LOW IMPACT DEVELOPMENT (LID) STUDY

HILLCREST GATEWAY PROJECT

2712 Park Avenue
La Verne, CA.

OWNER:

Hillcrest
2705 Mountain View Drive
La Verne, CA. 91750

PREPARED BY:

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Glendora, CA. 91741
(626) 335-3055

I. Introduction

The property owner proposes to redevelop this single family residential parcel with two single story, detached residential units. The project is located in an area of mixed residential uses. The lot currently contains a one story single family residence and detached two car garage.

A. Project Location

The site is located on the East side of Park Avenue between Sixth and Elmcrest Streets. The lot area is 12,777 square feet, and vehicle access is attained from Park Avenue, a public street.

B. Project Description

The developer is proposing to construct a pair of one story single family residences. Each proposed house will be 2,088 square feet in area. Both will have an attached 2 car enclosed garages accessed by a shared concrete driveway.

II. Site Assessment and Design Considerations

A. Designated or Non-Designated Projects

In Section 2.1 of the LID Manual there are 9 bullet points used to determine if a project is a Designated Project. If the project doesn't conform to any of these criteria they are determined to be a Non-Designated Project. Only 2 of these bullet points, however, are relevant to this project.

Bullet Point 1 references properties that are greater in size than one acre (43,560 s.f.). At 12,777 square feet this site is 0.29 acre and thus well below the Designated Project threshold.

Bullet Point 9 refers to “Redevelopment projects, which are developments that result in creation or addition or replacement of 10,000 square feet or more of impervious surface area on a site that was previously developed as a single family home.”

Based upon the foregoing I believe that this proposed development should not be subject to the requirements for a Designated Project. The lot in its entirety is marginally larger than 10,000 square feet threshold and when the landscaping area is deducted falls well below that limit. Therefore this project does qualify as a Non-Designated Project.

B. Small Scale or Large Scale Non-Designated Projects

In Section 3.1 of the LID manual a Small Scale Non-Designated Project must be residential in nature and consist of 4 or fewer units.

Though this site redevelopment is residential in nature it involves the construction of 2 new residences and therefore qualifies as a Small Scale Non-Designated Project.

C. Project Area Sizes

According to Los Angeles County Assessors Map Book 8381, Page 10, Parcel 033 measures 100 feet by 127.77 feet or 12,777 square feet (0.29 acre).

D. Drainage Areas

As presently graded Parcels 1 slopes gently from North to South at a rate of about 1%.

Currently free standing masonry walls separate the site from Hillcrest's own property to the North and East. Therefore no contributory drainage comes from either North or the East. Consequently only stormwater originating on site will be contained and infiltrated.

E. Location of Stormwater Runoff Discharge

The site has historically surface drained Westerly to Park Avenue. As a Small Scale Non-Designated Project storm runoff water will be collected on site and then be infiltrated using both Permeable Pavement without an Underdrain (RET-5) for the driveway and turn around areas as well as an Infiltration Trench (RET-3) located in the landscaped area. Specific details will be incorporated in the final site Grading and Drainage Plan.

F. Land Use Type

The current and future land use designation for this property is PR4.5D (Planned Residential 4.5 DU per acre-Detached). This land use designation acknowledges the type of development anticipated the General Plan authors.

G. Activities Expected On-Site

This proposal is to construct 2 single family residences on this parcel. As mentioned earlier these houses will each be 2,088 square feet, single story with 2 car attached garages.

III. Geotechnical Conditions

A. Topography

This site is relatively flat with surface water directed Westerly to the adjoining Park Avenue. Currently the lot is occupied by a single family residence with detached garage and several outdoor amenities. Based upon the current topography and an examination of the immediate surroundings the only rainfall runoff affecting it emanates only on the site. All offsite drainage is prevented from entering the site by perimeter walls.

B. Soil Type and Geology

The Geotechnical Investigation report prepared by RMA Geoscience (RMA) dated June 12, 2024 identifies top soil consists of 12 to 18 inches of silty fine sand (SM) with traces of gravel and clay. This soil was considered moist to very moist (no doubt due to frequent surface irrigation).

Underlying soil was reported to be “older alluvium …with Silty Sand with gravel and clay and medium to coarse sand with gravel and silt.”

An Infiltration Testing Report prepared by RMA Geoscience and dated June 18, 2024 recommended that a design infiltration rate of 1.0 inches per hour be used for design purposes. This exceeds the minimum acceptable limit of 0.3 inches per hour indicating the on-site soils are suitable for stormwater infiltration.

C. Groundwater

According to RMA's Geotechnical Investigation report no groundwater was encounter in any of the 9 test borings. In their report they indicate the "Depth to historic high groundwater is greater than 100 feet below existing grade according to the Seismic Hazard Zone Report for the area (CDMG, 1998)".

Based upon the location of groundwater it would appear that bedrock is located at a depth greater than 100 feet below the ground surface.

D. Other Geotechnical Issues

Collapsible Soil

Given the soil type described in the RMA's Geotechnical Investigation report there is little or no possibility of collapsible soil existing at this location. To quote the LID Standards Manual collapsible soils are"…sediments that are loosely deposited, separated by coatings or particles of clay or carbonate and subject to saturation." Silty sand and alluvium do not fit this profile.

Expansive Soil

The soil profile for silty sand indicates is not expansive and contains limited amounts of clay. RMA's lab findings verify this conclusion. The Expansion Index test results varied from 0 to 27. Expansion Test value of 0 is considered Very Low (0-20) while 27 is considered to be Low (21-50). Leaning to the conservative RMA has determined that the on-site soil expansion index is considered Low.

Slopes/Landslides

The sites are relatively flat and contain no slopes nor will there be any slopes when site grading is completed. As RMA has reported "According to the California Geological Survey Seismic Hazard Zone Map (1999) "…the site(s) do not lie in a landslide zone."

