches in thickness. The capillary break shall consist of open graded 1/2 inch or larger gravel. The gravels shall be vibrated smooth. Vibration of the gravels shall be verified by Coast Geotechnical. The gravels shall be covered with a heavy filter fabric prior to placement of the vapor retarder to minimize puncturing of the vapor retarder. A minimum 15-mil thick vapor retarder in accordance with requirements of ASTM E:1745 and E:1643 is recommended.

The vapor retarder is recommended for all slab on grade areas and shall be properly lapped and sealed in accordance with code. The vapor barrier shall be in contact with the slab bottom.

HARDSCAPE SLABS

Hardscape slab subgrade areas shall exhibit a minimum of 90% relative compaction and moisture content 3-4% over optimum moisture content to a depth of at least one foot. Deeper removal and recompaction may be required if unacceptable conditions are encountered. These areas require testing just prior to placing concrete.

Exterior hardscape slabs will be subject to stress from volume changes due to variations in subgrade soils, which could lead to cracking. The followings recommendations will minimize cracking and offsets, but will not eliminate concrete cracks.

Doweling slabs to perimeter footings can mitigate movement of slabs adjacent to structures. Doweling should consist of No. 4 bars bent around exterior slabs. Doweling should be spaced no farther than 36 inches on centers. As an option to doweling, an architectural separation could be provided between the main structure and abutting appurtenance improvements. Pre-saturation of exterior slab areas is also desirable. At exterior edges of patios and other flatwork, a cut-off wall to the same depth and containing the same reinforcement as exterior footings is highly recommended. If no significant load is associated with the edge of the slab, the width of the cut-off wall may be

limited to eight inches. Reinforcement adopted for the main structure may be applied to the appurtenances.

Exterior hardscape shall be a minimum of four inches in thickness and reinforced with # 3 bars at twelve inches OCEW.

As an alternative to rigid hardscape or brickwork, flexible pavers may be utilized.

DRAINAGE

Positive drainage should be planned for the site. Drainage should be directed away from structures via non-erodible conduits to suitable disposal areas. The structure should utilize roof gutters and down spouts tied directly to yard drainage.

Unlined flowerbeds, planters, and lawns should not be constructed against the perimeter of the structure. If such landscaping (against the perimeter of a structure) is planned, it should be properly drained and lined or provided with an underground moisture barrier. Irrigation should be kept to a minimum.

Section 1804.3 of the 2016 CBC recommends 5% slope away from structures for landscape areas and 2% slope away for hardscape areas, within ten feet of a residence. Minimum drainage shall be one percent for hardscape areas and two percent for landscape areas for all other areas.

We do not recommend the use of infiltration trenches, infiltration basins, dry wells, permeable pavements or similar systems designed primarily to percolate water into the subsurface soils to conform with infiltration best management practice (BMP), within fifteen feet of a structure. Due to the physical characteristics of the site earth materials, infiltration of waters into the subsurface earth materials has a risk of adversely affecting below grade structures, building foundations and slabs, and hardscape improvements. From a geotechnical viewpoint surface drainage should be directed to the street.

No cuts shall be allowed which would remove lateral support from adjacent properties, structures, or public right of ways.

The project soil engineer shall observe all cuts at the time of excavation. If adverse conditions are exposed, remedial measures will be recommended and implemented.

OSHA guidelines shall be followed where workers are to enter confined spaces, trench work, or excavations.

PRELIMINARY INFILTRATION ASSESSMENT

Site explorations placed by this consultant did not encounter groundwater to a depth of thirty feet below existing grade. The upper earth materials in this area consist of silty, fine to coarse-grained

sand, with gravel and cobbles, which are opinioned to have favorable; although, variable infiltration rates. Infiltration systems should be kept a minimum of fifteen feet away from structures.

Actual infiltration rates will require testing which can be performed, when system type and location(s) are known, under separate contract.

PAVEMENT DESIGN

The parking lot subgrade will require over-excavation and compaction to provide a minimum of two feet of compacted fill placed in accordance will recommendations of this report. An R-Value of 78 has been determined for near surface site soils; although, for analysis a maximum R-Value of 50 is utilized. Based on assumed traffic indexes and an R-value of 50 the following pavement sections may be utilized. Import material for future grading of the parking and driveways should consist of earth material similar to onsite soils. Additional R-values should be determined upon completion of grading. The following pavement sections may be subject to change based on these results.

AREA	FLEXIBLE PAVEMENT SECTION				
	T. I.	GE	AC	AB	SUBGRADE
Auto Parking	5.0	0.80	4.0"	4.0"**	* 24″
Auto Drives	6.0	0.96	4.0”	5.0"**	* 24"
Truck Drives	7.0	1.12	4.0”	6.0"**	*24"
Pavers (80mm stone thickness)	7.0	-	-	9.5"**	*24"

* *Compacted to 90% relative compaction.*
** *Compacted to 95% relative compaction.*

If concrete pavement is used, the concrete should be at least six inches thick underlain by at least four inches of base material compacted to a minimum of 95% relative compaction. Reinforcement is highly advised and at a minimum should consist of #3 bars on 12-inch centers both ways. To minimize cracking of concrete pavement recommendations of the PCA should be utilized as guidelines for placement, curing, jointing, saw cutting, etc.

Increased pavement sections and/or reinforced concrete aprons should be utilized where heavy axle loads from trash or delivery trucks will be encountered.

ENGINEERING CONSULTATION, TESTING & OBSERVATION

We will be pleased to provide additional input with respect to foundation design once methods of construction have been determined.

Grading, foundation and shoring plans should be reviewed by this office prior to commencement of grading so that appropriate recommendations, if needed, can be made.

Areas to receive fill should be observed when unsuitable materials have been removed and prior to placement of fill, and fill should be observed and tested for compaction as it is placed.

SUPPLEMENTAL CONSULTING

During construction, a number of reviews by this office are recommended to verify site geotechnical conditions and conformance with the intentions of the recommendations for construction. Although not all possible geotechnical observation and testing services are required. The following site reviews are advised, some of which will probably be required by the City of San Gabriel:

- Shoring installation
- Grading and excavations
- Foundation excavations and slab subgrade compaction testing
- Slab steel placement, primary and appurtenant structures
- Backfill compaction basement/retaining walls
- Compaction of utility trench backfill
- Hardscape subgrade compaction

AGENCY REVIEW

All soil and structural aspects of the proposed development are subject to the review and approval of the governing agency(s). It should be recognized that the governing agency(s) can dictate the manner in which the project proceeds. They could approve or deny any aspect of the proposed improvements and/or could dictate which foundation and grading options are acceptable. Supplemental geotechnical consulting in response to agency requests for additional information could be required and will be charged on a time and materials basis.

LIMITATIONS

This report presents recommendations pertaining to the subject site based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by our exploratory excavations. Our recommendations are based on the technical information, our understanding of the proposed construction, and our experience in the geotechnical field. We do not guarantee the performance of the project, only that our engineering work and judgments meet the standard of care of our profession at this time. In view of the general conditions in the area, the possibility of different local soil conditions may exist. Any deviation or unexpected condition observed during construction should be brought to the attention of the Geotechnical Engineer. In this way, any supplemental recommendations can be made with a minimum of delay necessary to the project.

If the proposed construction will differ from our present understanding of the project, the existing information and possibly new factors may have to be evaluated. Any design changes and the finished plans should be reviewed by the Geotechnical Consultant. Of particular importance would be extending development to new areas, changes in structural loading conditions, postponed development for more than a year, or changes in ownership.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project, and incorporated into the plans and that the necessary steps are taken to see that the Contractors and Subcontractors carry out such recommendations in the field.

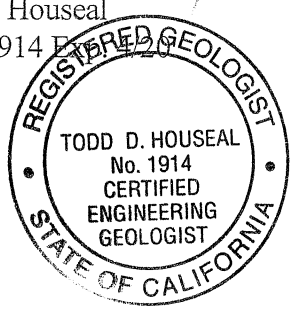
This report is subject to review by the controlling authorities for this project.

We appreciate this opportunity to be of service to you.

Respectfully submitted:
COAST GEOTECHNICAL, INC.

Ming-Tarng Chen
RCE 54011

Todd D. Houseal
CEG #1914 Exp. 12/31/20



APPENDIX A

This appendix contains a description of the field investigation, laboratory testing procedures and results, outside lab testing, site plan, exploratory logs and expansive soil recommendations.

FIELD INVESTIGATION

The field investigation was performed on December 12, 2018, and consisted of the excavation of four borings by hollow stem auger equipment at the locations shown on the attached Site Geotechnical Map. As drilling progressed, personnel from this office visually classified the soils encountered, and secured representative samples for laboratory testing.

Undisturbed samples for detailed testing in our laboratory were obtained by pushing or driving a sampling spoon into the material. A solid barrel-type spoon was used having an inside diameter of 2.5 inches with a tapered cutting tip at the lower end and a ball valve at the upper end. The barrel is lined with thin brass rings, each one inch in length. The spoon penetrated into the soil below the depth of boring approximately twelve inches. The central portion of this sample was retained for testing. All samples in their natural field condition were sealed in airtight containers and transported to the laboratory.

Description of the soils encountered is presented on the attached Boring Logs. The data presented on this log is a simplification of actual subsurface conditions encountered and applies only at the specific boring locations and the date excavated. It is not warranted to be representative of subsurface conditions at other locations and times.

LABORATORY TESTING

Field samples were examined in the laboratory and a testing program was then established to develop data for preliminary evaluation of geotechnical conditions.

Field moisture and dry densities were calculated for each undisturbed sample. The samples were obtained per ASTM:D-2937 and tested under ASTM:D-2216.

Maximum density-optimum moisture relationships were established per ASTM:D-1557 for use in evaluation of in-situ conditions and for future use during grading operations.

Direct shear tests were performed in accordance with ASTM:D-3080, on specimens at near saturation under various normal loads. The results of tests are based on an 80% peak strength or ultimate strength, whichever is lower, and are attached as Plates F and G.

Expansion tests were performed on typical specimens of earth materials in accordance with the procedures outlined in ASTM D-4829.

Consolidation tests were performed on a representative sample based on ASTM:D-2435. The consolidation plots are presented on Plates H and I.

TEST RESULTS

Maximum Density/Optimum Moisture (ASTM:D-1557)

Boring	Depth in Feet	Maximum Density, pcf	Optimum Moisture, %
1	0 - 5	126.0	9.5

Direct Shear (ASTM:D-3080)

Boring	Depth in Feet	Cohesion (lbs./sq. ft.)	Angle of Internal Friction (Degrees)
1	0– 5 (remolded)	250	30
1	10	250	31

Expansion Index (ASTM:D-4829)

Boring	Depth in Feet	Expansion Index	Expansion Potential
1	0 – 5	15	Very low
1	5 - 10	5	Very low
1	10 - 15	4	Very low

SPECIFICATIONS FOR GRADING

SITE CLEARING

All existing vegetation shall be stripped and hauled from the site.

PREPARATION

After the foundation for the fill has been cleared, plowed or scarified, it shall be disced or bladed until it is uniform and free from large clods, brought to a proper moisture content and compacted to not less than ninety percent of the maximum dry density in accordance with ASTM:D-1557-00 (5 layers - 25 blows per layer; 10 lb. hammer dropped 18"; 4" diameter mold).

MATERIALS

On-site materials may be used for fill, or fill materials shall consist of materials approved by the Soils Engineer and may be obtained from the excavation of banks, borrow pits or any other approved source. **The materials used should be free of vegetable matter and other deleterious substances and shall not contain rocks or lumps greater than six inches in maximum dimension.**

PLACING, SPREADING AND COMPACTING FILL MATERIALS

Where natural slopes exceed five horizontal to one vertical, the exposed bedrock shall be benched prior to placing fill.

The selected fill material shall be placed in layers which, when compacted, shall not exceed six inches in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to ensure uniformity of material and moisture of each layer.

Where moisture of the fill material is below the limits specified by the Soils Engineer, water shall be added until the moisture content is as required to ensure thorough bonding and thorough compaction.

Where moisture content of the fill material is above the limits specified by the Soils Engineer, the fill materials shall be aerated by blading or other satisfactory methods until the moisture content is as specified.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than 90 percent of the maximum dry density in accordance with ASTM:D-1557-00 (5 layers -25 blows per layer; 10 lbs. hammer dropped 18 inches; 4" diameter mold) or other density tests which will attain equivalent results.

Compaction shall be by sheepsfoot roller, multi-wheel pneumatic tire roller, track loader or other types of acceptable rollers.

Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified moisture content. Rolling of each layer shall be continuous over the entire area and the roller shall make sufficient trips to ensure that the desired density has been obtained. The final surface of the lot areas to receive slabs on grade should be rolled to a dense, smooth surface.

The outside of all fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until the outer nine inches of the slope is at least 90 percent compacted. Compacting of the slopes may be progressively in increments of three feet to five feet of fill height as the fill is brought to grade, or after the fill is brought to its total height.

Field density tests shall be made by the Soils Engineer of the compaction of each layer of fill. Density tests shall be made at intervals not to exceed two feet of fill height provided all layers are tested. Where the sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches and density readings shall be taken in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion there is below the required 90 percent density, the particular layer or portion shall be reworked until the required density has been obtained.

The grading specifications should be a part of the project specifications.

The Soil Engineer shall review the grading plans prior to grading.

INSPECTION

The Soil Engineer shall provide continuous supervision of the site clearing and grading operation so that he can verify the grading was done in accordance with the accepted plans and specifications.

