

**LOW IMPACT DEVELOPMENT
DE FOREST PARK SITE IMPROVEMENTS**

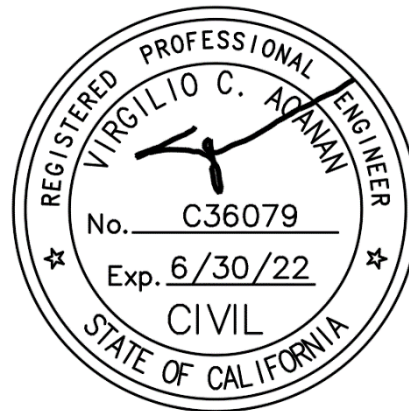
6255 DE FOREST AVENUE,
LONG BEACH, CALIFORNIA, 90805

February 19, 2021

PREPARED FOR:

**CITY OF LONG BEACH DEPARTMENT OF PUBLIC WORKS
411 W. OCEAN BLVD.,
LONG BEACH, CA 90802**

PREPARED BY:



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1.0 Project Background

The report demonstrates that the proposed drainage system will adequately meet the City of Long Beach Low Impact Development Best Management Practices Design Manual.

1.1 Project Description

1.1.1 Introduction

The project site is comprised of one lot totaling to 3.7 acres located at 6255 De Forest Avenue in the City of Long Beach. The site, totaling 7,917 sf, is located in De Forest Park. The property is owned and will be developed by the Conservation Corps Long Beach De Forest Park.

1.1.2 Scope of Development

Pre-development site consists of a single story building, hardscape areas, and landscape areas. Pre-development imperviousness of the total site is at 57.82%. The proposed development will replace the existing single story stucco building that is to be demolished and a portion of the hardscape and landscape around the building.

The proposed development will consist of a building with roof area totaling 2,487 sf (0.06 acres), various planter areas totaling 3,604 sf (0.08 acres), and hardscape areas of 4,313 sf (0.10 acres) with 1,915 sf (0.04 acres) open to the sky. 361 sf (0.01 acre) of existing hardscape will be replaced after the removal of the existing building's canopy. The replacement of the existing hardscape will be exempted from the calculations as it will be for maintenance only. The post-development imperviousness of the new project site will be 54.48%.

1.1.3 Drainage Description

The project site is located in the Los Angeles River watershed. The runoff from the existing site appears to sheet flow to the adjacent street. The proposed site will utilize the capture and reuse planter system for LID compliance that will collect water from the developed project site and store within the planter system for passive irrigation. Any overflow water will discharge to a curb drain.

The site runoff from the northern walkway area will be collected in a catch basin and will be conveyed to the permavoid capture and reuse system. Runoff from the hardscape on the west and south of the building and the building will be collected by a permavoid planter system by sheet flow over the landscape. Water collected from the center roof gutter will be conveyed to the 18" diameter planter feature where runoff will flow to the permavoid system for LID Compliance.

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1.1.4 Project Area Soil Type

Soil information was provided in the Soils Report prepared by GeoSystems, Inc., dated August 13, 2020. Per the soils report, artificial fill and alluvium are encountered at the site. The artificial fill consists of brown silty sand, whereas the alluvium consists of sandy silt and silty clay to sandy clay. Ground water was encountered at 44 feet below ground surface. However, local fluctuation in groundwater may occur due to seasonal variation in rainfall, irrigation, and water line leak; historically highest groundwater is located at 25 feet below ground surface.

2.0 Hydrology Calculations

2.1. HydroCalc

The peak mitigated volume and flow rate, for the entire site, was calculated using the 85th design storm and the LA County HydroCalc. Results provided a value of 314.93 cu.ft. and 0.03 cfs, respectively. Hydrograph results are shown in Appendix I.

2.2. Design Volume

Calculation for Water Quality Design Volume (V_m) for the total drainage area was based on the formula found in the Low Impact Development Handbook and 85th Percentile 24-hour rainfall data. Rainfall data is included in Appendix I. Design Volume calculations are included as part of the capture and reuse calculation of the manufacturer and are shown in Appendix II. Technical Feasibility Screening

3.0 Technical Feasibility Screening

3.1. LID Design Criteria

Infiltration, capture and reuse, and biofiltration strategies were considered following the City of Long Beach Low Impact Development Best Management Practices Design Manual, February 2013. Design criteria and sizing calculations follow the City of Long Beach Low Impact Development Design Manual, February 2013. Calculations are shown in the appendices.

3.1.1. Storm water Infiltration

Infiltration was considered, but was determined to be infeasible. As stated in the soils report, infiltration is not recommended as the site is located in a state defined liquefaction hazard zone. In addition, the proposed infiltration system will saturate on-site soils consisting of sandy silts above the historical highest ground water level, which have a high liquefaction potential.