Faults

Though the three sites are not located within an Alquist-Priolo Earthquake Fault Zone the Cucamonga branch of the Sierra Madre Fault is locate about 6 miles Northeast of the 3 sites. There is a possibility that moderate to intense ground shaking could occur in the future.

Liquefaction

Per RMA's report no groundwater should be expected above a depth of 100 feet. Since high groundwater is not an issue here and the soil is well drained there is little or no chance of liquefaction occurring during a seismic event or infiltration of surface runoff.

IV. Source Control Measures

As shown in Table 5-1 Source Control Measures Selection Matrix (LID Standards Manual, page 5-3) there are various required Source Control Measures for Non-Designated Projects. These are:

- Storm Drain Message and Signage (S-1)
- Landscape Irrigation Practices (S-8)
- Building Materials (S-9)

Storm Drain Message and Signage (S-1)

Since there will be no onsite catch basins serving these projects as all rainfall runoff will be retained and infiltrated on-site then a sign and painted message are impractical.

Landscape Irrigation Practices (S-8)

The project landscape designer will be directed to employ measures that will reduce excessive irrigation runoff including but not limited to using:

Rain triggered shut off devices

Adjust irrigation system design to specific plantings

Include flow reducers or shut off valves to prevent loss due to breakage.

Follow local water conservation methods and techniques.

Building Materials (S-9)

Alternative building materials will be considered by the project architect. These may include the use of properly coated metal flashing, vents, etc.

V. Delta Storm Water Quality Design Volume (△SWQDv)

Section 6 of the LID Standards Manual states that "Current water quality requirements are based on treating a specific volume of storm water runoff from the site (SWQDv)." "…it is expected that pollutant loads….will be reduced in the discharge…".

It is the developer's desire to utilize two previously mentioned retention and infiltration devices to disperse the projected storm water runoff. However to verify the effectiveness of these measures the Los Angeles County Department of Public Works HydroCalc

program will be utilized to determine the anticipated storm water volume.

The storm water volume utilized is established incorporating the following data:

- Site Area = 12,777 sq. ft. = 0.29 acre
- Existing Impervious Area = 6,408 sq. ft.
- Proposed Impervious Area = 7,738 sq. ft.
- Existing Impervious Area percentage = 6,408/12,777 = 50%
- Proposed Impervious percentage = 7,738/12,777 = 61%
- Soil type = 012
- 85^{th} percentile, 24 hour storm total = 1.0 in.
- Flow path (before) = 168 ft.
- Flow path (after) = 211 ft.
- Average slope = 1.0%

$V_u = 546 ft^3$

$V_d = 632 ft^3$

$\triangle SWQDv = V_d - V_u = 632 ft^3 - 546 ft^3 = 86 ft^3$

The onsite drainage system will be designed to collect and infiltrate the $\triangle SWQD_V$ runoff.

VI. Stormwater Quality Control Measure Maintenance

The property owner will be required to execute any applicable Covenants and Agreements for the Maintenance of all BMPs and devices constructed or installed as part of the project (see Exhibits K & L). When those documents are executed they will be filed with the City of La Verne for eventual recording by the County Recorder.

The property owner will also be responsible to maintain any applicable BMPs in an effective and efficient condition and the City shall have all necessary enforcement powers to assure such maintenance is completed.