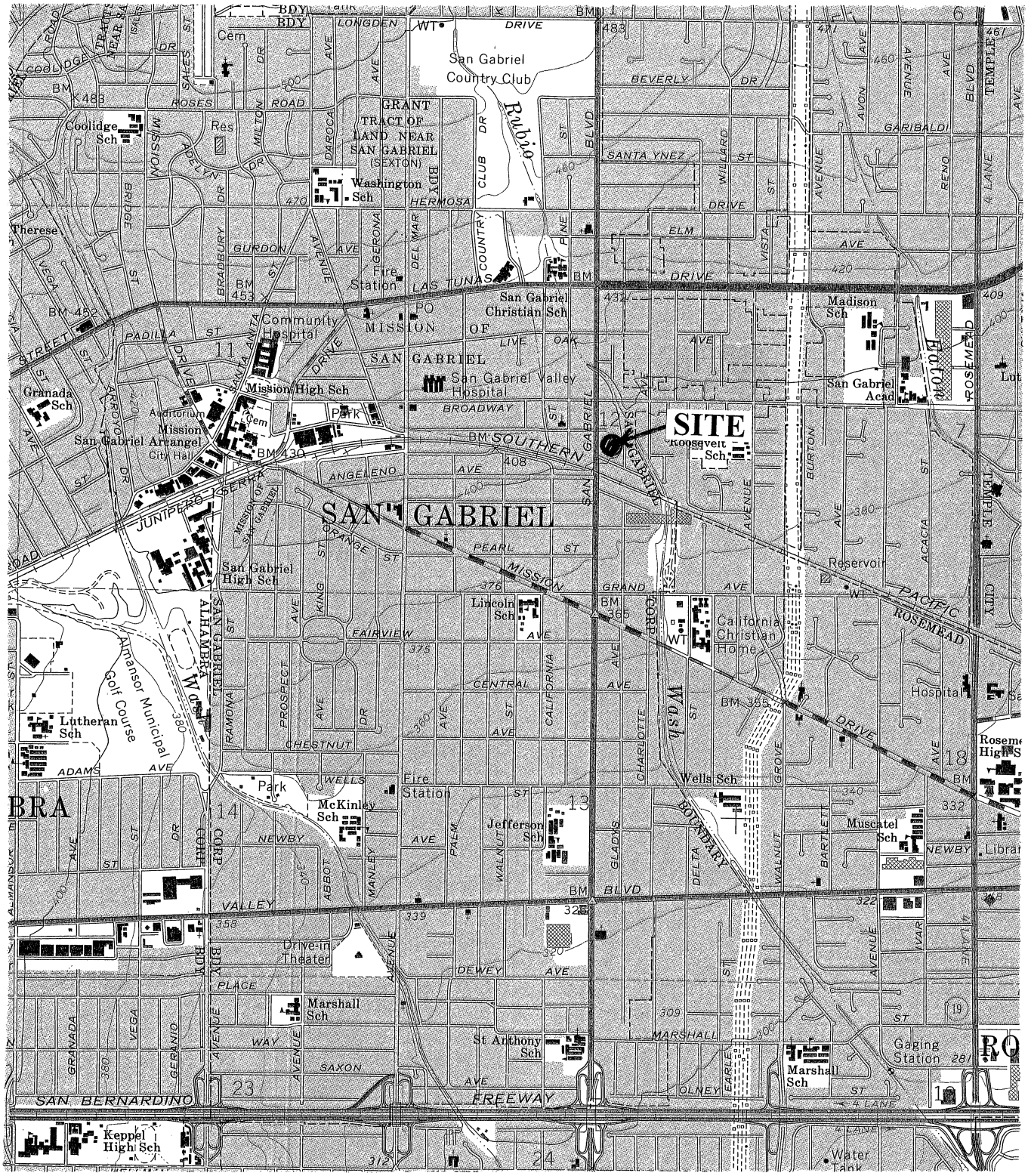
SEASONAL LIMITATIONS

No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the field tests by the Soils Engineer indicate the moisture content and density of the fill are as previously specified.

EXPANSIVE SOIL CONDITIONS

Whenever expansive soil conditions are encountered, the moisture content of the fill or recompacted soil shall be as recommended in the expansive soil recommendations included herewith.

SITE VICINITY MAP

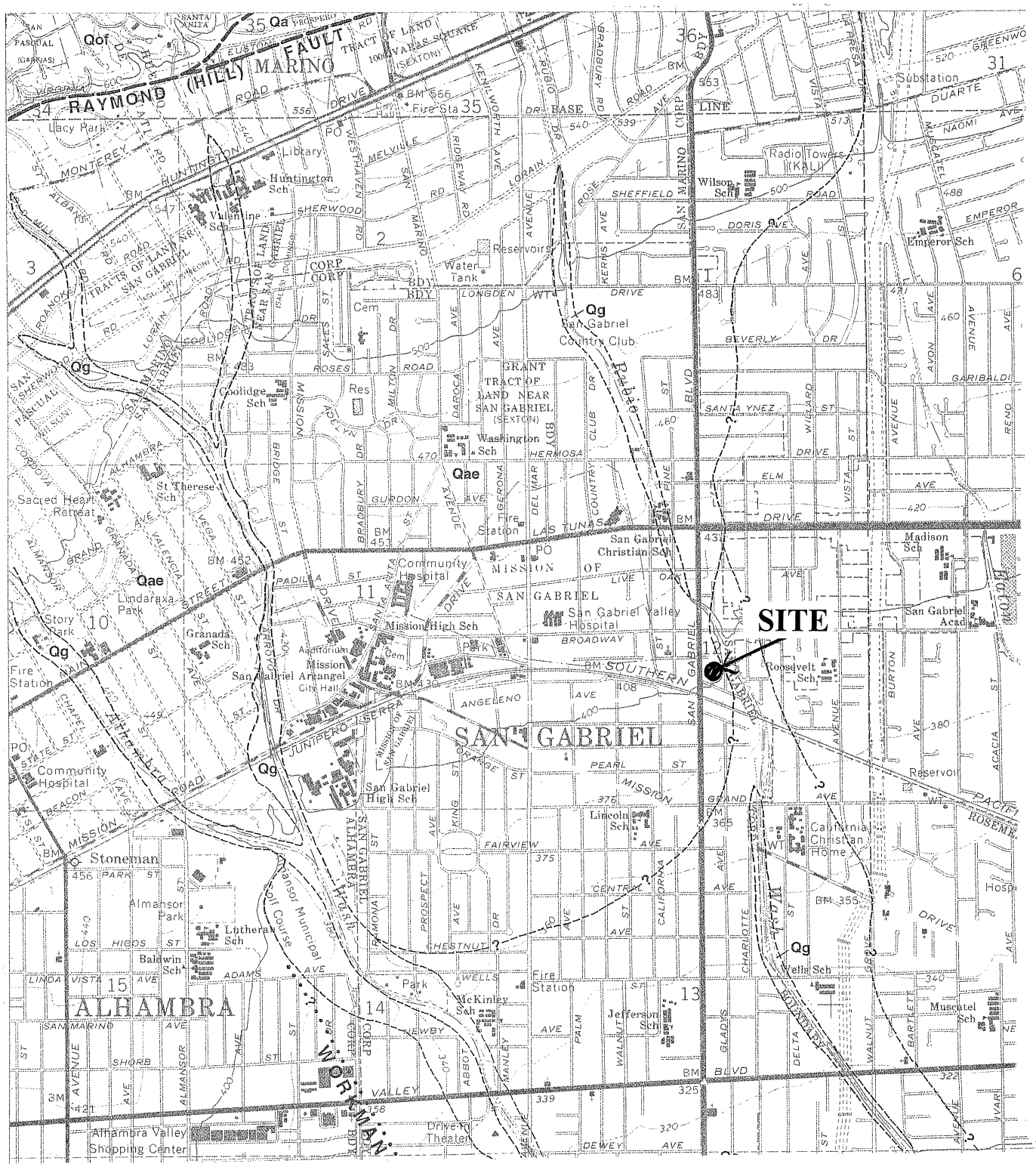


El Monte USGS Topographic Map

COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 1

REGIONAL GEOLOGY MAP



GEOLOGIC MAP OF THE EL MONTE AND BALDWIN PARK QUADRANGLES

LOS ANGELES COUNTY, CALIFORNIA

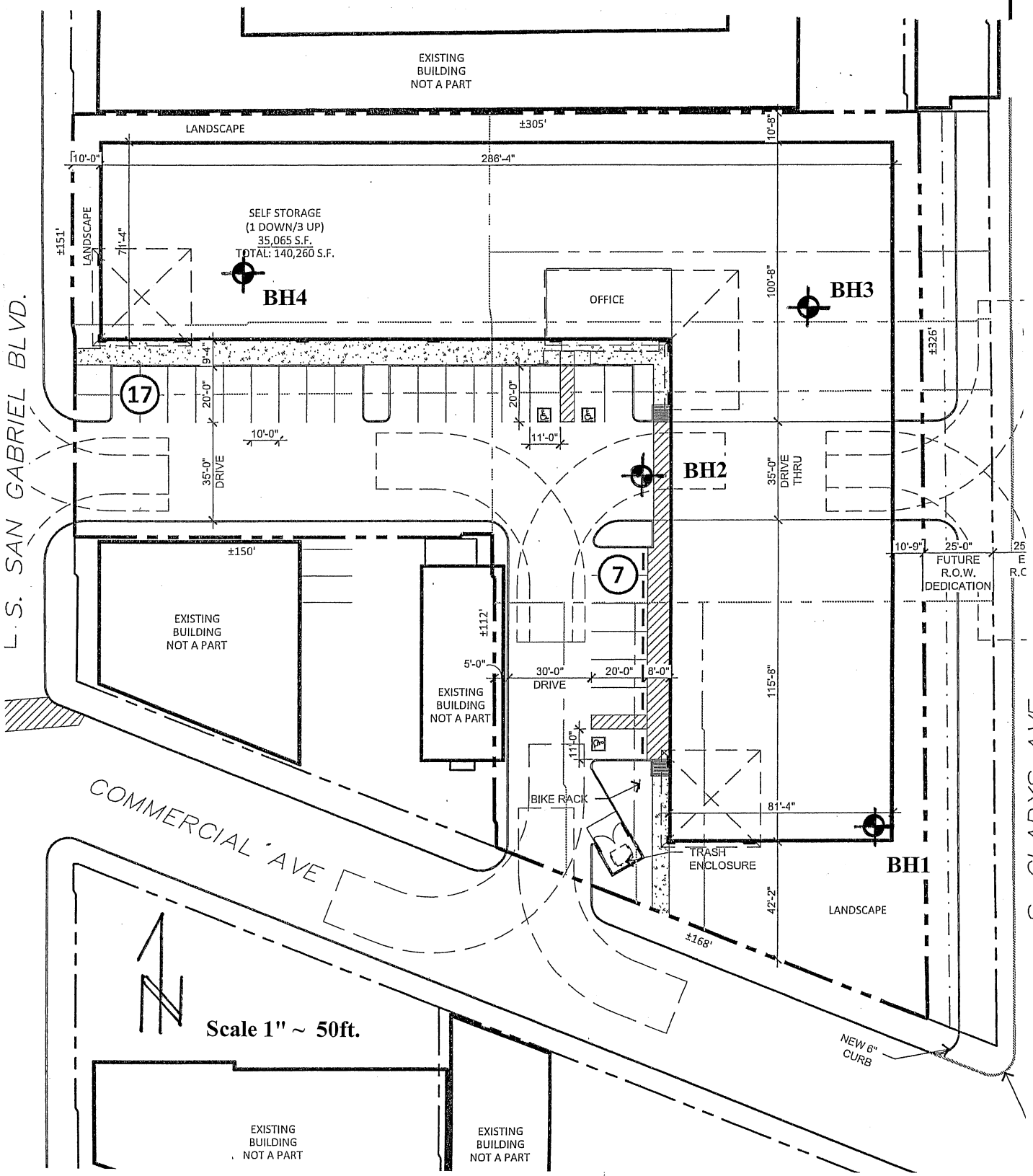
BY THOMAS W. DIBBLEE, JR., 1999

EDITED BY HELMUT E. EHRENSPECK

COAST GEOTECHNICAL, INC.

W.O. 565718 **Figure 2**

SITE GEOTECHNICAL MAP

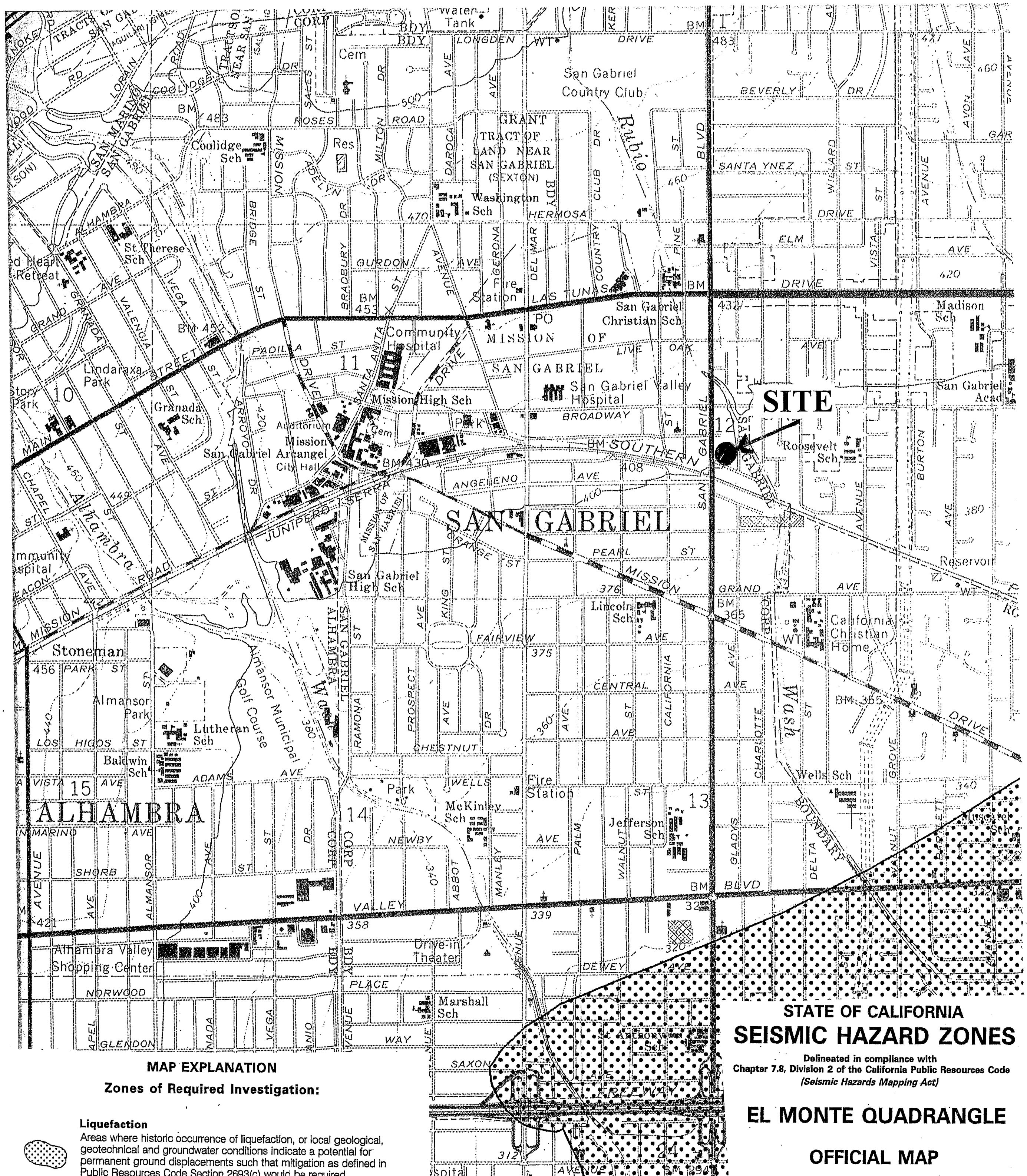


RKAA ARCHITECTS, INC

COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 3

SEISMIC HAZARD MAP



STATE OF CALIFORNIA

SEISMIC HAZARD ZONES

Delineated in compliance with Chapter 7.8, Division 2 of the California Public Resources Code
(Seismic Hazards Mapping Act)

EL MONTE QUADRANGLE

OFFICIAL MAP

Released: March 25, 1999

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Overlapping Liquefaction and Earthquake-Induced Landslides
Areas that lie within zones of required investigation for both liquefaction and earthquake-induced landslides. (See above for explanation of each zone.)