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3.1.2. Capture and Use

Capture and Use was considered, and is determined to be feasible as the design volume is lower than the estimated total water use. Calculations made were based on the LID handbook and are shown in Table 1.

3.1.3. Biofiltration

Biofiltration was not utilized for this project.

4.0 Conclusion

Table 1. Capture and Reuse Summary

AREA #	Impervious Area (acre)	V _m (cu.ft)	BMP	Area Required (ft ²)	Area Provided (ft ²)
TOTAL	0.10	315	Permavoid Planter System	386	420

The municipal storm water program requires the preparation of LID (Low Impact Development) to address runoff pollution from post-development projects. The goal for the design is to mitigate the volume of runoff, produced from the 85th Percentile 24-hr rainfall storm event, for the entire site. The new hardscape areas are directed through a BMP. The total BMP treatment volume is oversized, which exceeds what is required. As demonstrated in this report VCA concludes and recommends that the capture and reuse system is more than adequate to handle the minimum design volume required for treatment of the LID mitigated volume.

APPENDIX I

Rainfall Data
&
Hydrology Calculations

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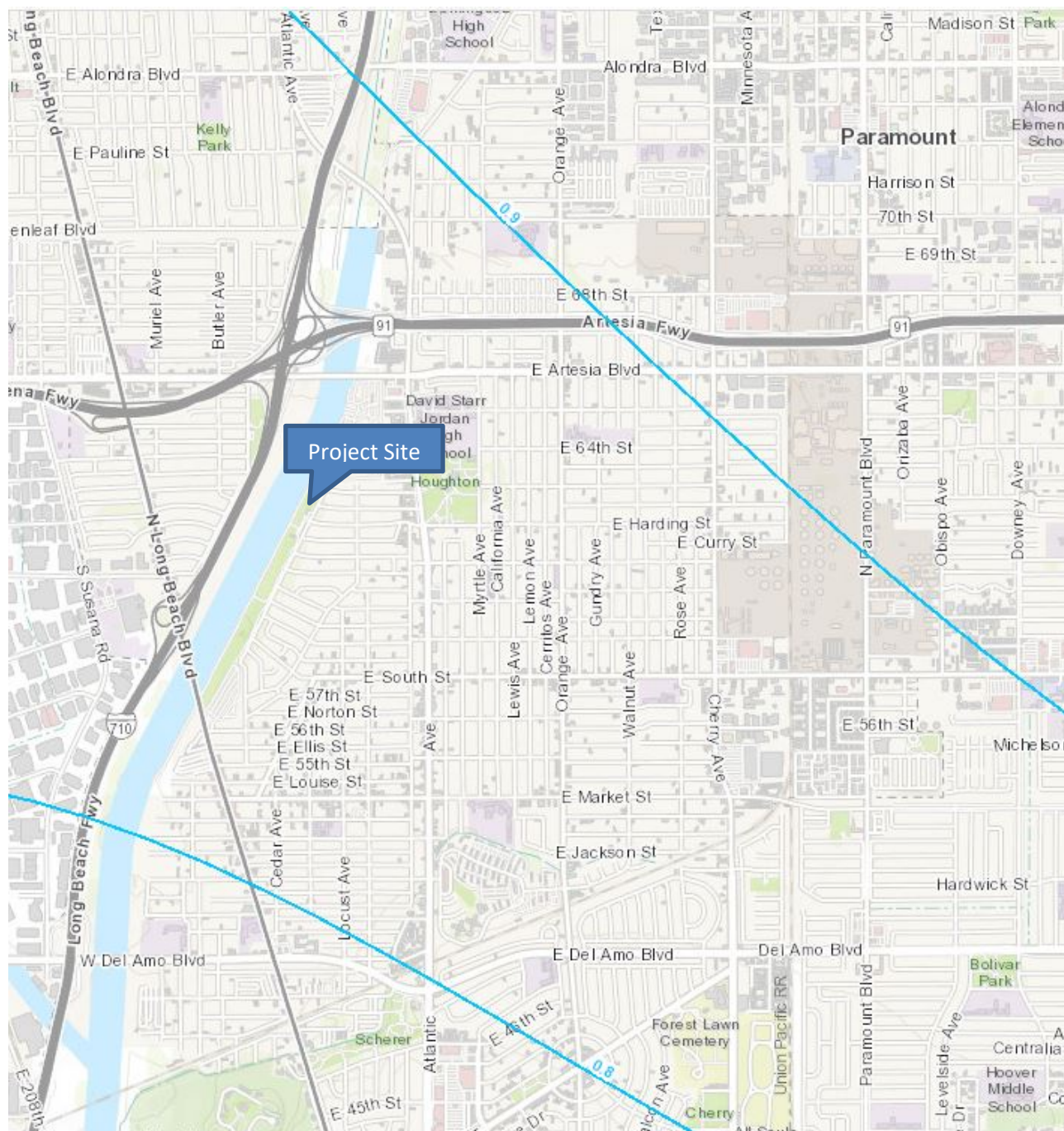