LIST OF EXHIBITS

A. Los Angeles County Assessor's Parcel Map

B. Los Angeles County Department of Public Works LID Manual Table 5-1

C. Los Angeles County DPW 85th Percentile 24 hour Rainfall Isohyetal Map

D. Los Angeles County DPW Soil Type Map

E. Los Angeles County DPW Soil Identification Table

F. Infiltration Trench (RET-3)

G. Permeable Pavement without an Underdrain (RET-5)

H. Los Angeles County DPW HydroCalc Analysis-Sub Area 1A-before

J. Los Angeles County DPW HydroCalc Analysis-Sub Area 1A-after

K. Covenant and Agreement (sample)

L. Covenant for Maintenance (sample)

M. Conceptual Site Grading Plan

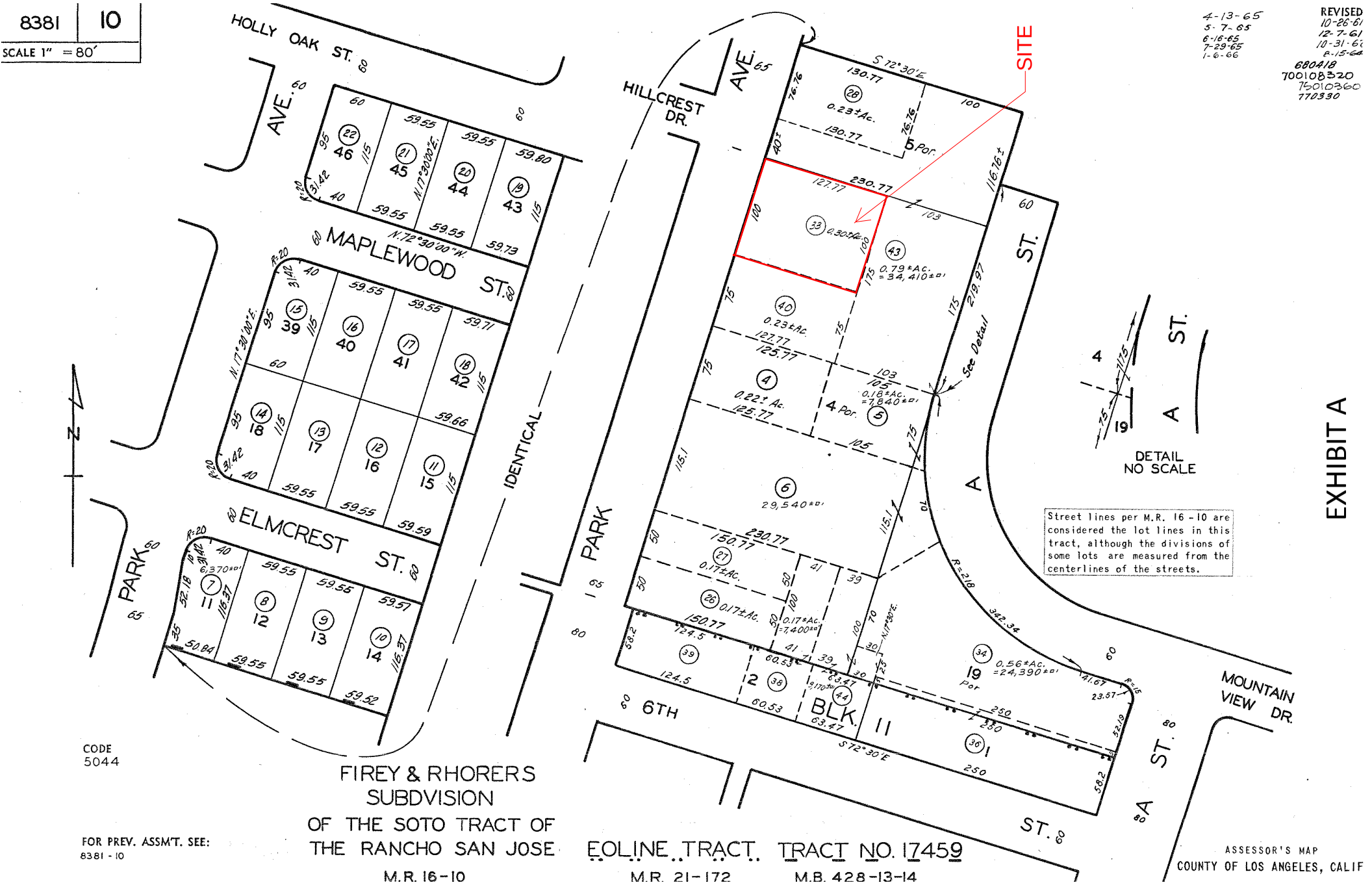

8381 | 10
SCALE 1" = 80'
HOLLY OAK ST.
AVE.
MAPLEWOOD ST.
ELMCREST ST.
PARK
HILLCREST DR.
IDENTICAL
SITE
S 72°30'E
N 17°30'00"E
N 72°30'00"W
130.77
230.77
127.77
125.77
150.77
124.5
60.53
63.47
0.23±Ac.
0.30±Ac.
0.79±Ac. = 34,410±D.
0.22±Ac.
0.18±Ac. = 7,840±D.
29,540±D.
0.17±Ac.
0.17±Ac. = 7,400±D.
0.56±Ac. = 24,390±D.
4 Por.
5 Por.
19 Por.
2 BLK. 11
See Detail
DETAIL NO SCALE
Street lines per M.R. 16 - 10 are considered the lot lines in this tract, although the divisions of some lots are measured from the centerlines of the streets.
EXHIBIT A
4-13-65
5-7-65
6-16-65
7-29-65
1-6-66
REVISED
10-26-61
12-7-61
10-31-61
8-15-64
680418
700108320
750103 60
770390
CODE 5044
FOR PREV. ASSM'T. SEE: 8381 - 10
FIREY & RHORERS SUBDIVISION OF THE SOTO TRACT OF THE RANCHO SAN JOSE
M.R. 16-10
EOLINE TRACT TRACT NO. 17459
M.R. 21-172 M.B. 428-13-14
ASSESSOR'S MAP
COUNTY OF LOS ANGELES, CALIF

Table 5-1. Source Control Measures Selection Matrix (continued)