COAST GEOTECHNICAL, INC.

W.O. 565718 ***Figure 4***

HISTORIC HIGH GROUNDWATER MAP

Open–File Report 98–15

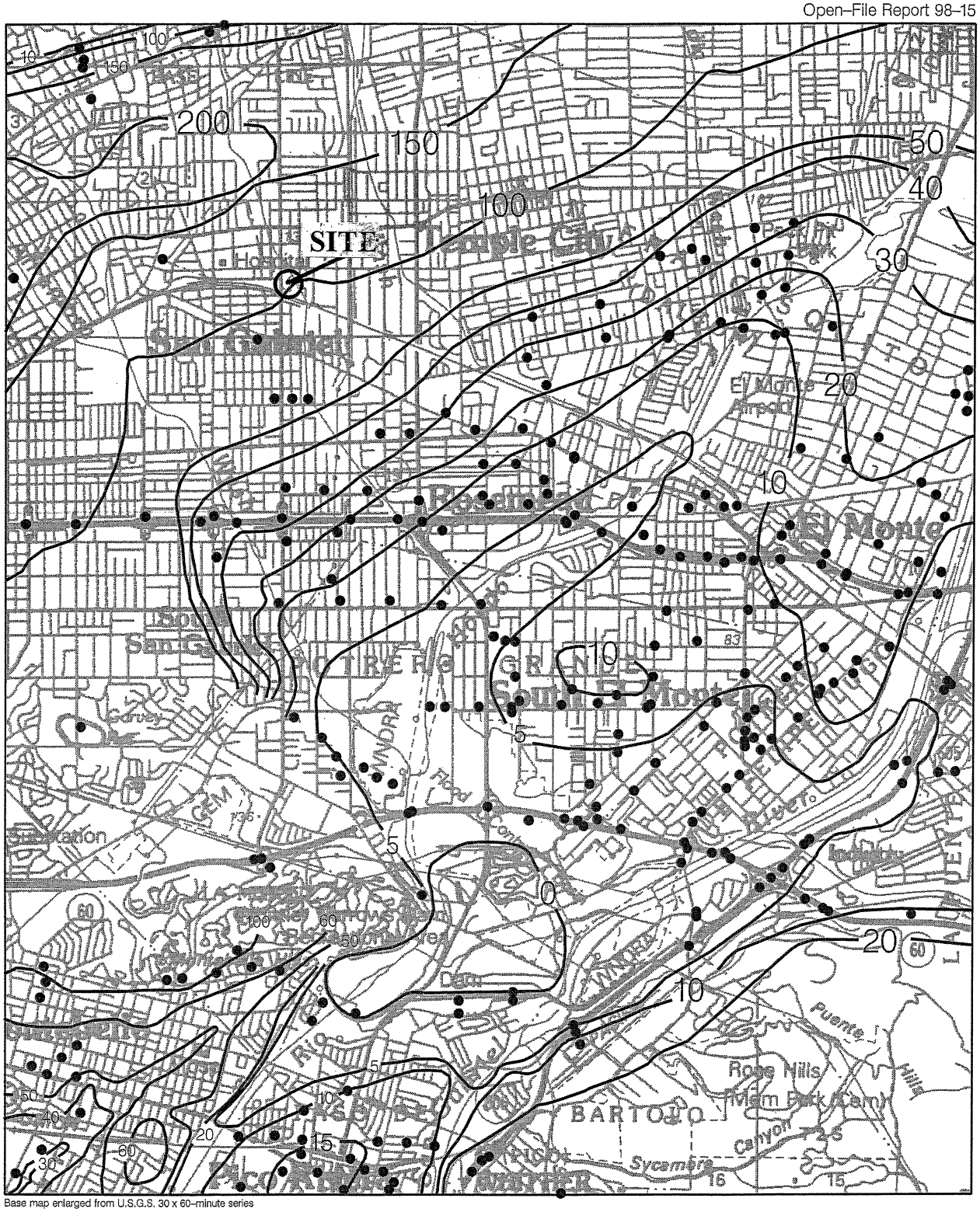


Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, El Monte Quadrangle.

● Borehole Site

30 Depth to ground water in feet

COAST GEOTECHNICAL, INC.

W.O. 565718 Figure 5

(Text Supercedes)

PLATE A

EXPANSION INDEX	VERY LOW 0 - 20	LOW 21 - 50	MEDIUM 51 - 90	HIGH 91 - 130	VERY HIGH 130+
Footing Width 1 Story 2 Story 3 Story	 12" 15" 18"	 12" 15" 18"	 12" 15" 18"	 15" 15" 18"	 15" 15" 18"
Exterior Footing Depth 1 Story 2 Story	 24" 24"	 24" 24"	 24" 24"	 24" 24"	 30" 36"
Interior Footing Depth 1 Story 2 Story	 24" 24"	 24" 24"	 24" 24"	 24" 24"	 36" 36"
Footing Reinforcement	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom	4 #5 Bars 2 Top 2 Bottom
Slab Thickness	5" Nominal	5" Nominal	5" Nominal	5" Actual	5" Actual
Slab Reinforcement	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Centers Both Ways
Moisture Barrier (2)	15 mil Vapor Barrier 2" Sand	15 mil Vapor Barrier 2" Sand	15 mil Vapor Barrier 2" Sand	15 mil Vapor Barrier 2" Sand	15 mil Vapor Barrier 2" Sand
Garage Slab Reinforcement	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Centers Both Ways	#4 Bars on 12" Center Both Ways Free Floating	#4 Bars on 12" Center Both Ways Free Floating
Grade Beam - Garage Entrance	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.	Same as Adj. Ext. Ftg.
Subgrade	4" Clean Aggregate (1/2 inch or larger)	4" Clean Aggregate (1/2 inch or larger)	4" Clean Aggregate (1/2 inch or larger)	4" Clean Aggregate (1/2 inch or larger)	4" Clean Aggregate (1/2 inch or larger)
Presaturation	Not Required	Above Opt. To Depth of Ftg. (No Testing)	110% of Opt M/C to Depth Footing	130% of Opt M/C to Depth Footing	130% of Opt M/C to Depth Footing

1. The surrounding areas should be graded so as to ensure drainage away from the building.
2. Concrete floor slab in areas to be covered with moisture sensitive coverings shall be constructed over a 15 mil Stego Wrap or equivalent. The plastic should be properly lapped, sealed and protected filter fabric (Mirifi 140N) and sand.
3. Two inches of sand over moisture barrier in addition to the four-inches of clean aggregate below the membrane.

SUMMARY OF BORING NO. 1

Date: 12/12/2018

Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U	Samples B	Depth (Ft.)	Description	Color	Consistency
						Artificial FILL: SAND --- fine to medium-grained, silty, clayey, moist	Reddish Brown	Loose
3.2	113	7.5		■		NATIVE: SAND --- slightly slty, slightly clayey, scattered small rocks, moist	Reddish Dark Brown	Loose to Medium Dense
10.5	117	8.9		■	5			
12.3	121	9.1		■	10	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Reddish Brown	Medium Dense
						SAND --- medium-grained, silty, gravels, moist	Tan Buff	Medium Dense
28.0	118	2.3		■	15	SAND --- medium to coarse-grained, slightly silty, gravels, small rocks, damp	Tan Buff Rust Orange	Very Dense
28.0	120	2.9		■	20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Very Dense
16.1	108	3.4		■	25	SAND --- fine to medium-grained, slightly silty, scattered small rocks, damp	Tan Rust Buff Orange	Dense
32.9	109	6.1		■	30	SAND --- fine to medium-grained, slightly silty, moist	Orange Buff Brown Tan	Very Dense
						End of boring at 31.5 feet No groundwater No caving		
					35			

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

Work Order 565718

Plate B

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 2

Date: 12/12/2018 Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples C	Samples B	Depth (Ft.)	Description	Color	Consistency
						Artificial FILL: SAND --- fine to medium-grained, silty, scattered rocks and concrete debri,moist	Dark Brown Reddish	Medium Dense
						NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Dark Brown	Medium Dense
10.6	127	7.6	■		5	SAND --- medium-grained, silty, slightly clayey, gravels, moist	Tan Buff	Medium Dense
28.0	120	3.0	■		10	SAND --- medium to coarse-grained, silty, gravels, scattered rocks, moist	Tan Buff Rust	Medium Dense
						SAND --- coarse-grained, slightly silty, scattered	Tan Buff Rust	Dense
24.9	124	6.3	■		15	SAND --- coarse-grained, slightly silty, rocks, damp	Tan Buff Rust Pink	Dense
16.8	120	3.7	■		20	SAND --- coarse-grained, slightly silty,rocks, damp	Tan Buff Rust	Dense
35.0	121	3.5	■		25	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Brown	Very Dense
17.9	102	8.0	■		30	SAND --- medium to coarse-grained, slightly silty, gravel, silty, moist	Orange Buff Brown Tan	Dense
					35	End of boring at 31.5 feet No groundwater No caving		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

Work Order 565718

Plate C

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 3

Date: 12/12/2018

Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U	Samples B	Depth (Ft.)	Description	Color	Consistency
						Artificial FILL: SAND --- fine-grained, silty, rootlets, moist	Dark Brown	Medium Dense
						NATIVE: SAND --- silty, slightly clayey, scattered small rocks, damp to moist	Reddish Brown	Medium Dense
7.0	111	2.8	■		5	SAND --- fine to medium-grained, silty, scattered rocks, damp	Tan Buff	Medium Dense
23.5	124	2.0	■		10	SAND --- medium to coarse-grained, silty, gravels, very rock, damp	Buff Rust Tan	Dense
28.0	119	4.1	■		15	SAND --- coarse-grained, slightly silty, gravel, rocks, damp	Buff Rust Orange Tan	Very Dense
22.8	113	7.6	■		20	SAND --- coarse-grained, slightly silty, very rocky, moist	Buff Orange Brown Rust	Dense
21.4	111	9.8	■		25	SAND --- coarse-grained, slightly silty, rocky, moist	Brown Orange Buff Rust	Dense
24.5	104	8.3	■		30	SILT --- sandy, moist	Dark Brown Reddish	Hard
					35	End of boring at 31.5 feet No groundwater No caving		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

Work Order 565718

Plate D

COAST GEOTECHNICAL, INC.

SUMMARY OF BORING NO. 4

Date: 12/12/2018 Elevation: E.G.

Drive Energy (Kip-Ft.)	Dry Density (Pcf)	Moisture (% Dry Wt.)	Samples U	Samples B	Depth (Ft.)	Description	Color	Consistency
						Artificial FILL: SAND --- fine-grained, silty, clayey,moist	Dark Brown	Loose
10.3	112	8.1	■			NATIVE: SAND --- fine-grained, silty, slightly clayey, scattered small rocks, damp to moist	Dark Reddish Brown	Loose
10.8	117	8.8	■		5	SAND --- fine to medium-grained, silty, clayey, rocky, moist	Reddish Brown	Loose to Dense
						SAND --- medium to coarse-grained, silty, rocky, damp	Tan Buff	Dense
19.3	127	2.5	■		10	SAND --- medium to coarse-grained, silty, very rocky, gravels, damp	Tan Buff Rust Pink	Dense
30.1	116	5.0	■		15	SAND --- coarse-grained, silty, rocky, damp	Tan Buff Orange Rust	Very Dense
23.8	117	4.5	■		20	SAND --- medium to coarse-grained, slightly silty, gravels, damp	Rust Tan Buff Orange	Dense
28.0	119	3.4	■		25	SAND --- coarse-grained, slightly silty rocky, damp	Buff Rust Brown	Very Dense
25.2	118	7.2	■		30	SAND --- fine to medium-grained, silty, moist	Dark Brown Rust Buff	Dense
					35	End of boring at 31.5 feet No groundwater No caving		

Geotechnical Engineering Investigation

414-420 South San Gabrial Boulevard, 815-827 Commercial Avenue, And 415-423 Gladys Avenue

San Gabrial, California

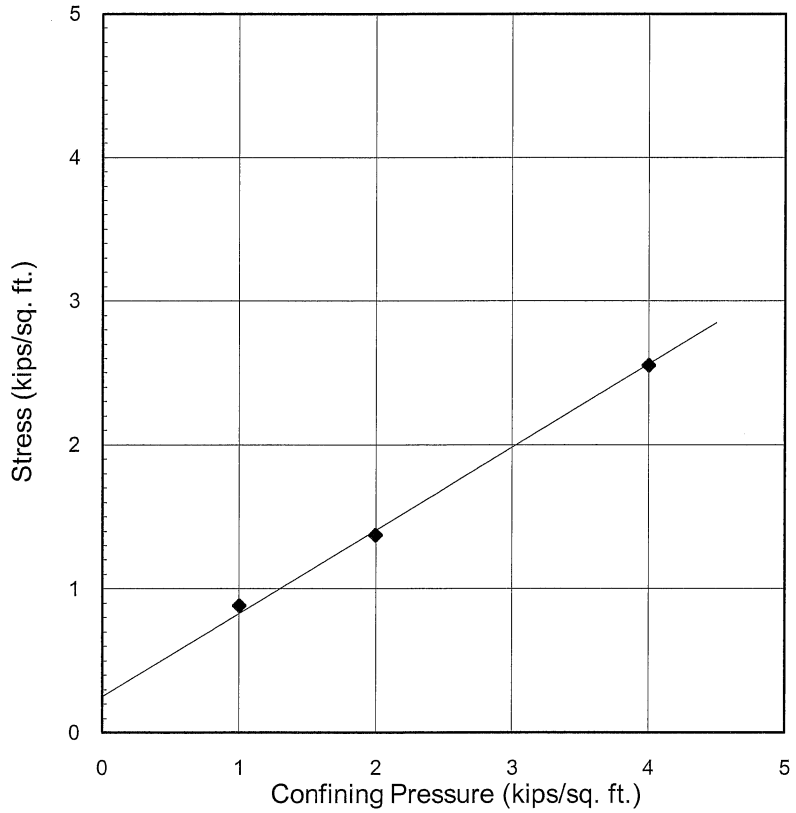
Work Order 565718

Plate E

COAST GEOTECHNICAL, INC.

SHEAR TEST RESULT

Boring No.1 @ 0 to 5 Feet (Remolded to 90%)



Remolded soil samples were tested at saturated conditions.