Figure 1. 85th Percentile Map

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Peak Flow Hydrologic Analysis

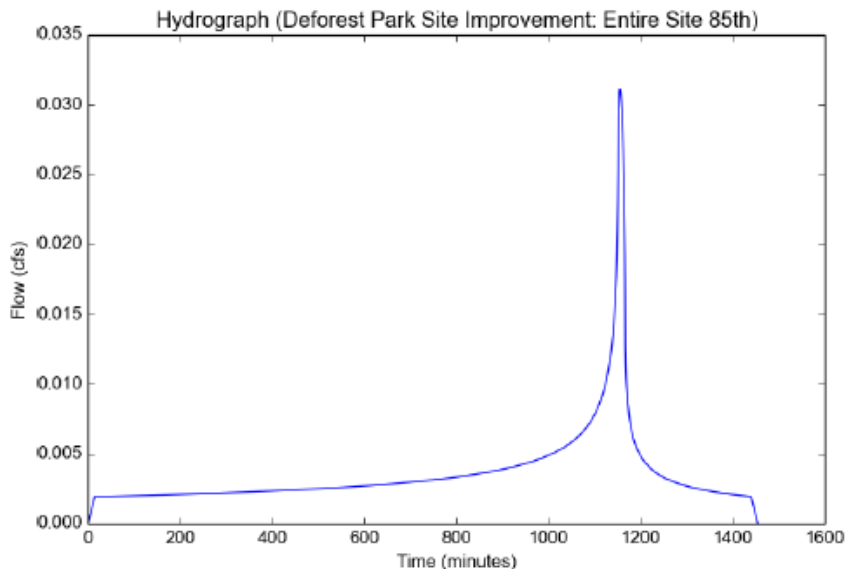
File location: Z:\VCA Projects 5\2103 to XXX\2176-419 Deforest Park Site Improvements\Calcs\LID\Deforest Park Site Improvement - Entire Site - 85th.
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Deforest Park Site Improvement
Subarea ID	Entire Site 85th
Area (ac)	0.18
Flow Path Length (ft)	130.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	0.9
Percent Impervious	0.55
Soil Type	15
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.9
Peak Intensity (in/hr)	0.3204
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.54
Time of Concentration (min)	15.0
Clear Peak Flow Rate (cfs)	0.0311
Burned Peak Flow Rate (cfs)	0.0311
24-Hr Clear Runoff Volume (ac-ft)	0.0072
24-Hr Clear Runoff Volume (cu-ft)	314.9289



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APPENDIX II

Applicable Pages: Soils Report
&
Capture and Reuse System

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August 13, 2020
6255 De Forest Avenue

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RECOMMENDATIONS FOR SUSMP FACILITY

Based on the Long Beach Low Impact Development Best Management Practices Design Manual (2013), on-site water infiltration is not recommended for the proposed stormwater facility based on the following:

- 1) The site is located in a state defined liquefaction hazard zone.
- 2) The proposed infiltration system will saturate on-site soils consisting of sandy silts above the historical highest ground water level which have high liquefaction potential.

On-site water infiltration is not recommended for this site, all pad and roof drainage should be collected and transferred to an approved non-erosive drainage device. Drainage should not be allowed to pond on the pad, against any foundation, or infiltrated into the on-site soils. We recommend that a comprehensive site drainage plan be prepared by the civil engineer and implemented during the proposed development. All drainage devices should be installed and maintained in accordance with the approved plans, our recommendations, and the requirements of all applicable municipal agencies by the contractor and ultimately the developer and/or property owner. This includes installation and maintenance of all subdrain outlets and surface drainage devices.

10. APPROVAL

A set of foundation and grading plans should be submitted to this office for review and approval prior to initiation of construction.

It is recommended that all foundation excavations be approved by this firm prior to placing concrete or steel. Any fill which is placed should be tested for compaction if used for engineering purposes. All cut-slopes and temporary excavations should be observed by a representative of this

GEOSYSTEMS, Inc.

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Project Name: 6255 De Forest Ave.

Date: 2/26/2021

Project Number: PV321294

Planter ID Number:	CU	1	
Catchment Area:	Acat	3,731	ft ²
85th Percentile Storm Depth:	D85	0.0750	ft
Soil Depth:	Dsoil	18.0	in.
Soil Available Water:	Wa	0%	%
Ponding Depth:	Dpond	0.0	Allowed
Soil Saturated Infiltration Rate:	Ksat	N/A	
Safety Factor:	SF	N/A	
Time To Fill:	Tf	N/A	
Permavoid System Depth:	150-85	9.3	in.
Permavoid Voids:	Vpv	94	%
7-Month Reference Evapotranspiration:	ETo7	21.7	in.
Permavoid Irrigation Efficiency:	IE	0.85	

Design Summary		
Planter Area:	Ap	386.1 ft ²
Capture & Use Volume:	Vcu	279.8 ft ³
Biofiltration Volume:	Vbf	N/A
Plant Factor (min.):	PF	0.34
Internal Planter Depth:	Dip	27.5 in.