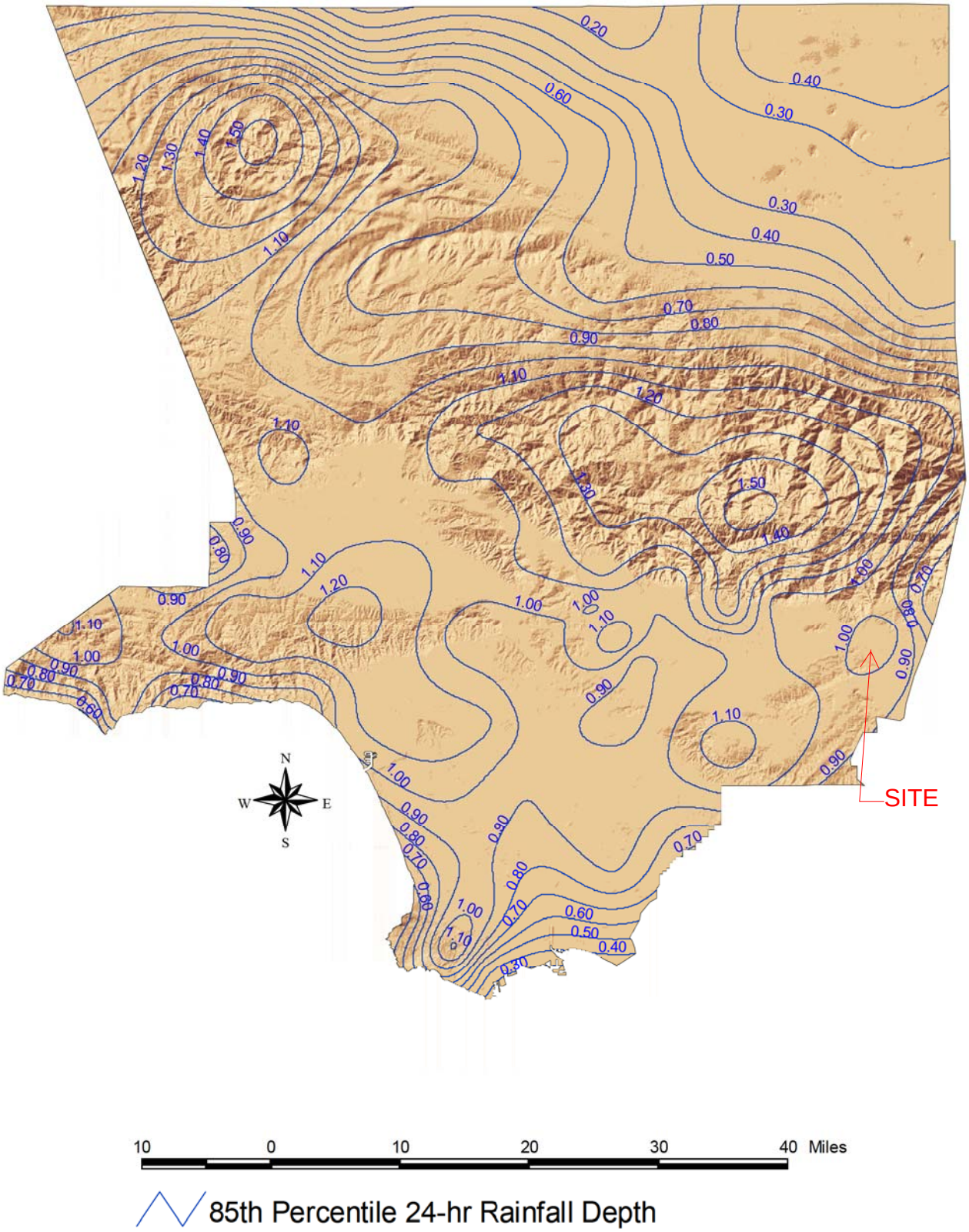
Project Type	Source Control Measure										
	Storm Drain Message and Signage (S-1)	Outdoor Material Storage Area (S-2)	Outdoor Trash Storage/ Waste Handling Area (S-3)	Outdoor Loading/Unloading Dock Area (S-4)	Outdoor Vehicle/Equipment Repair/Maintenance Area (S-5)	Outdoor Vehicle/ Equipment/ Accessory Wash Area (S-6)	Fuel & Maintenance Area (S-7)	Landscape Irrigation Practices (S-8)	Building Materials (S-9)	Animal Care and Handling Facilities (S-10)	Outdoor Horticulture Areas (S-11)
Designated Projects – Redevelopment											
Projects creating or adding ≥5,000 ft^2	R	R^1	R^1	R^1	R^1	R^1	R^1	R	R	R^1	R^1
Projects altering existing impervious surface	R	R^1	R^1	R^1	R^1	R^1	R^1	R	R	R^1	R^1
Non-Designated Projects											
Small-Scale Residential Projects	R	R^1	R^2	–	–	–	–	R	R	–	–
Large-Scale Projects	R	R^1	R^1	R^1	R^1	R^1	R^1	R	R	R^1	R^1

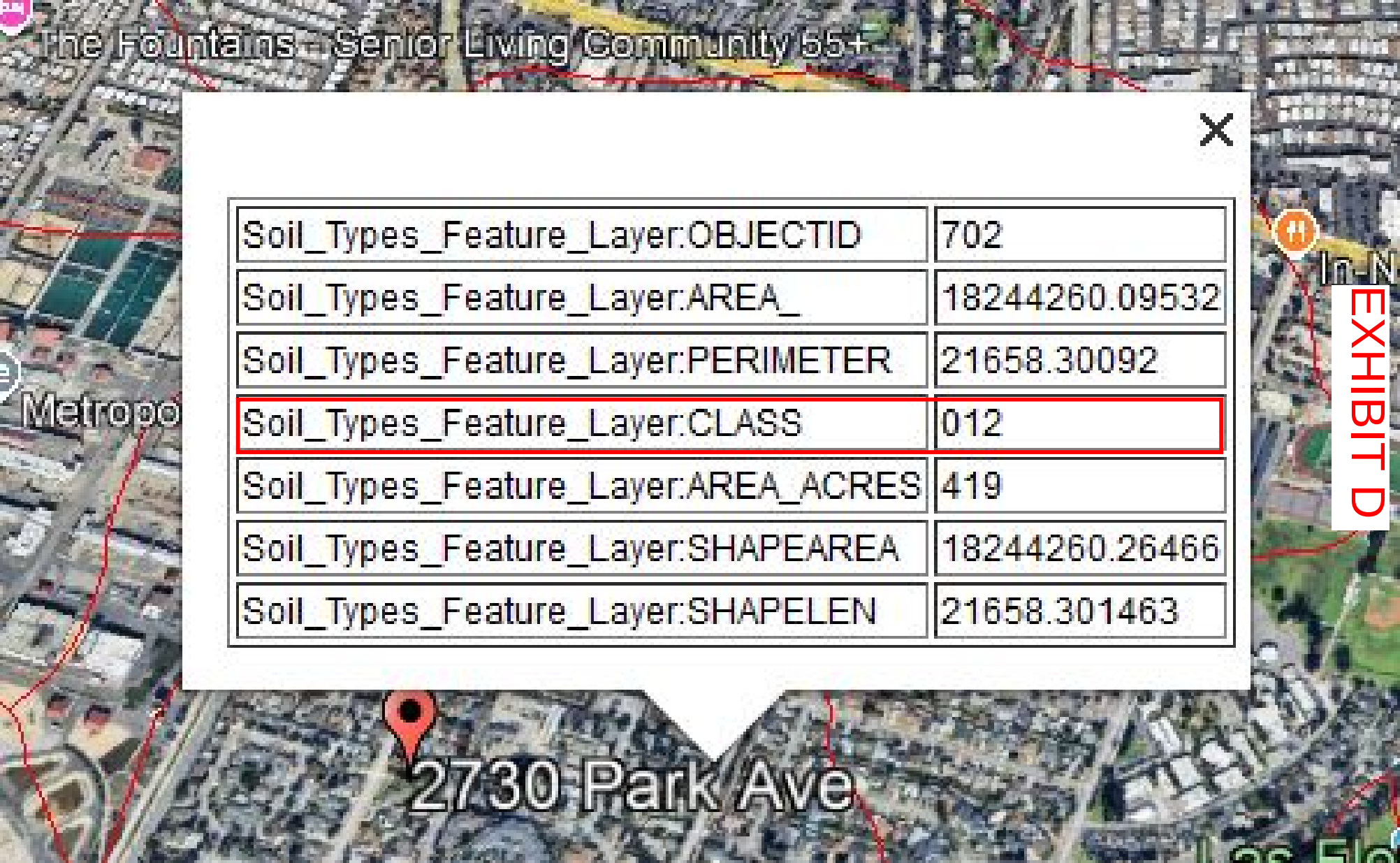
R = required; R^1 = required if outdoor activity area is included in project; R^2 = required for multi-family dwellings