The sample had a dry density of 113 lbs./cu.ft. and a moisture content of 17.8 %.

Cohesion = 250 psf

Friction Angle = 30 degrees

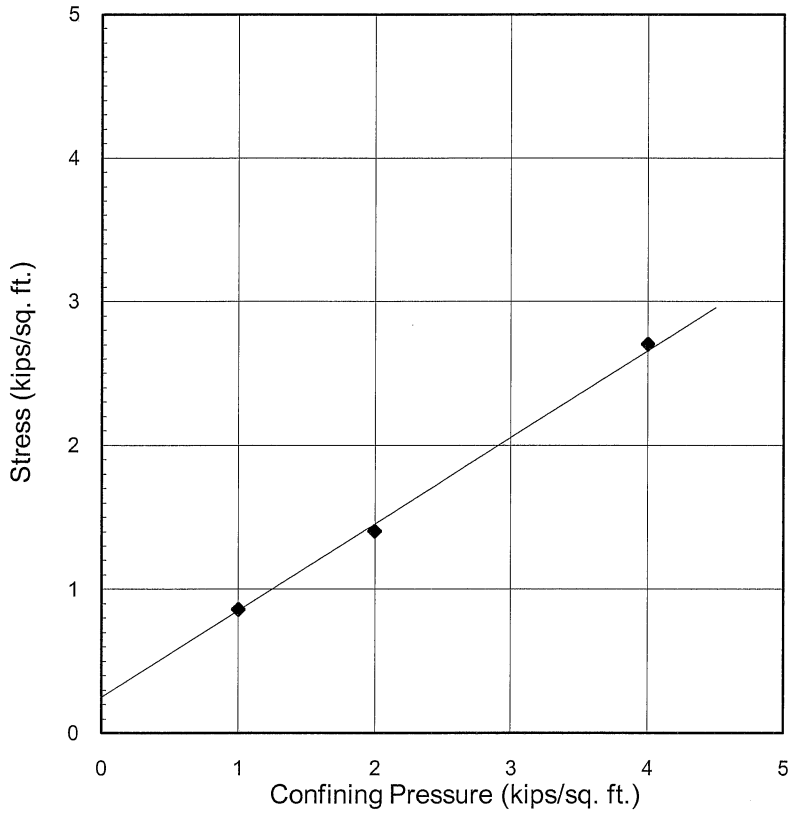
Based on 80% peak strength or ultimate strength, whichever is lower

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, CA	Work Order 565718 Plate F

COAST GEOTECHNICAL, INC.

SHEAR TEST RESULT

Boring No. 1 @ 10 Feet



Native samples were tested at saturated conditions.

The sample had a dry density of 121 lbs./cu.ft. and a moisture content of 14.2 %.

Cohesion = 250 psf

Friction Angle = 31 degrees

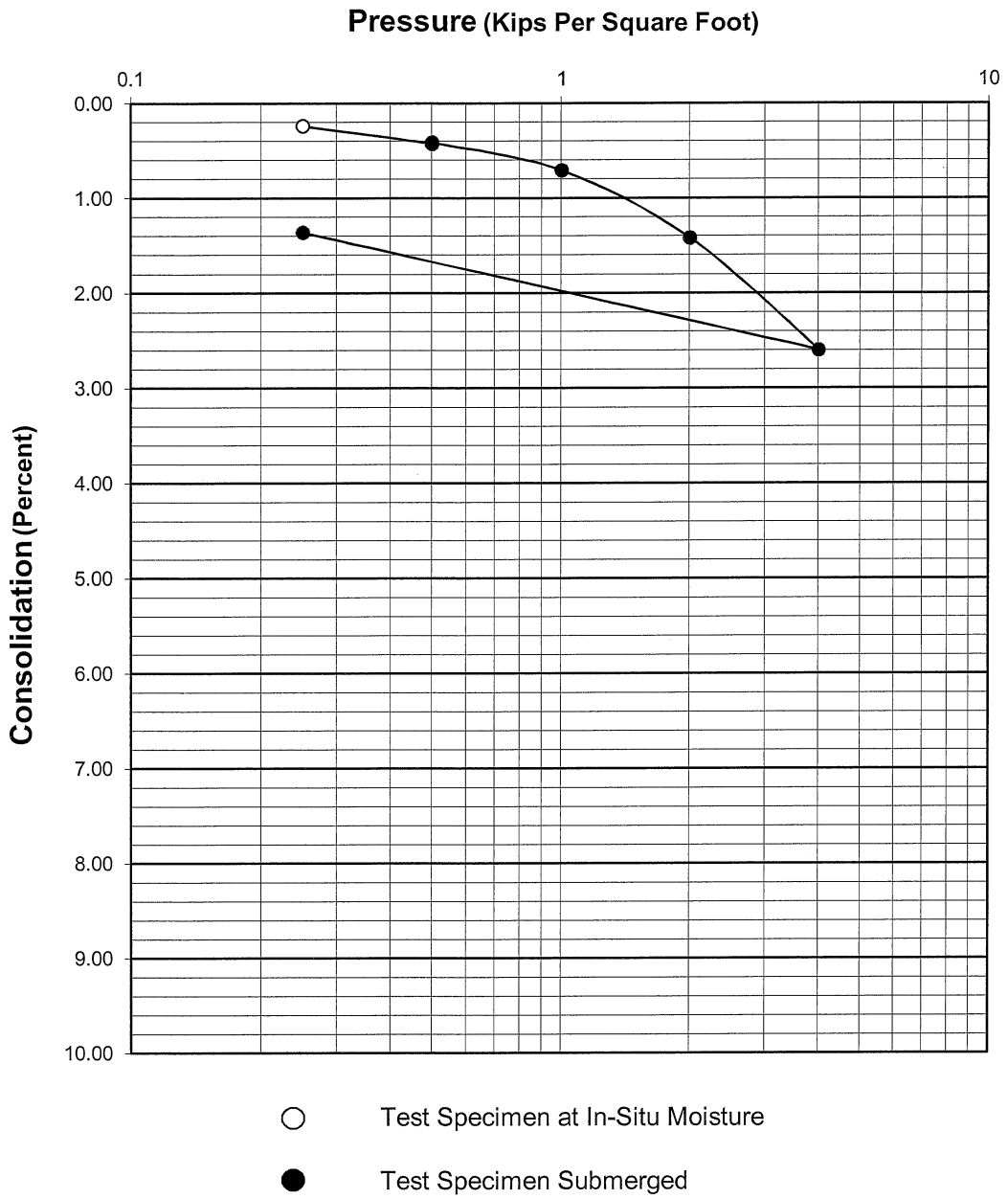
Based on 80% peak strength or ultimate strength, whichever is lower

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, CA	Work Order 565718 Plate G

COAST GEOTECHNICAL, INC.

CONSOLIDATION TEST RESULTS

Boring No.1 @ 5 Feet

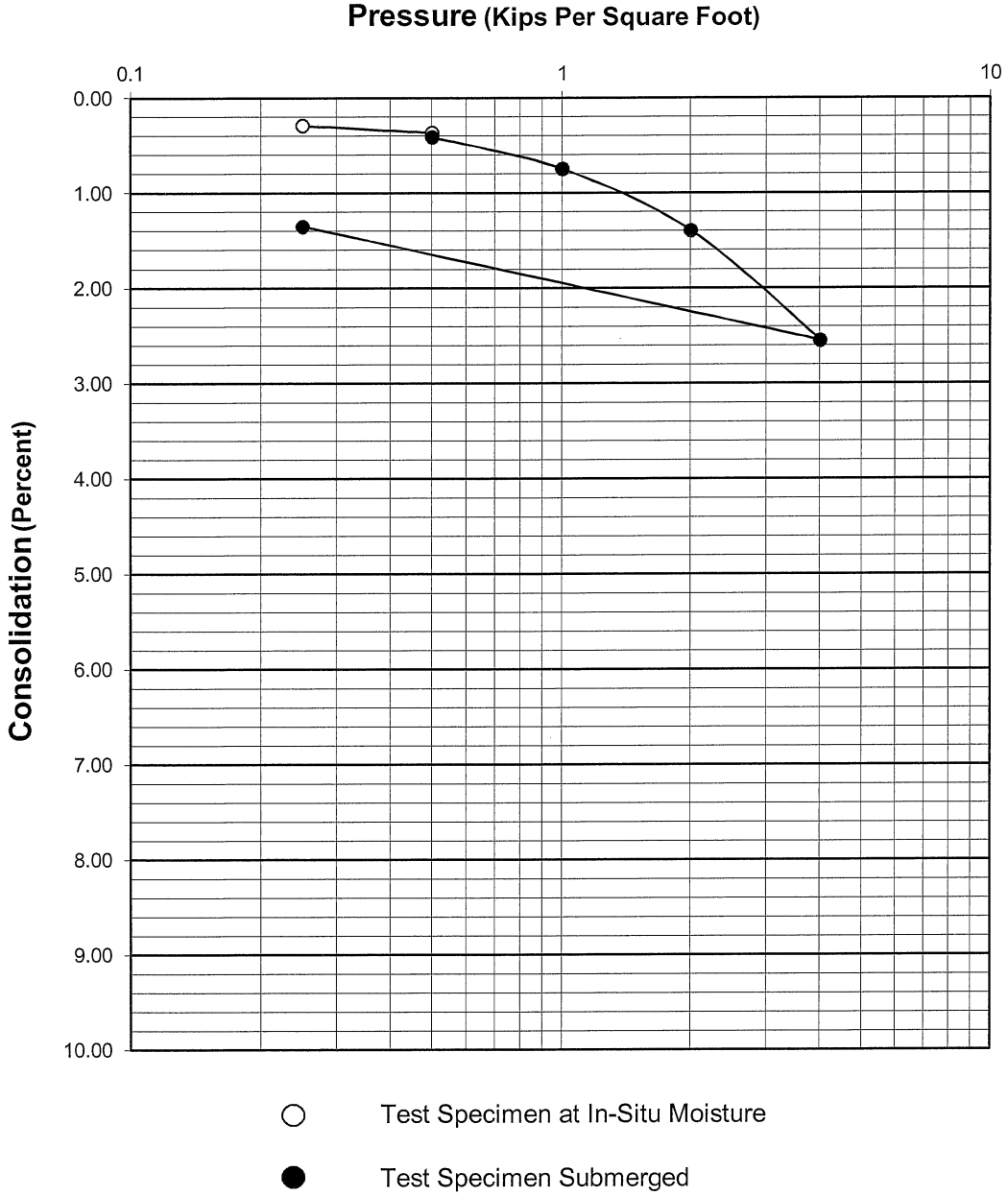


Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate No. H

COAST GEOTECHNICAL, INC.

CONSOLIDATION TEST RESULTS

Boring No.1 @ 10 Feet



Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate No. I

COAST GEOTECHNICAL, INC.

ALLOWABLE BEARING CAPACITY

Bearing Capacity Calculations are based on "Terzaghi's Bearing Capacity Theory"

Bearing Material: Compacted fill

Properties:

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees
Footing Depth (D)	=	2	feet
Footing Width (B)	=	1.0	foot
Factor of Safety	=	3.0	

Calculations - Ultimate Bearing Capacity

from Table 3.1 on page 127 of "Foundation Engineering Handbook", 1975

N_c = 30.14 N_q = 18.4 N_γ = 22.4

$Q_u = 1.3\ C\ N_c + \gamma\ D\ N_q + 0.4\ \gamma\ B\ N_\gamma$ (Square Footing)

$= 1.3 * 250 * 30.14 + 125 * 2 * 18.4 + 0.4 * 125 * 1 * 22.4$

$= 9795 + 4600 + 1120 = 15515$ psf

Allowable Bearing Capacity for Square Footing

$Q_{all} = Q_u / F.S. =$ 5171 psf

Use 2000 psf

$Q_u = 1.0\ C\ N_c + \gamma\ D\ N_q + 0.5\ \gamma\ B\ N_\gamma$ (Continuous Footing)

$= 1.0 * 250 * 30.14 + 125 * 2 * 18.4 + 0.5 * 125 * 1 * 22.4$

$= 7535 + 4600 + 1400 = 13535$ psf

Allowable Bearing Capacity for Continuous Footing

$Q_{all} = Q_u / F.S. =$ 4511 psf

Use 2000 psf

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate J

COAST GEOTECHNICAL, INC.

CALCULATION OF SUBGRADE REACTION

Subgrade reaction calculations are based on "Foundation Analysis and Design" Fourth Edition, by Joseph E. Bowles.

$Ks = 24\ q_{ult}$ (for $\Delta H = 1/2$ inch)

Where:

Ks = subgrade reaction in k / ft^3

q_{ult} = ultimate bearing capacity

For q_{ult} = 9.4 ksf (from bearing capacity calculations)

Ks = $24 * 9.4$ k / ft^3

= $225.6* 1000 / (12 * 12 * 12)$ lb / in^3

= 130.6 lb / in^3

Use 100 pound per cubic inch

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate No. K

COAST GEOTECHNICAL

LATERAL EARTH PRESSURE CALCULATIONS

Retaining structures such as retaining walls, basement walls, and bulk-heads are commonly used in foundation engineering, and they support almost vertical slopes of earth masses. Proper design and construction of these structures require a through knowledge of the lateral forces acting between the retaining structures and the soil masses being retained. These lateral forces are due to lateral earth pressure.

Properties of earth material: Compacted fill

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees

Coefficient of Friction = tan ϕ

Therefore,

Coefficient of Friction = tan ϕ

= $\tan \phi$ = 0.577 Use 0.35

Assumed H = 5 feet

$Pp = 0.5 \gamma H^2 \tan^2 (45^0 + \phi / 2) + 2 C H \tan (45^0 + \phi / 2)$

= 0.5 * 125 * 25 * 3 + 2 * 250 * 5 * 1.732

= 4688 + 4330 = 9018 lbs / LF

$1/2 \text{ EFP } H^2 = 9018$ EFP: passive pressure

EFP = 721 psf / LF

Allowable Passive Pressure = 300 psf / LF (with F.S. = 2.4)

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate L

COAST GEOTECHNICAL, INC.

LATERAL EARTH PRESSURE CALCULATIONS

Retaining structures such as retaining walls, basement walls, and bulk-heads are commonly used in foundation engineering, and they support almost vertical slopes of earth masses. Proper design and construction of these structures require a through knowledge of the lateral forces acting between the retaining structures and the soil masses being retained. These lateral forces are due to lateral earth pressure.