Material Requirements		
Permavoid Units:	PV-150-85	143 Units
Capillary Cones:	23/160 T	143 Pairs
Wicking Geotextile Length:	Cap. Tex.	47 - 60 ft
Planting Media:	By Others	23.6 CY

*NOTES: Quantities are for estimation only. Fluctuations in material quantities will occur based on the precise configuration. Contact ABT-Permavoid for planting media recommendations based on soil depth.

Calculate the Design Capture Volume (Vcap):

$$V_{cap} = D85 \cdot Acat$$

$$V_{cap} = 0.075ft \cdot 3730.5ft^2$$

$$V_{cap} = 279.8 ft^3$$

Calculate the Permavoid Capture & Use Depth (Dcu):

$$D_{cu} = (150-85 \cdot Vpv) + (Dsoil \cdot Wa)$$

$$D_{cu} = (9.3in. \cdot 94\%) + (18in. \cdot 0\%)$$

$$D_{cu} = 8.7 in. = 0.725 ft$$

Calculate the Planter Area (Ap):

$$A_p = 386.1 ft^2$$

Calculate the Capture & Use Volume (Vcu):

$$V_{cu} = A_p \cdot D_{cu}$$

$$V_{cu} = 386.1 ft^2 \cdot 0.725ft$$

$$V_{cu} = 279.8 ft^3$$

Calculate the Minimum Required Plant Factor (PF):

$$PF = (V_{cu} \cdot IE) / (ETo7 \cdot A_p)$$

$$PF = (279.8 ft^3 \cdot 0.85) / [(21.7in. / 12ipf) \cdot 386.1 ft^2]$$

$$PF = 0.34$$

Calculate the 7-Month Estimated Total Water Use (ETWU-7):

$$ETWU-7 = (ETo7 \cdot PF \cdot A_p) / IE$$

$$ETWU-7 = [(21.7in. / 12ipf) \cdot 0.34 \cdot 386.1 ft^2] / 0.85$$

$$ETWU-7 = 279.8 ft^3$$

Check the Capture & Use Volume (Vcu) vs. the 7-Month Estimated Total Water Usage (ETWU-7):

Vcu vs. ETWU-7

$$279.8 ft^3 \text{ vs. } 279.8 ft^3$$

$$279.8 ft^3 = 279.8 ft^3$$

$$V_{cu} = ETWU-7$$

✓ - CHECKED





Project Number: PV321294
 Street Address: 6255 De Forest Ave.
 85th Rainfall Depth: 0.90 inches

Date: 2/26/2021
 ECD: 0 0

LID BMP	Design Summary										Material Summary										
	Drainage Area At (ft ²)	Impervious Area Ai (%)	Catchment Area Acat (ft ²)	Design Capture Vol. Vcap (ft ³)	Required Planter Area Ap (ft ²)	Capture & Use Volume Vcu (ft ³)	Biofiltration Volume Vbf (ft ³)	Minimum Plant Factor PF ---	Soil Depth Dsoil (in.)	Ponding Depth Dpond (in.)	Planter Depth (Interior) Dip (in.)	Permavoid Units (Quantity)		Capillary Cones (Quantity)		Wicking Geotex. (Roll-ft)	Tie Connectors	Shear Connectors	Est. Soil Volume (CY)		
ID - #	4,145	100.0%	3,731	280	386	280	0	0.34	18.0	N/A	27.5	85s	85HD	PV150	36/90	36/60+ 24/30	23/160T Pairs	60	1,144	48	23.6
CU-1	4,145	100.0%	3,731	280	386	280	0	0.34	18.0	N/A	27.5	0	143	143	0	0	215	60	1,144	48	23.6
Total	4,145	---	3,731	280	386	280	0	---	---	---	---	0	143	143	0	0	215	60	1,144	48	23.6

Permavoid Los Angeles LID Table 1.1

REF: 00PV321294w8747A

Permavoid Planter Soil Requirements (non-traffic loading):

- 75% (+/- 5%) by weight shall consist of sand meeting the following:
 - For soil depths of 6 to 12 inches, average particle size shall be 500µm (0.020 in.)
 - For soil depths of 12 to 24 inches, average particle size shall be 300µm (0.012 in.)
- Soils shall have a uniformity coefficient of 4.0 or less.
- Soils shall have less than 10% fines (passing 200 sieve) by weight.
- Soils used for biofiltration shall meet "Attachment H. Biofiltration / Biofiltration Design Criteria" as provided by the California Regional Water Quality Control Board.