EXHIBIT B

EXHIBIT C

85th Percentile 24-hr Rainfall Isohyetal Map





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Soil_Types_Feature_Layer:PERIMETER	21658.30092
Soil_Types_Feature_Layer:CLASS	012
Soil_Types_Feature_Layer:AREA_ACRES	419
Soil_Types_Feature_Layer:SHAPEAREA	18244260.26466
Soil_Types_Feature_Layer:SHAPELEN	21658.301463

EXHIBIT E

Soil Identification Table

Number	Name	Original Name
2	ALTAMONT CLAY LOAM	A
3	CHINO SILT LOAM	CS-1
4	DIABLO CLAY LOAM	DY
5	HANFORD FINE SANDY LOAM	HF
6	HANFORD FINE SANDY LOAM	HF-1
7	HANFORD GRAVELLY SANDY LOAM	HG
8	HANFORD SILT LOAM	HN
9	MONTEZUMA CLAY ADOBE	M
10	OAKLEY FINE SAND	OS
11	PLACENTIA LOAM	PL
12	RAMONA CLAY LOAM	RC- 1
13	RAMONA LOAM	RO
14	RAMONA SANDY LOAM	RS
15	TUJUNGA FINE SANDY LOAM	TF
16	YOLO LOAM	Y
17	YOLO CLAY LOAM	YC
18	YOLO FINE SANDY LOAM	YF
19	YOLO GRAVELLY SANDY LOAM	YG
20	YOLO SANDY LOAM	YS
21	SANTA MONICA MOUNTAINS	SMM-1
22	SANTA MONICA MOUNTAINS	SMM-2
23	SANTA MONICA MOUNTAINS	SMM-3
24	SANTA MONICA MOUNTAINS	SMM-4
25	SANTA MONICA MOUNTAINS	SMM-5
26	SANTA MONICA MOUNTAINS	SMM-6
27	SANTA MONICA MOUNTAINS	SMM-7
28	SANTA MONICA MOUNTAINS	SMM-8
29	SANTA MONICA MOUNTAINS	SMM-9
30	SANTA MONICA MOUNTAINS	SMM-10
31	SANTA MONICA MOUNTAINS	SMM- 11
32	SANTA MONICA MOUNTAINS	SMM-12
33	SANTA MONICA MOUNTAINS	SMM-13
34	SANTA MONICA MOUNTAINS	SMM-14
35	SANTA MONICA MOUNTAINS	SMM-15
36	SANTA MONICA MOUNTAINS	SMM-16
37	SANTA MONICA MOUNTAINS	SMM- 17
38	SANTA MONICA MOUNTAINS	SMM- 18

sediment reduction (e.g., vegetated swales, vegetated filter strips, sedimentation manholes, and proprietary devices).

Setbacks

Infiltration trenches must be sited following the setbacks from the most recent GMED Policy GS 200.1.

Geometry

- Infiltration trenches must be designed and constructed to be at least 24 inches wide and 3 to 5 feet deep.
- The longitudinal slope of the trench should not exceed three percent.
- The filter bed media layers must have the following composition and thickness:
  - Top layer: 2 inches of pea gravel
  - Middle layer: 3 to 5 feet of washed 2- to 6-inch gravel; void spaces should be approximately 30 to 40 percent
  - Bottom layer: 6 inches of sand or geomembrane liner equivalent.

Sizing

Infiltration trenches are sized a simple sizing method where the SWQDv must be completely infiltrated within 96 hours. Infiltration trenches provide stormwater runoff storage in the voids of the rock fill or percolation tank modules.

Step 1: Determine the SWQDv

Infiltration trenches must be designed to capture and retain the SWQDv (see Section 6 for SWQDv calculation procedures).

Step 2: Determine the design infiltration rate

Determine the corrected in-situ infiltration rate (f_{design}) of the native soil using the procedures described in the most recent GMED Policy GS 200.1.

Step 3: Calculate the surface area

Determine the size of the required infiltration surface by assuming the SWQDv will fill the available void spaces of the gravel storage layer. The maximum depth of stormwater runoff that can be infiltrated within the maximum retention time (96 hrs) is calculated using the following equation:

$$d_{max} = \frac{f_{design}}{12} \times t$$

Where:

d_{max} = Maximum depth of water that can be infiltrated within the maximum retention time [ft];
f_{design} = Design infiltration rate [in/hr]; and
t = Maximum retention time (max 96 hrs) [hr].