Properties of earth material: Native soil

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	31	degrees

Coefficient of Friction = tan ϕ

Therefore,

Coefficient of Friction = tan ϕ

= $\tan\phi$ = 0.601 Use 0.35

Assumed H = 5 feet

$Pp = 0.5\,\gamma\,H^2 \tan^2(45^0 + \phi/2) + 2\,C\,H \tan(45^0 + \phi/2)$

= 0.5 * 125 * 25 * 3.122 + 2 * 250 * 5 * 1.767

= 4878 + 4418 = 9296 lbs / LF

$1/2\ EFP\ H^2$ = 9296 EFP: passive pressure

EFP = 744 psf / LF

Allowable Passive Pressure = 300 psf / LF (with F.S. = 2.48)

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate M

COAST GEOTECHNICAL, INC.

ACTIVE EARTH PRESSURE BY COULOMB THEORY

The total active thrust can be expressed as

$P_A = 0.5\, K_A\, \gamma\, H^2$

where the active earth pressure coefficient, K_A, is given by

$$K_A = \frac{\cos^2(\phi - \theta)}{\cos^2\theta \cos(\delta + \theta)\left\{1 + \left[\frac{\sin(\delta + \phi)\sin(\phi - \beta)}{\cos(\delta + \theta)\cos(\beta - \theta)}\right]^{0.5}\right\}^2}$$

Where:

θ = slope of the back of the wall with respect to the vertical

δ = angle of friction between the wall and the soil

β = slope of the backfill with respect to the horizontal

Properties of earth material:

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees
θ	=	0	
δ	=	20	

Caculate K_A based on slope of the backfill

Surface Slope	Slope Angle (β)	K_A	EFP [= γ * K_A], pcf
Level	0.0	0.297	37.2
5:1 (H:V)	11.3	0.347	43.4
4:1 (H:V)	14.0	0.364	45.5
3:1 (H:V)	18.4	0.399	49.8
2:1 (H:V)	26.6	0.524	65.6
1.5:1 (H:V)	33.7	0.798	99.8

LATERAL EARTH PRESSURE CALCULATIONS

Retaining structures such as retaining walls, basement walls, and bulk-heads are commonly used in foundation engineering, and they support almost vertical slopes of earth masses. Proper design and construction of these structures require a through knowledge of the lateral forces acting between the retaining structures and the soil masses being retained. These lateral forces are due to lateral earth pressure.

Properties of earth material:

Wet Density (γ)	=	125	pcf
Cohesion (C)	=	250	psf
Angle of Friction (ϕ)	=	30	degrees

Coefficient of earth pressure at rest (Jaky, 1944), $K_0 = 1 - \sin \phi$

K_0 = 0.500

Therefore,

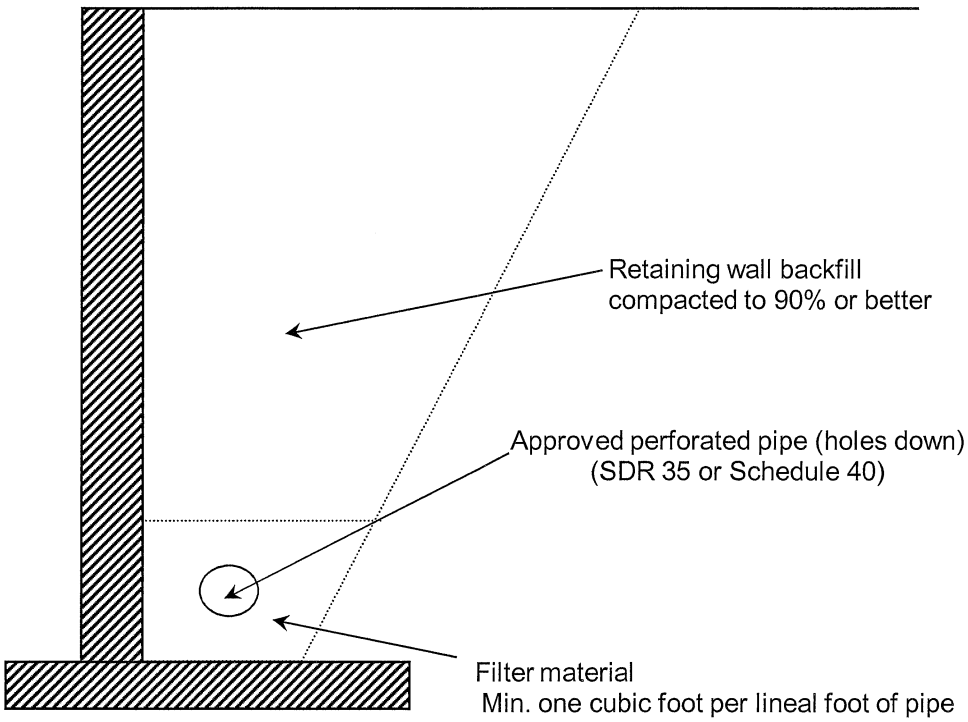
Earth pressure at rest

= γK_0 = 62.5 psf / LF

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate O

COAST GEOTECHNICAL, INC.

TYPICAL RETAINING WALL SUBDRAIN DETAIL



Filter material to meet following specification or approved equal:

Sieve Size	Percentage Passing
1"	100
3/4"	90 -100
3/8"	40 -100
No.4	25 - 40
No.8	18 - 33
No.30	5 - 15
No.50	0 - 7
No.200	0 - 3

Alternate is to place pipe in 3/4-inch gravel blanket which is wrapped in filter cloth. Filter cloth shall be Mirafi 140N, Amoco 4537 or product equivalent approved by COAST GEOTECHNICAL.

Geotechnical Engineering Investigation NEC San Gabriel Boulevard and Commercial Avenue San Gabriel, California	Work Order 565718 Plate No. P

COAST GEOTECHNICAL, INC.

APPENDIX B

Seismic design data output

OSHPD

420 S San Gabriel Blvd, San Gabriel, CA 91776, USA

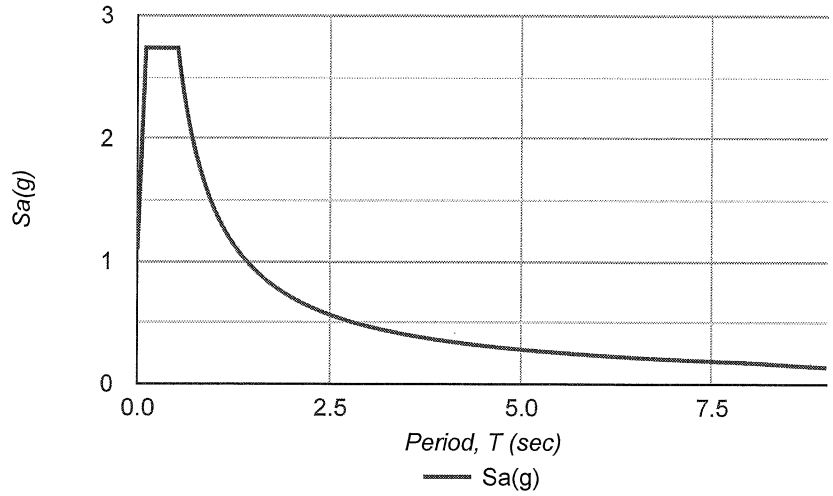
Latitude, Longitude: 34.097145, -118.09051999999997

Date	1/9/2019, 8:18:07 AM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

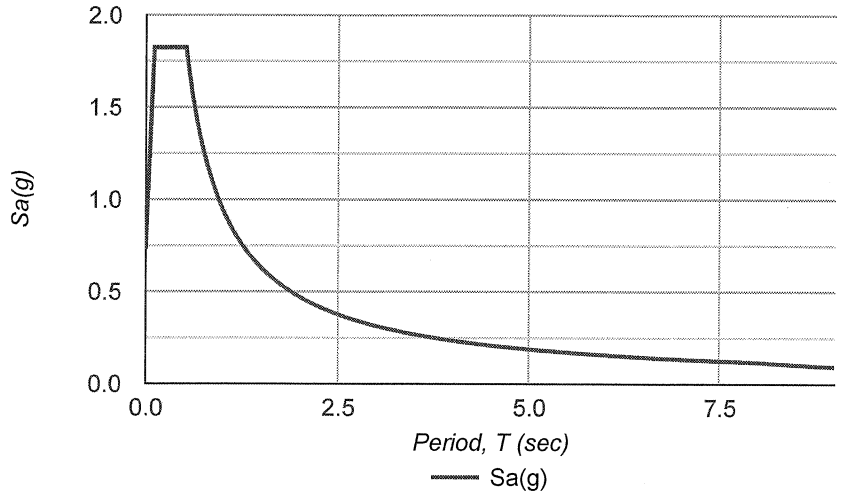
Type	Value	Description
S_S	2.737	MCE_R ground motion. (for 0.2 second period)
S_1	0.939	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.737	Site-modified spectral acceleration value
S_{M1}	1.409	Site-modified spectral acceleration value
S_{DS}	1.825	Numeric seismic design value at 0.2 second SA
S_{D1}	0.939	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	1.031	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	1.031	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.737	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.894	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.882	Factored deterministic acceleration value. (0.2 second)
S1RT	0.946	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.992	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.939	Factored deterministic acceleration value. (1.0 second)
PGAd	1.101	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.946	Mapped value of the risk coefficient at short periods
C_{R1}	0.954	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum

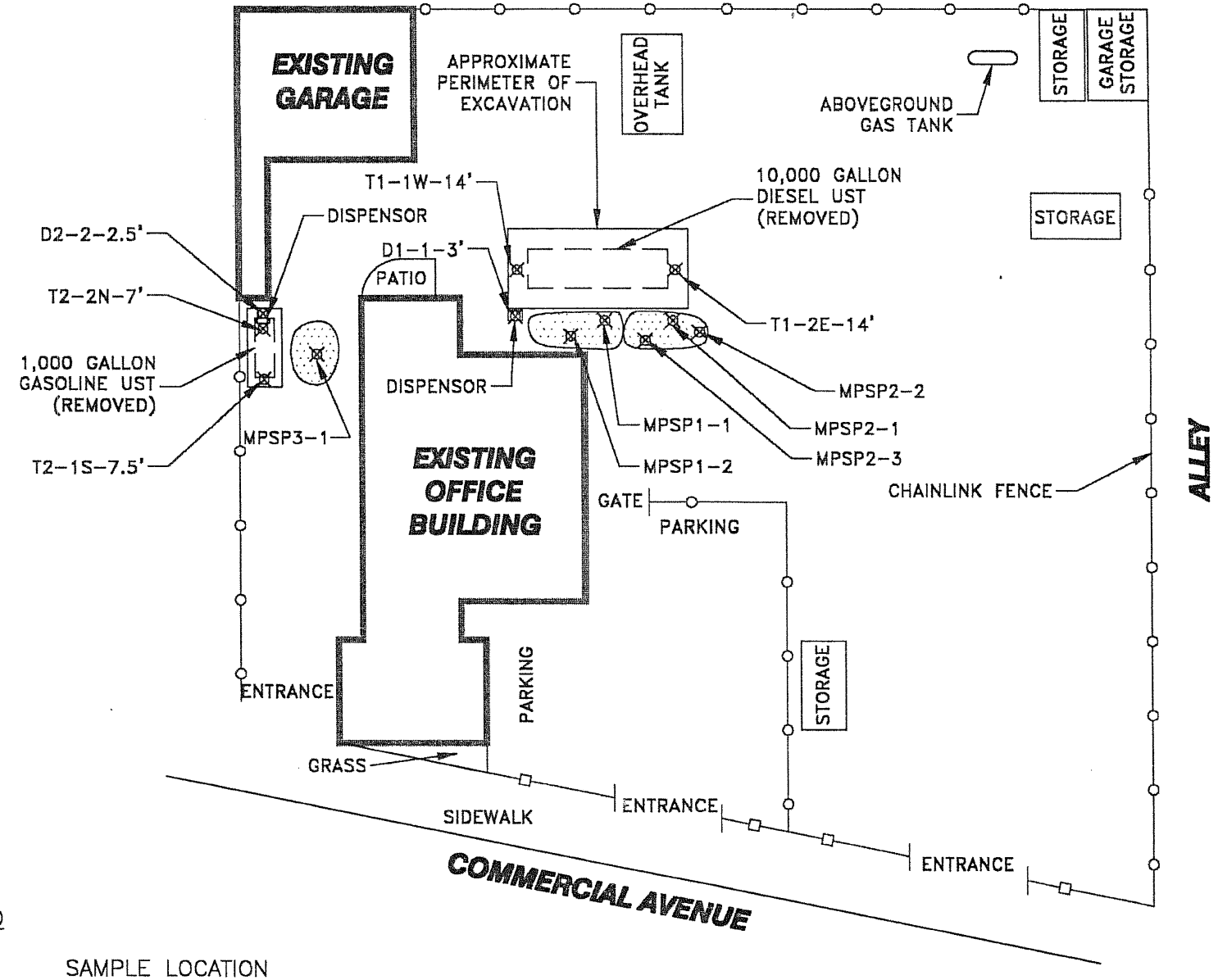


Design Response Spectrum



APPENDIX C

Records



LEGEND

⊠ SAMPLE LOCATION

T1-1W-14' SAMPLE DESIGNATION

SOIL PILE

N

0 30

FEET

Member The Tyree Organization

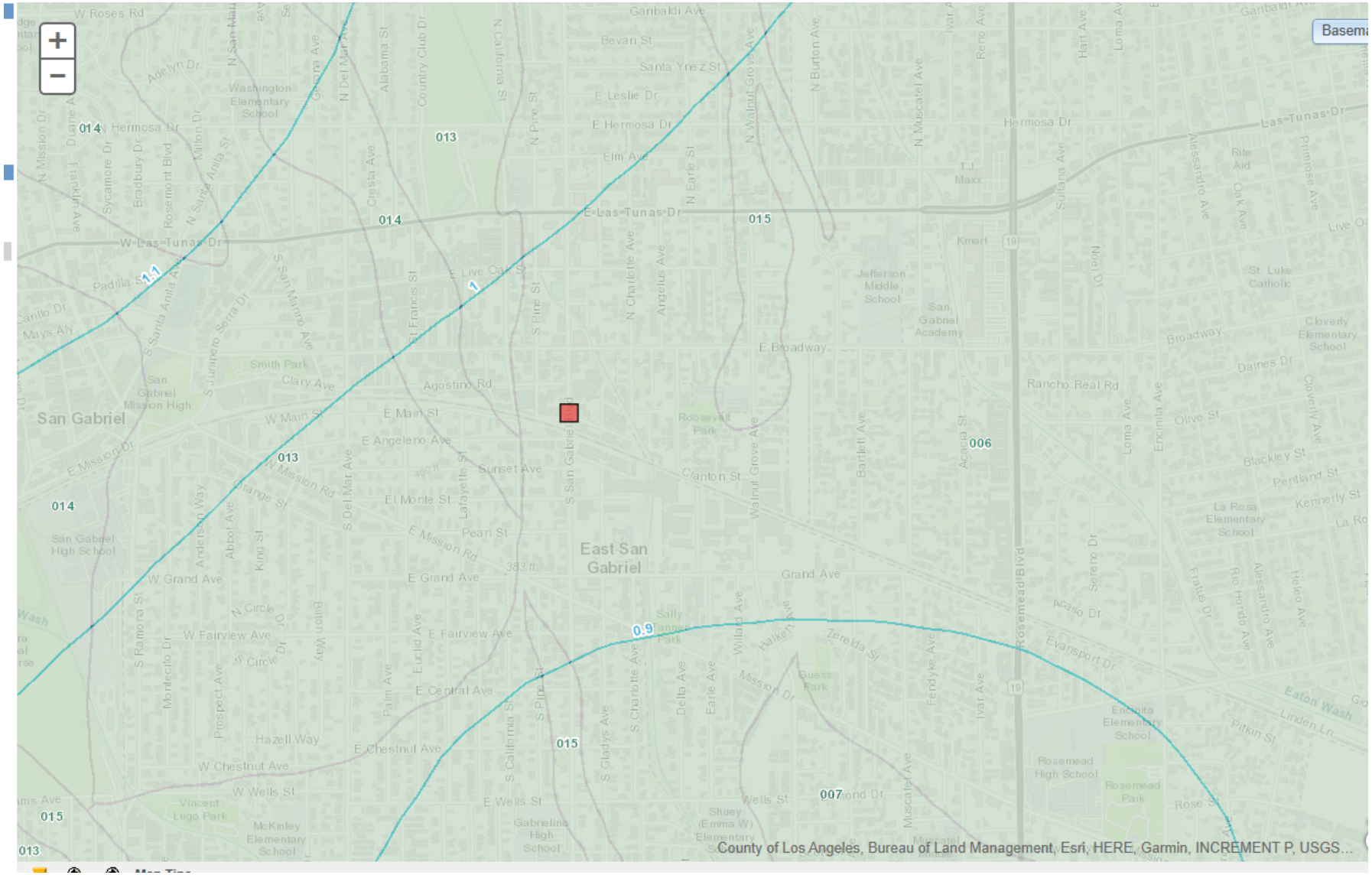
TITLE	MISSION PAVING AND SEALING		FIGURE
SAMPLE LOCATION MAP			3
815 E. COMMERICIAL AVE. SAN GABRIAL, CALIFORNIA			
DATE 9-1-99	PROJECT NUMBER 997565	DWN BY P.M.	DWG # Xconcr-2

APPENDIX C – LID Forms

LEFT BLANK

APPENDIX D – BMP Calculations and Details

LA COUNTY-85th Percentile and Soil Map



Peak Flow Hydrologic Analysis

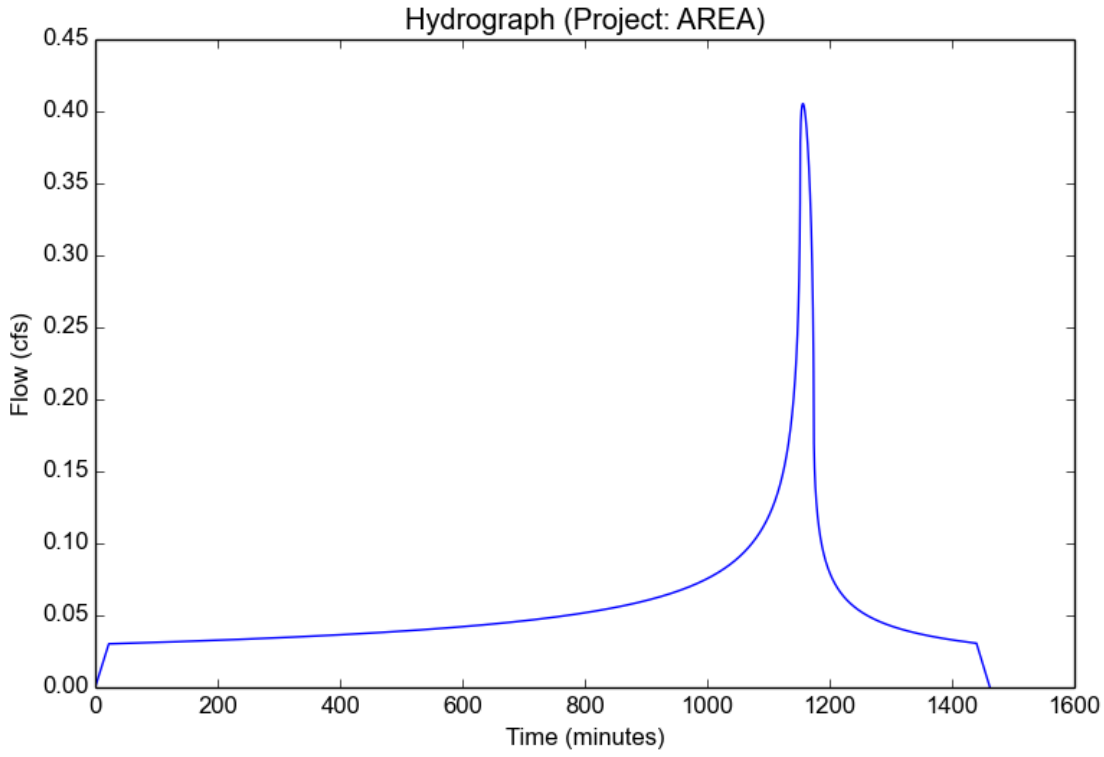
File location: D:/Dropbox/0706-1784 Capital-San Gabriel/LID/Calculations/Project - AREA-85th Percentile.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Project
Subarea ID	AREA
Area (ac)	1.75
Flow Path Length (ft)	389.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	0.95
Percent Impervious	0.9
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.95
Peak Intensity (in/hr)	0.2825
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.82
Time of Concentration (min)	22.0
Clear Peak Flow Rate (cfs)	0.4054
Burned Peak Flow Rate (cfs)	0.4054
24-Hr Clear Runoff Volume (ac-ft)	0.1127
24-Hr Clear Runoff Volume (cu-ft)	4907.7301



Hydraulic Analysis Report

Project Data

Project Title: LOW-FLOW PIPE SIZING

Designer:

Project Date: Monday, June 8, 2020

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Channel Analysis

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Depth: 0.5000 ft

Result Parameters

Flow: 0.4298 cfs = Q85TH = 0.41 CFS --> OKAY

Area of Flow: 0.1963 ft^2

Wetted Perimeter: 1.5708 ft

Hydraulic Radius: 0.1250 ft

Average Velocity: 2.1891 ft/s

Top Width: 0.0000 ft

Froude Number: 0.0000

Critical Depth: 0.3340 ft

Critical Velocity: 3.0842 ft/s

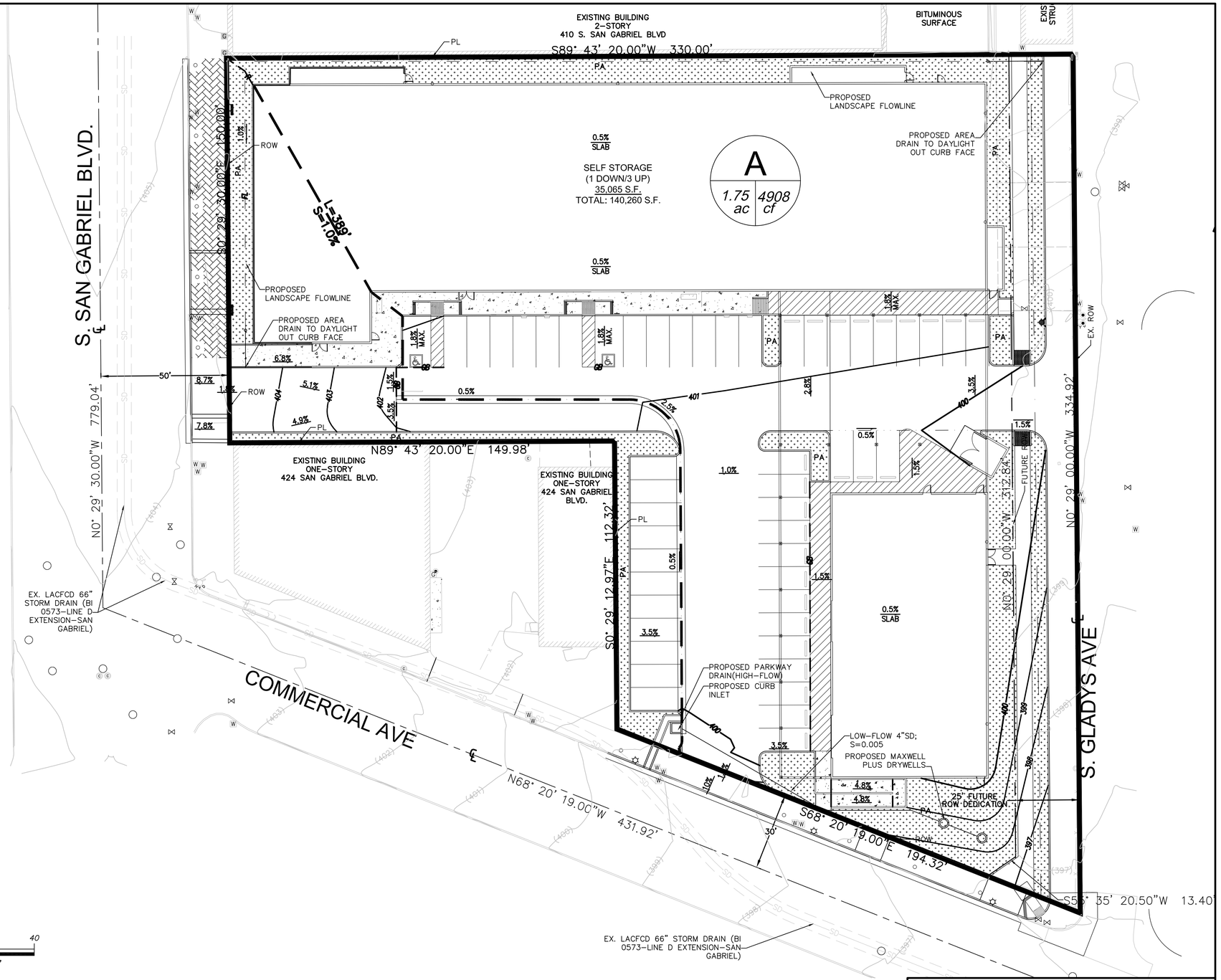
Critical Slope: 0.0081 ft/ft

Critical Top Width: 0.47 ft

Calculated Max Shear Stress: 0.1560 lb/ft^2

Calculated Avg Shear Stress: 0.0390 lb/ft^2

APPENDIX E – LID Plans



LEGEND

DRAINAGE AREA

AREA — DRAINAGE CALLOUT

20 10 0 20 40

SCALE: 1"=20'

85TH PERCENTILE CALCULATION SUMMARY:

LID CALCULATIONS (LID CALCULATIONS)			
AREA ID	AREA (ACRES)	$Q_{(LID)}$ CFS	$V_{(LID)}$ CF
A	1.75	0.41	4,908

SEE LID DETAILS SHEET FOR DRYWELL SIZING

DIGALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

NO DUMPING! ¡NO CONTAMINE! DRAINS TO WATERWAYS

CITY STANDARD CURB MARKER #NDW
3 IN X 5.25 IN ROUNDED CORNER RECTANGLES
(OR CITY APPROVED EQUAL)
INSTALL MARKER AT EVERY CURB ADJACENT TO INLETS..

STORM DRAIN MARKER

REVISIONS			
NO.	DESCRIPTION	APP.	DATE

BLUE PEAK ENGINEERING, INC.
18543 YORBA LINDA BL., #235
YORBA LINDA, CA 92886
714.749.3077
714.281.1640 FAX

PREPARED UNDER THE SUPERVISION OF:

REGISTERED PROFESSIONAL ENGINEER
KIMBERLY A. JOHNSON
No.81979
Exp.03/31/2022
CIVIL
STATE OF CALIFORNIA

KIMBERLY A. JOHNSON RCE 81979 DATE

CITY OF SAN GABRIEL

PRELIMINARY GRADING SET
NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
PRELIMINARY LID PLAN

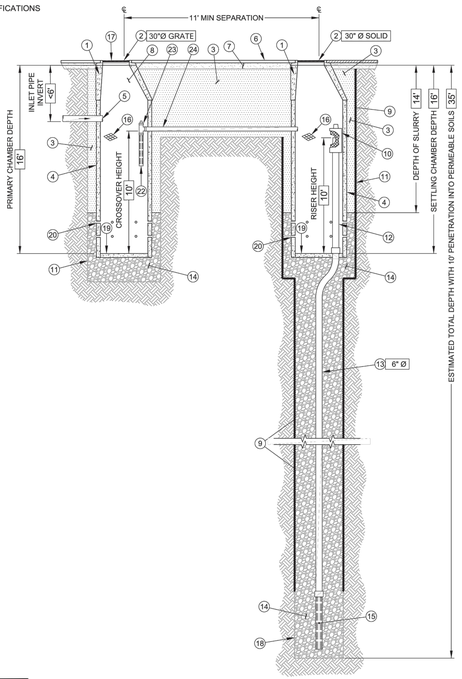
RECOMMENDED	APPROVED DAREN T. GRILLEY, P.E. #68057
CHECKED	CITY ENGINEER R.C.E. DATE
DESIGNED PRIVATE CONSULTANT	SHEET 4 OF 6
DRAWN PRIVATE CONSULTANT	

The MaxWell® Plus

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Self Storage

San Gabriel, CA



AZ Lic. ROC070466 A, ROC047997 B-A, ADWR 393
CA Lic. 888759, C-42, C-57, HAZ
Also licensed in the following states: MT, NM, NV, OR, TX, UT, and WA.
U.S. Patent No. 4,303,330. ™ Trademark 1974, 1985, 2004

ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **BOLTED RING & GRATE/COVER** - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON WITH WORDING **"STORM WATER ONLY"** IN RAISED LETTERS. **BOLTED IN 2 LOCATIONS** AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX.
4. **PRE-CAST LINER -** 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE.**
5. **INLET PIPE (BY OTHERS). SEE SEPARATE PLAN FOR INVERT ELEVATIONS.**
6. **GRADED BASIN OR PAVING** (BY OTHERS).
7. **COMPACTED BASE MATERIAL**, IF REQUIRED (BY OTHERS).
8. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE PRIMARY AND SECONDARY CHAMBER DEPTHS AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. **NON-WOVEN GEOTEXTILE SLEEVE** - MIRAFI 140 NL. MIN. 6 FT Ø. HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED**.
11. **MIN. 6' Ø DRILLED SHAFT.**
12. **RISER PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. **DRAINAGE PIPE** - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. WITH TRI-B COUPLER. OVERALL LENGTH VARIES, UP TO 120" WITH TRI-B COUPLER.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, 2 PER CHAMBER.
17. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION. GRATED ONLY.
18. **MIN. 4' Ø DRILLED SHAFT.**
19. **BASE SEAL** - CONCRETE SLURRY.
20. **6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.**
21. NOT USED.
22. **INTAKE SCREEN** - 4" Ø SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/ FT. 48" OVERALL LENGTH WITH TRI-CEND CAP.
23. **VENTED ANTI-SIPHON INTAKE WITH FLOW REGULATOR.**
24. **CONNECTOR PIPE** - 4" Ø SCH. 40 PVC.