Select the infiltration trench depth (d_t) such that:

$$d_t \leq \frac{d_{max}}{n_t}$$

Where:

d_t = Depth of infiltration trench [ft];
d_{max} = Maximum depth of water that can be infiltrated within the maximum retention time [ft]; and
n_t = Infiltration trench fill porosity.

Calculate the infiltrating surface area (bottom of the infiltration trench) required:

$$A = \frac{SWQDv}{d_t \times n_t}$$

Where:

A = Surface area of the bottom of the infiltration trench [ft^2];
SWQDv = Stormwater quality design volume [ft^3];
d_t = Depth of infiltration trench fill [ft]; and
n_t = Infiltration trench porosity.

Flow Entrance and Energy Dissipation

Energy dissipation controls, constructed of sound materials such as stones, concrete, or proprietary devices that are rated to withstand the energy of the influent flow, must be installed at the inlet to the infiltration trench. Flow velocity at the inlet must be 4 ft/s or less. Consult with LACDPW for the type and design of energy dissipation structure.

Drainage

The specifications for designing drainage systems for infiltration trenches are presented below:

- The bottom of infiltration trench must be native soil that is over-excavated at least one foot in depth with the soil replaced uniformly without compaction. Amending the excavated soil with two to four inches (~15 to 30 percent) of coarse sand is recommended.

- The use of vertical piping, either for distribution or infiltration enhancement, is prohibited. This application may be classified as a Class V Injection Well per 40 CFR Part 146.5(e)(4).
- The infiltration capacity of the subsurface layers should be sufficient to ensure a maximum detention time of 96 hours. An observation well must be installed to allow observation of detention time.

Hydraulic Restriction Layer

The entire infiltrative area, including the side slopes must lined with a geomembrane liner to prevent soil from migrating into the top layer and reducing the infiltration capacity. The specifications of the geomembrane liner are presented in Table E-5. The entire trench area, including the sides, must be lined with a geomembrane liner prior to placing the media bed. Provide generous overlap at the seams.

Table E-5. Geomembrane Liner Specifications for Infiltration Trenches

Parameter	Test Method	Specifications
Material		Nonwoven geomembrane liner
Unit weight		8 oz/yd^3 (minimum)
Filtration rate		0.08 in/sec (minimum)
Puncture strength	ASTM D-751 (Modified)	125 lbs (minimum)
Mullen burst strength	ASTM D-751	400 lb/in^2 (minimum)
Tensile strength	AST D-1682	300 lbs (minimum)
Equiv. opening size	US Standard Sieve	No. 80 (minimum)

Observation Well

The observation well is a vertical section of perforated PVC pipe, four- to six-inch diameter, installed flush with the top of the infiltration trench on a footplate and with a locking, removable cap. The observation well is needed to monitor the infiltration rate in infiltration trench and is useful for marking the location of the infiltration trench.

Vegetation

- Infiltration trenches must be kept free of vegetation.
- Trees and other large vegetation should be planted away from infiltration trenches such that drip lines do not overhang the infiltration area.

Restricted Construction Materials

Use of pressure-treated wood or galvanized metal at or around an infiltration trench is prohibited.

Overflow Device

An overflow device must be provided in the event that stormwater runoff overtops the infiltration trench or if the infiltration trench becomes clogged. The overflow device must be able to convey stormwater runoff to a downstream conveyance system or other acceptable discharge point.

Maintenance Access

The infiltration trench must be safely accessible during wet and dry weather conditions if it is publicly-maintained. An access road along the entire length of the infiltration trench is required unless the trench is located along an existing road or parking lot that can be safely used for maintenance access. If the infiltration trench becomes plugged and fails, access is needed to excavate the infiltration trench and replace the filter bed media. All dimensions of the infiltration trench should also be increased by two inches to provide a fresh surface for infiltration. To prevent damage and compaction, access must able to accommodate a backhoe working at "arm's length" from the infiltration trench.

Maintenance Requirements

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

- Conduct regular inspection and routine maintenance for pretreatment devices.
- Inspect infiltration trench and its observation well frequently to ensure that water infiltrates into the subsurface completely within the maximum detention time of 96 hours. If water is present in the observation well more than 96 hours after a major storm, the infiltration trench may be clogged. Maintenance activities triggered by a potentially clogged facility include:
    - Check for debris/sediment accumulation, rake surface and remove sediment (if any), and evaluate potential sources of sediment and vegetative or other debris (i.e., embankment erosion, channel scour, overhanging trees). If suspected upstream sources are outside of the County's jurisdiction, additional pretreatment (i.e., trash racks, vegetated swales) 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 infiltration trench may need to be excavated and replaced.
- Eliminate standing water to prevent vector breeding.
- Inspect infiltration trenches annually. Remove and dispose of trash and debris as needed, but at least prior to the beginning of the wet season.
- Inspect overflow devices for obstructions or debris, which should be removed immediately. Repair or replace damaged pipes upon discovery.

A summary of potential problems that may need to be addressed by maintenance activities is presented in Table E-6.

The County requires execution of a maintenance agreement to be recorded by the property owner for the on-going maintenance of any privately-maintained stormwater quality control measures. The property owner is responsible for compliance with the maintenance agreement. A sample maintenance agreement is presented in Appendix H.

Table E-6. Infiltration Trench 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, inlet or overflow structures	Remove sediment, debris, and/or oil/grease.
Water Drainage Rate	Standing water, or by inspection of observation wells	Remove the top layer of the infiltration trench bottom and replace if necessary.

RET-5: Permeable Pavement without an Underdrain

Description

Permeable pavement includes permeable interlocking concrete pavers, pervious concrete, or porous asphalt pavement that is flat in all directions. Permeable pavement can be used to infiltrate stormwater runoff into the porous pavement and sublayers of sand and gravel and subsequently into the underlying soil and groundwater, if present.