DETAIL:	PL-4-SS-CA	REVISED BY:	BDJ
DRAWN ON:	05-23-19	REVISED DATE:	06-05-20
		SCALE:	N.T.S

Manufactured and Installed by

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ARIZONA 602-268-0785

Maxwell® Plus Drainage System Calculations Prepared on June 05, 2020
Project: **Self Storage - San Gabriel, CA**
Contact: Kimberly Johnson at Blue Peak - Yorba Linda, CA

TORRENT RESOURCES

Given:

Design Infiltration Rate	25.00 in/hr
Mitigated Volume	4,908 ft^3
Required Drawdown Time	96 hours
Depth to Emergency Overflow	0 ft
Min. Depth to Infiltration	10 ft
Groundwater Depth for Design	100 ft

Proposed:

Drywell Rock Shaft Diameter	4 ft
Primary Chamber Depth	16 ft
Drywell Chamber Depth	16 ft
Rock Porosity	40 %
Depth to Infiltration	14 ft
Drywell Bottom Depth	35 ft

Convert Design Rate from in/hr to ft/sec.

$25.00 \frac{in}{hr} \times \frac{ft}{12\,in} \times \frac{1\,hr}{3600\,sec} = 0.000579 \frac{ft}{sec}$

A 4 foot diameter drywell provides 12.57 SF of infiltration area per foot of depth, plus 12.57 SF at the bottom.

For a 35 foot deep drywell, infiltration occurs between 14 feet and 35 feet below grade. This provides 21 feet of infiltration depth in addition to the bottom area. Infiltration area per drywell is calculated below.

$4\ ft \times 18.85 \frac{ft^2}{ft} + 17\ ft \times 12.57 \frac{ft^2}{ft} + 12.57\ ft^2 = 302\ ft^2$

Combine design rate with infiltration area to get flow (disposal) rate for each drywell.

$0.000579 \frac{ft}{sec} \times 302\ ft^2 = 0.17453 \frac{ft^3}{sec}$

Volume of disposal for each drywell based on various time frames are included below.

96 hrs: 0.1745 CFS x 96 hours x $\frac{3600\,sec}{1\,hr}$ = 60,319 cubic feet of retained water disposed of.

Chamber diameter = 4 feet. Drywell rock shaft diameter = 4 feet.
Volume provided in each primary settling chamber with depth of 16 feet.
$16\ ft \times 12.57\ ft^2 = 202\ ft^3$
Volume provided in each drywell with chamber depth of 16 feet.
$16\ ft \times 12.57\ ft^2 + 2\ ft \times 28.27\ ft^2 \times 40\ \% + 17\ ft \times 12.57\ ft^2 \times 40\ \% = 309\ ft^3$

The MaxWell System is composed of 1 drywell(s) and 1 primary chamber(s).
Total volume provided = 511 ft^3
Total 96 hour infiltration volume = 60,319 ft^3
Total infiltration flowrate = 0.17453 $\frac{ft^3}{sec}$

Based on the total mitigated volume of 4908 CF, after subtracting the volume infiltrated as quickly as it enters the drywell of 4608 CF, the remaining volume is 300 CF. The storage provided in the drywell system is 511 CF.

For any questions, please contact Bill De Jong at 909-915-9490 or via email at BDejong@TorrentResources.com

Torrent Resources (CA) Incorporated
9950 Alder Avenue
Bloomington, CA 92316
Phone 909-829-0740

HydroCalc Summary

Using the hydrograph produced by the HydroCalc Calculator, the area below the drywell flow disposal rate and the hydrograph curve is estimated as the volume infiltrated in the drywell as it enters. 3 different phases will occur during the 85th percentile storm event. Phase 1 will occur during the beginning of the storm event at the initial increase of flow produced by the storm. When the storm flow is equal to the drywell flow disposal rate, phase 1 ends and phase 2 begins. Phase 2 is when the drywell performs at the flow rate it was design at. Any additional runoff that is produced due to the increase of storm flow will require a detention system. The storm will then hit its peak flow and begin to decrease. When the storm flow decreases to an amount equal to the drywell flow disposal rate, phase 2 ends and phase 3 begins. Phase 3 will occur near the end the storm when the drywell infiltrates the residual runoff until the end of the event.

Phase 1 – Initial Filling of Drywell
From time 0 minutes to 1134.6 minutes, the 85th storm event flowrate that enters the drywell is less than the drywell steady-state infiltration flowrate (flow disposal rate). Therefore, the entire volume entering the drywell from 0 minutes to 1134.6 minutes will infiltrate without overwhelming the drywell. This volume is 3378.1 CF.

Time (min)	Incremental Masscurve	Incremental Design Storm Depth (in)	Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)	Clear Peak Flow Rate (cfs)	Incremental Volume (cu-ft)	Cumulative Volume (cu-ft)	Volume infiltrated by drywell (CF)
1134.4	0.712774817	0.677136077	0.12134428	0.1	0.82	0.174129	2.085856205	3375.991005	2.085856205
1134.6	0.713301562	0.677636484	0.12177818	0.1	0.82	0.1747517	2.093284378	3378.084289	2.09436
1134.8	0.713831159	0.678139601	0.12221725	0.1	0.82	0.1753818	2.10080065	3380.18509	2.09436

Phase 2 – Drywell Performing at the Design Rate
From time 1134.6 minutes to 1174.2 minutes, the flowrate that enters the drywell exceeds the drywell steady-state infiltration flowrate (flow disposal rate). Therefore, the drywell can only infiltrate up to its flow disposal rate which is 0.17453 CFS. Over this period, we multiply the time by the flowrate (and covert as needed) to determine the volume infiltrated in this phase. This volume is 414.6 CF.

(1174.2-1134.6) x 60 SEC/MIN x 0.17453 CFS = 414.6 CF

Time (min)	Incremental Masscurve	Incremental Design Storm Depth (in)	Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)	Clear Peak Flow Rate (cfs)	Incremental Volume (cu-ft)	Cumulative Volume (cu-ft)	Volume infiltrated by drywell (CF)
1174	0.851172425	0.808613804	0.13325831	0.1	0.82	0.1902568	2.458920065	4090.298835	2.09436
1174.2	0.851418459	0.808847536	0.12224187	0.1	0.82	0.1754171	2.194043034	4092.490878	2.09436
1174.4	0.851663453	0.80908028	0.11800288	0.1	0.82	0.1693341	2.068507291	4094.559385	2.068507291

Phase 3 – End of the Storm Event
From time 1174.2 to 1462 minute (end of storm event), the 85th storm event flowrate that enters the drywell is less than the drywell steady-state infiltration flowrate (flow disposal rate). Therefore, the entire volume entering the drywell from 1174.2 minutes to 1462 minutes will infiltrate without overwhelming the drywell. This volume is 815.2 CF.

4907.7 CF - 4092.5 CF = 815.2 CF

Time (min)	Incremental Masscurve	Incremental Design Storm Depth (in)	Intensity (in/hr)	Undeveloped Runoff Coefficient (Cu)	Developed Runoff Coefficient (Cd)	Clear Peak Flow Rate (cfs)	Incremental Volume (cu-ft)	Cumulative Volume (cu-ft)	Volume infiltrated by drywell (CF)
1461.8	1	0.95	0.00019075	0.1	0.82	0.0002737	0.00492763	4907.728502	0.00492763
1462	1	0.95	0	0.1	0.82	0	0.001642365	4907.730144	0.001642365
	0	0	0	0	0	0	0	0	0

The total volume infiltrated as it enters the drywell during the 85th percentile storm event is 3378.1 + 414.6 + 815.2 = 4607.9 CF

Peak Flow Hydrologic Analysis

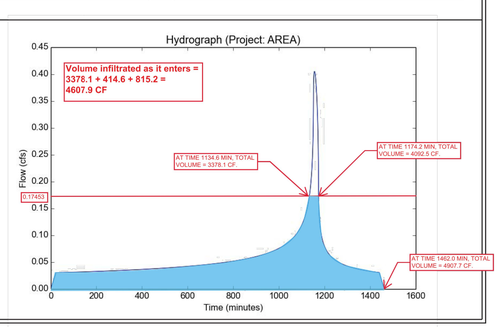
File location: D:/Dropbox/0706-1784 Capital-San Gabriel/LID/Calculations/Project - AREA-85th Percentile.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Project
Subarea ID	AREA
Area (ac)	1.75
Flow Path Length (ft)	389.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	0.95
Percent Impervious	0.9
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.95
Peak Intensity (in/hr)	0.2825
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.82
Time of Concentration (min)	22.0
Clear Peak Flow Rate (cfs)	0.4054
Burned Peak Flow Rate (cfs)	0.4054
24-Hr Clear Runoff Volume (ac-ft)	0.1127
24-Hr Clear Runoff Volume (cu-ft)	4907.7301



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UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REVISIONS			
NO.	DESCRIPTION	APP.	DATE

BLUE PEAK ENGINEERING, INC.
18543 YORBA LINDA BL., #235
YORBA LINDA, CA 92886
714.749.3077
714.281.1640 FAX

PREPARED UNDER THE SUPERVISION OF:

REGISTERED PROFESSIONAL ENGINEER — KIMBERLY A. JOHNSON — No.81979 Exp.03/31/2022 — CIVIL — STATE OF CALIFORNIA

KIMBERLY A. JOHNSON RCE 81979 DATE

CITY OF SAN GABRIEL

PRELIMINARY GRADING SET
NEC SAN GABRIEL BLVD. AND COMMERCIAL AVE.
LID DETAILS

RECOMMENDED	APPROVED DAREN T. GRILLEY, P.E. #68057
CHECKED	CITY ENGINEER R.C.E. DATE
DESIGNED PRIVATE CONSULTANT	SHEET 5 OF 6
DRAWN PRIVATE CONSULTANT	

APPENDIX F – Master Covenant and Agreement

RECORDING REQUESTED BY
AND MAIL TO:

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUILDING AND SAFETY DIVISION
900 S. FREMONT AVENUE, 3RD FLOOR
ALHAMBRA, CA 91803-1331

Space above this line is for Recorder's use

COVENANT AND AGREEMENT
REGARDING THE MAINTENANCE OF LOW IMPACT DEVELOPMENT (LID) & NATIONAL POLLUTANTS DISCHARGE ELIMINATION SYSTEM (NPDES) BMPs

The undersigned, _____ ("Owner"), hereby certifies that it owns the real property described as follows ("Subject Property"), located in the County of Los Angeles, State of California:

LEGAL DESCRIPTION

ASSESSOR'S ID # 5373-025-024,-003,-004,-005,-006,-007,-008,-009,-025,-023,-021 TRACT NO._____ LOT NO._____

ADDRESS: NEC SAN GABRIEL BLVD AND COMMERCIAL AVE., SAN GABRIEL CA.

Owner is aware of the requirements of the County of Los Angeles' Green Building Standards Code, Title 31, Section 4.106.4 and Section 5.106.2 (LID), and National Pollutant Discharge Elimination System (NPDES) permit. The following post-construction BMP features have been installed on the Subject Property:

- □ Porous pavement
- □ Cistern/rain barrel
- ☒ Infiltration trench/pit
- □ Bioretention or biofiltration
- □ Rain garden/planter box
- □ Disconnect impervious surfaces
- □ Dry Well
- □ Storage containers
- □ Landscaping and landscape irrigation
- □ Green roof
- □ Other _____

The location, including GPS x-y coordinates, and type of each post-construction BMP feature installed on the Subject Property is identified on the site diagram attached hereto as Exhibit 1.

Owner hereby covenants and agrees to maintain the above-described post-construction BMP features in a good and operable condition at all times, and in accordance with the LID/NPDES Maintenance Guidelines, attached hereto as Exhibit 2.

Owner further covenants and agrees that the above-described post-construction BMP features shall not be removed from the Subject Property unless and until they have been replaced with other post-construction BMP features in accordance with County of Los Angeles' Green Building Standards Code, Title 31 and NPDES permit.

Owner further covenants and agrees that if Owner hereafter sells the Subject Property, Owner shall provide printed educational materials to the buyer regarding the post-construction BMP features that are located on the Subject Property, including the type(s) and location(s) of all such features, and instructions for properly maintaining all such features.

Owner makes this Covenant and Agreement on behalf of itself and its successors and assigns. This Covenant and Agreement shall run with the Subject Property and shall be binding upon owner, future owners, and their heirs, successors and assignees, and shall continue in effect until the release of this Covenant and Agreement by the County of Los Angeles, in its sole discretion.

Owner(s):

By:_____ Date:_____

By:_____ Date:_____

(PLEASE ATTACH NOTARY)

REFERENCE

PLAN CHECK NO.: _____ DISTRICT OFFICE NO.:_____

ATTACHMENTS

APPENDIX G – Educational Material

Efficient Irrigation SD-12

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

CASQA California Stormwater Quality Association

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

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SC-43 Parking/Storage Area Maintenance

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).
- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:
  - Purchase and installation of signs.
  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.
  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.
  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Housekeeping Practices SC-60

Description

Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals. Related information is provided in BMP fact sheets SC-11 Spill Prevention, Control & Cleanup and SC-34 Waste Handling & Disposal.

Approach

Pollution Prevention

- Purchase only the amount of material that will be needed for foreseeable use. In most cases this will result in cost savings in both purchasing and disposal. See SC-61 Safer Alternative Products for additional information.
- Be aware of new products that may do the same job with less environmental risk and for less or the equivalent cost. Total cost must be used here; this includes purchase price, transportation costs, storage costs, use related costs, clean up costs and disposal costs.

Suggested Protocols

General

- Keep work sites clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Dispose of wash water, sweepings, and sediments, properly.
- Recycle or dispose of fluids properly.
- Establish a daily checklist of office, yard and plant areas to confirm cleanliness and adherence to proper storage and security. Specific employees should be assigned specific inspection responsibilities and given the authority to remedy any problems found.
- Post waste disposal charts in appropriate locations detailing for each waste its hazardous nature (poison, corrosive, flammable), prohibitions on its disposal (dumpster, drain, sewer) and the recommended disposal method (recycle, sewer, burn, storage, landfill).
- Summarize the chosen BMPs applicable to your operation and post them in appropriate conspicuous places.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

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- Require a signed checklist from every user of any hazardous material detailing amount taken, amount used, amount returned and disposal of spent material.
- Do a before audit of your site to establish baseline conditions and regular subsequent audits to note any changes and whether conditions are improving or deteriorating.
- Keep records of water, air and solid waste quantities and quality tests and their disposition.
- Maintain a mass balance of incoming, outgoing and on hand materials so you know when there are unknown losses that need to be tracked down and accounted for.
- Use and reward employee suggestions related to BMPs, hazards, pollution reduction, work place safety, cost reduction, alternative materials and procedures, recycling and disposal.
- Have, and review regularly, a contingency plan for spills, leaks, weather extremes etc. Make sure all employees know about it and what their role is so that it comes into force automatically.

Training

- Train all employees, management, office, yard, manufacturing, field and clerical in BMPs and pollution prevention and make them accountable.
- Train municipal employees who handle potentially harmful materials in good housekeeping practices.
- Train personnel who use pesticides in the proper use of the pesticides. The California Department of Pesticide Regulation license pesticide dealers, certify pesticide applicators and conduct onsite inspections.
- Train employees and contractors in proper techniques for spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and Countermeasure (SPCC) plant up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- There are no major limitations to this best management practice.
- There are no regulatory requirements to this BMP. Existing regulations already require municipalities to properly store, use, and dispose of hazardous materials

Requirements

Costs

- Minimal cost associated with this BMP. Implementation of good housekeeping practices may result in cost savings as these procedures may reduce the need for more costly BMPs.

Maintenance

- Ongoing maintenance required to keep a clean site. Level of effort is a function of site size and type of activities.

Supplemental Information

Further Detail of the BMP

- The California Integrated Waste Management Board's Recycling Hotline, 1-800-553-2962, provides information on household hazardous waste collection programs and facilities.

Examples

There are a number of communities with effective programs. The most pro-active include Santa Clara County and the City of Palo Alto, the City and County of San Francisco, and the Municipality of Metropolitan Seattle (Metro).

References and Resources

British Columbia Lake Stewardship Society. Best Management Practices to Protect Water Quality from Non-Point Source Pollution. March 2000.
http://www.nalms.org/bclss/bmphome.html#bmp

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities, Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July, 1998, Revised by California Coastal Commission, February 2002.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

San Mateo STOPPP - (http://stoppp.tripod.com/bmp.html)

Plaza and Sidewalk Cleaning SC-71

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

Approach

Pollution Prevention

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

Suggested Protocols

Surface Cleaning

- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)

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- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

Graffiti Removal

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

Surface Removal and Repair

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

Concrete Installation and Repair

- Schedule asphalt and concrete activities for dry weather.

- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

Training

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewering agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

Requirements

Costs

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

References and Resources

Bay Area Stormwater Management Agencies Association (BASMAA). 1996. Pollution From Surface Cleaning Folder http://www.basmaa.org

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

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San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Plan. 2001. Municipal Activities Model Program Guidance. November.

Landscape Maintenance SC-73

Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	☑

Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach

Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.

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- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

Suggested Protocols

Mowing, Trimming, and Weeding

- Whenever possible use mechanical methods of vegetation removal (e.g mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

Waste Management

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a know in location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

Requirements

Costs

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

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Water & Sewer Utility Maintenance SC-76

Objectives

- Contain
- Educate
- Reduce/Minimize

Description

Although the operation and maintenance of public utilities are not considered chronic sources of stormwater pollution, some activities and accidents can result in the discharge of pollutants that can pose a threat to both human health and the quality of receiving waters if they enter the storm drain system. Sewage incident response and investigation may involve a coordinated effort between staff from a number of different departments/agencies. Cities that do not provide maintenance of water and sewer utilities must coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

Pollution Prevention

Inspect potential non-stormwater discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).

Suggested Protocols

Water Line Maintenance and Cleaning

Procedures can be employed to reduce pollutants from discharges associated with water utility operation and maintenance activities. Planned discharges may include fire hydrant testing, flushing water supply mains after new construction, flushing lines due to complaints of taste and odor, dewatering mains for maintenance work. Unplanned discharges from treated, recycled water, raw water, and groundwater systems operation and maintenance activities can occur from water main

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breaks, sheared fire hydrants, equipment malfunction, and operator error.

Planned discharges

- Identify a suitable discharge option in the following order of preference:
  - Apply to the land.
  - Reuse water for dust suppression, irrigation, or construction compaction.
  - Discharge to a sanitary sewer system with approval.
  - Discharge to the storm drain system using applicable pollution control measures. (Only available to clean water discharges such as water main/ water storage tank/water hydrant flushing).
- If water is discharged to a storm drain, control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain protection options include:
  - Silt fence – appropriate where the inlet drains a relatively flat area.
  - Gravel and wire mesh sediment filter – Appropriate where concentrated flows are expected.
  - Wooden weir and fabric – use at curb inlets where a compact installation is desired.
- Prior to discharge, inspect discharge flow path and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- General Design considerations for inlet protection devices include the following:
  - The device should be constructed such that cleaning and disposal of trapped sediment is made easy, while minimizing interference with discharge activities.
  - Devices should be constructed so that any standing water resulting from the discharge will not cause excessive inconvenience or flooding/damage to adjacent land or structures.
- The effectiveness of control devices must be monitored during the discharge period and any necessary repairs or modifications made.

Unplanned Discharges

- Stop the discharge as quickly as possible.
- Inspect flow path of the discharged water:
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions

- Identify the potential for pollutants to be washed into the waterway

- If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path.

Sanitary Sewer Maintenance

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by a municipality. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

- Clean sewer lines on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.

- Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified

- Cleaning activities may require removal of tree roots and other identified obstructions.

- During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:
  - Cracked/deteriorating pipes
  - Leaking joints/seals at manhole
  - Frequent line plugs
  - Line generally flows at or near capacity
  - Suspected infiltration or exfiltration.

- Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.

- Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure.

Spills and Overflows

- Identify and track sanitary sewer discharges. Identify dry weather infiltration and inflow first. Wet weather overflow connections are very difficult to locate.

- Locate wet weather overflows and leaking sanitary sewers using conventional source identification techniques such as monitoring and field screening. Techniques used to identify other illicit connection sources can also be used for sewer system evaluation surveys (see SC74 Drainage System Operation and Maintenance).

- Implement community awareness programs for monitoring sanitary sewer wet weather overflows. A citizen's hotline for reporting observed overflow conditions should be established to supplement field screening efforts.

- Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.

- When a spill, leak, and/or overflow occurs and when disinfecting a sewage contaminated area, take every effort to ensure that the sewage, disinfectant and/or sewage treated with the disinfectant is not discharged to the storm drain system or receiving waters. Methods may include:

  - Blocking storm drain inlets and catch basins

  - Containing and diverting sewage and disinfectant away from open channels and other storm drain fixtures (using sandbags, inflatable dams, etc.)

  - Removing the material with vacuum equipment

- Record required information at the spill site.

- Perform field tests as necessary to determine the source of the spill.

- Develop notification procedures regarding spill reporting.

Septic Systems

- Ensure that homeowners, installers, and inspectors are educated in proper maintenance of septic systems. This may require coordination with staff from other departments. Outreach to homeowners should include inspection reminders informing then that inspection and perhaps maintenance is due for their systems. Recommend that the system be inspected annually and pumped-out regularly.

- Programs which seek to address failing septic systems should consider using field screening to pinpoint areas where more detailed onsite inspection surveys are warranted.

Training

- Conduct annual training of water utility personnel and service contractors. (field screening, sampling, smoke/dye testing, TV inspection).

- OSHA-required Health and Safety Training 29 CFR 1910.120 plus annual Refresher Training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).

Spill Response and Prevention

- See previous section regarding spills and overflows.
- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Enact ordinance granting "right-of-entry" to locate potentially responsible parties for sewer overflows.
- Reliance on individual onsite inspection to detect failed septic systems can be a major limitation. The individual onsite inspection is very labor-intensive and requires access to private property to pinpoint the exact location of the failing system.
- A significant limitation to correcting failing septic systems is the lack of techniques available for detecting individual failed septic systems.

Requirements

Costs

- Departmental cooperation recommended for sharing or borrowing staff resources and equipment from municipal wastewater department.
- Infiltration, inflow, and wet weather overflows from sanitary sewers are very labor and equipment intensive to locate.
- The costs associated with detecting and correcting septic system failures are subject to a number of factors, including availability of trained personnel, cost of materials, and the level of follow-up required to fix the system problems.

Maintenance

- Minimum 2-person teams to perform field screening and associated sampling.
- Larger teams required for implementing other techniques (i.e. zinc chloride smoke testing, fluorometric dye testing, television camera inspection and physical inspection with confined space entry) to identify sewer system leaks.
- Program coordination required for handling emergencies, record keeping, etc.
- Many of the problems associated with improper use of septic systems may be attributed to lack of user knowledge on operation and maintenance. Educational materials for homeowners and training courses for installers and inspectors can reduce the incidence of pollution from these widespread and commonly used pollution control devices.

SC-76 Water & Sewer Utility Maintenance

Supplemental Information

Further Detail of the BMP

Onsite Sewage Disposal Systems

New onsite sewage disposal systems should be designed, located, and installed away from open waterbodies and sensitive resources such as wetlands and floodplains. A protective separation between the OSDS and groundwater should also be established. OSDSs should be operated and maintained to prevent surface water discharges and reduce pollutant loadings to groundwater. Inspection of OSDSs should occur regularly and repairs made immediately. New or replacement plumbing fixtures should be of the high efficiency type.

Typical Sanitary Sewer Problems

- Old and deteriorated main and lateral pipes - Sewers range in age from 30 to 100 years with an average age of 50 years.
- Cracked sewer pipes - Existing sewers are mostly clay pipes which can crack as they deteriorate with age and also by earth movement.
- Misaligned and open pipe joints - Most of the mortar used to seal the joints between sections of clay pipe has deteriorated.
- Undersized sewer pipe - The existing sewer system is overloaded due to new sewer hook-ups, underground water infiltration, and illegal roof and/or yard drain connections.
- Defective manholes - Old manholes are made of bricks. Typical problems associated with brick manholes are loose bricks, missing bricks, and misaligned manholes.
- Missing and/or unrecorded sewer pipes and manholes - This problem is typical in the easement/backline sewer. Sewer pipe locations shown on the sewer record map are different from the actual sewer location.
- Sewer main under houses and other improvements - Complaints of sewer main alignment crossing the house and other improvements. A solution to this problem requires an agreement with the property owner for a new sewer easement at a relocated line.

Causes of Sanitary Sewer Backups

- Root infiltration - Tree roots are a major cause of backups.
- Water inflow/infiltration - Rain water entering the sewer pipe causes overflows.
- Solids - Typical solids that buildup in the pipe and cause backups are grease, dirt, bones, tampons, paper towels, diapers, broken dishware, garbage, concrete, and debris.
- Structural defects in pipes and manholes - Sags in the line, cracks, holes, protruding laterals, misaligned pipe, offset joints are all possible causes of backups.

Design Considerations

Sanitary sewer overflows can often be reduced or eliminated by a number of practices, in addition to sewer system cleaning and maintenance, including the following:

- Reducing infiltration and inflow through rehabilitation and repair of broken or leaking sewer lines.
- Enlarging or upgrading the capacity of sewer lines, pump stations, or sewage treatment plants.
- Constructing wet weather storage and treatment facilities to treat excess flows.
- Addressing SSOs during sewer system master planning and facilities planning.

Septic Systems

Two field screening techniques that have been used with success at identifying possible locations of failing septic systems are the brightener test and color infrared (CIR) aerial photography. The first involves the use of specific phosphorus-based elements found in many laundry products, often called brighteners, as an indicator of the presence of failing onsite wastewater systems. The second technique uses color infrared (CIR) aerial photography to characterize the performance of septic systems. This method has been found to be a quick and cost-effective method for assessing the potential impacts of failing systems and uses variations in vegetative growth or stress patterns over septic system field lines to identify those systems that may potentially be malfunctioning. Then a more detailed onsite visual and physical inspection will confirm whether the system has truly failed and the extent of the repairs needed. These inspections may be carried out by county health departments or other authorized personnel.

References and Resources

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APPENDIX H – Operation and Maintenance Manual

Stormwater BMP Inspection and Maintenance Log Sheet

MAXWELL DRYWELL PLUS SYSTEM

Property Address:	
BMP Type:	
Begin Date:	End Date:

Date	Inspected By:	Cause for Inspection	Conditions Requiring Correction	Comments and Actions Taken

DRYWELL MAINTEANANCE

(County of Los Angeles Reference)

Maintenance Access

The dry well must be safely accessible during wet and dry weather conditions if it is publicly-maintained. If the dry well becomes plugged and fails, access is needed to excavate the dry well and replace the filter bed media. To prevent damage and compaction, access must able to accommodate a backhoe working at “arm’s length” from the dry well.

Maintenance Requirements

Maintenance and regular inspections are important for proper function of dry wells. The following are general maintenance requirements:

- Conduct regular inspection and routine maintenance for pretreatment devices.
- Inspect dry well and its observation well frequently to ensure that water infiltrates into the subsurface completely within maximum retention time of 96 hours. If water is present in the observation well more than 96 hours after a major storm, the dry well may be clogged. Maintenance activities triggered by a potentially clogged facility include:
    - Check for debris/sediment accumulation and remove sediment (if any) and evaluate potential sources of sediment and vegetative or other debris (e.g., embankment erosion, channel scour, overhanging trees, etc). If suspected upstream sources are outside of the County's jurisdiction, additional pretreatment operations (e.g., trash racks, vegetated swales, etc.) may be necessary.
    - Assess the condition of the top aggregate layer for sediment buildup and crusting. Remove the top layer of pea gravel and replace. If slow draining conditions persist, the entire dry well may need to be excavated and replaced.
- Eliminate standing water to prevent vector breeding.
- Remove and dispose of trash and debris as needed, but at least prior to the beginning of the wet season.

Table E-8. Dry Well Troubleshooting Summary

Problem	Conditions When Maintenance Is Needed	Maintenance Required
Trash and Debris	Trash and debris > 5 ft^3/1,000 ft^2	Remove and dispose of trash and debris.
Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Remove any evidence of visual contamination.
Erosion/Sediment Accumulation	Undercut or eroded areas at inlet structures	Repair eroded areas and re-grade if necessary.
	Accumulation of sediment, debris, and oil/grease in pretreatment devices	Remove sediment, debris, and/or oil/grease.
	Accumulation of sediment, debris, and oil/grease on surface or inlet	Remove sediment, debris, and/or oil/grease.
Water Drainage Rate	Standing water, or by inspection of observation wells	Remove the top layer of the dry well bottom and replace if necessary.