Permeable interlocking concrete pavement is comprised of a layer of durable concrete pavers or blocks separated by joints filled with small stones. Pervious concrete is made from carefully controlled amounts of water and cement materials used to create a paste that forms a thick coat around aggregate particles. Unlike conventional concrete, the mixture contains little or no sand, which creates a substantial void content (between 15 and 25 percent). Porous asphalt, or "open-graded" asphalt, pavement contains no fine aggregate particles, which creates void spaces in the pavement and allows water to collect within and drain through the pavement. An alternative approach for permeable pavement is to use stabilized grassy porous pavement, consisting of grass turf reinforced with plastic rings and filter fabric underlain by gravel. Permeable pavement is highly versatile and can be used in place of impermeable asphalt in many situations.

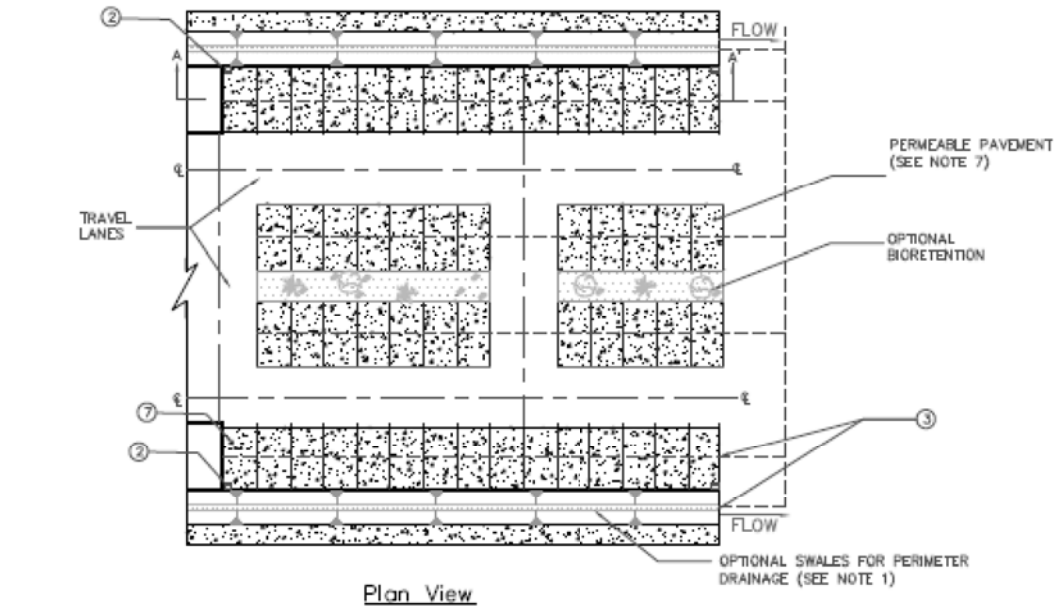
A schematic of a typical permeable pavement system without an underdrain is presented in Figure E-5.

LID Ordinance Requirements

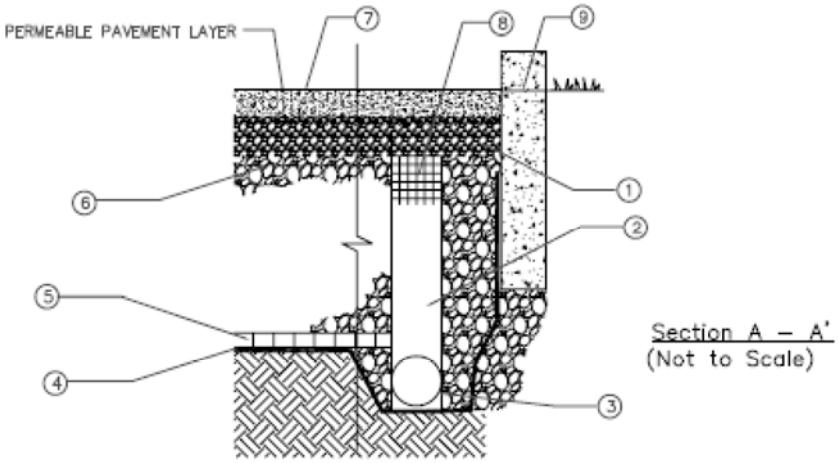
Permeable pavement without an underdrain may be used to comply with the on-site retention requirements of the LID Ordinance for at least its tributary area. The remaining project site SWQDv may need to be routed to other stormwater quality control measures for on-site retention. Permeable pavement without an underdrain will prevent pollutants in the SWQDv from its tributary area from being discharged off-site.

Advantages

- Reduces stormwater runoff volume and peak flows during small storm events
- Can serve functional and aesthetic purposes
- Can reduce heat island effects if light color concrete pavements are used
- Creates dual use for limited space (e.g., parking and stormwater management provided within same space) and can reduce the need and space required for separate stormwater quality control measures



Plan View
(Not to Scale)



Section A – A'
(Not to Scale)

NOTES:

1. BEDDING COURSE SHALL BE 1½" TO 3" MIN THICKNESS (TYP NO. 8 AGGREGATE).
2. OPTIONAL OVERFLOW PIPE(S) SHALL BE PROVIDED IF OVERFLOWS ARE NOT MANAGED VIA PERIMETER DRAINAGE TO SWALES, BIORETENTION OR STORM WATER CONVEYANCE SYSTEM INLETS.
3. CONNECT OUTFALL PIPES TO DOWNSTREAM STORMWATER CONVEYANCE SYSTEM. OUTFALL PIPES SHALL BE SLOPED TOWARDS COLLECTION SYSTEM.
4. SOIL SUBGRADE SHALL HAVE ZERO SLOPE.
5. INSTALL GEOTEXTILE OR CHOKING LAYER ON BOTTOM & SIDES OF OPEN-GRADED BASE FOR FULL AND PARTIAL INFILTRATION, OR AN IMPERMEABLE LINER FOR NO INFILTRATION.
6. OPEN-GRADED BASE. THICKNESS AND GRADATION VARIES WITH DESIGN. TYP. NO. 57 AGGREGATE OR 4" THICK NO. 57 OVER NO. 2 STONE SUBASE. THICKNESS OF SUB-BASE VARIES WITH DESIGN.
7. PERMEABLE PAVEMENT INFILTRATIVE LAYER
8. OPTIONAL RIGID PLASTIC SCREEN FASTENED OVER OVERFLOW INLETS.
9. CURB/EDGE RESTRAINT WITH CUT-OUTS FOR OVERFLOW DRAINAGE TO PERIMETER BMPS, STORMWATER CONVEYANCE SYSTEM INLETS OR OPTIONAL OVERFLOW PIPES.

Figure E-5. Permeable Pavement without an Underdrain Schematic

Disadvantages

- May not be appropriate for industrial sites or locations with contaminated soils or where spills may occur because of the potential threat to groundwater contamination
- Is not appropriate for high turning areas or areas with heavy truck or equipment use
- A sacrificial non-infiltrating area will develop in the transition area between the permeable pavement and natural areas
- Results in an uneven driving surfaces and potential traps for high-heeled shoes
- Requires frequent maintenance to maintain effectiveness due to clogging from sediment if not situated properly
- Has a high cost for restorative maintenance if the system seals with sediment and can no longer function properly as permeable pavement

General Constraints and Implementation Considerations

- Permeable pavement may be used for sidewalks, walkways, and patios.
- Permeable pavement may be used in low vehicle-movement areas. Potential applications may include the following:
    - Low vehicle movement airport zones;
    - Parking aprons and maintenance roads;
    - Crossover/emergency stopping/parking lanes on divided highways;
    - Residential street parking lanes;
    - Residential driveways;
    - Overflow parking; and
    - Emergency vehicle and fire access lanes in apartment/multi-family/complex facilities.
- Permeable pavement must be installed on relatively flat surfaces with slopes less than 10 percent.
- Solid asphalt or concrete pavement for vehicle movement lanes should be used leading up to permeable pavement parking pads.
- Grass may be planted in block voids, but would require irrigation and lawn care.
- If possible, the entire tributary area of the permeable pavement area should be stabilized before construction begins. If this is not possible, all flows should be diverted around the permeable pavement area to protect it from sediment loads during construction.

- The equipment used to construct the permeable pavement should have extra wide low-pressure tires. Construction traffic should not enter the permeable pavement area because it can compact soil, which reduces infiltration capacity.
- Permeable pavement should not be installed during periods of extreme high or low temperatures. The mix should be transported to the project site in clean vehicles with smooth dump beds that have been sprayed with a non-petroleum release agent. The mix should be covered during transit to limit cooling.
- The surface should be compacted when it is cool enough to resist a 9-Mg roller (class equivalent of a 10-ton roller). One or two passes are needed to provide proper compaction. Any additional passes may reduce porosity.
- Vehicular traffic is prohibited until cooling and hardening have taken place, which is no sooner than six hours, but preferably two days.

Design Specifications

Minimum and maximum dimensions and other specifications are product-specific and must comply with manufacturer's recommendations. The following sections provide design specifications for permeable pavement systems without an underdrain.

Geotechnical

Due to the potential to contaminate groundwater, cause slope instability, impact surrounding structures, and potential for insufficient infiltration capacity, an extensive geotechnical site investigation must be conducted during the site planning process to verify site suitability for permeable pavement without an underdrain. All geotechnical investigations must be performed according to the most recent GMED Policy GS 200.1. Soil infiltration rates and the groundwater table depth must be evaluated to ensure that conditions are satisfactory for proper operation of a permeable pavement system. The project applicant must demonstrate through infiltration testing, soil logs, and the written opinion of a licensed civil engineer that sufficiently permeable soils exist on-site to allow the construction of a properly functioning permeable pavement system without an underdrain.

Permeable pavement systems without an underdrain are appropriate for soils with a minimum corrected in-situ infiltration rate of 0.3 in/hr. The geotechnical report must determine if the proposed project site is suitable for a permeable pavement system without an underdrain and must recommend a design infiltration rate (see "Design Infiltration Rate" under the "Sizing" section). The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move through the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Setbacks

Permeable pavement must be sited following the setbacks from the most recent GMED Policy GS 200.1.

Sizing

Permeable pavement is sized using a simple sizing method where the SWQDv must be completely infiltrated within 96 hours. Permeable pavement provides stormwater runoff storage in the voids of the sub-base reservoir layer.

Step 1: Determine the SWQDv

Dry wells must be designed to capture and retain the SWQDv (see Section 6 for SWQDv calculation procedures).

Step 2: Determine the design infiltration rate

Determine the corrected in-situ infiltration rate (f_{design}) of the native soil using the procedures described in the most recent GMED Policy GS 200.1.

Step 3: Calculate the surface area

The depth of the sub-base reservoir layer is calculated using the following equation:

$$d_{max} = \frac{\mathrm{f_{design}}}{12} \times t$$

Where:

d_{max} = Maximum depth of sub-base reservoir layer [ft];
f_{design} = Design infiltration rate [in/hr];
t = Maximum retention time (max 96 hrs) [hr]; and

Select the permeable pavement sub-base reservoir layer depth (d_t) such that:

$$d_t \leq \frac{d_{max}}{n_t}$$

Where:

d_t = Depth of permeable pavement sub-base reservoir layer [ft];
d_{max} = Maximum depth of water that can be infiltrated within the maximum retention time [ft]; and
n_t = permeable pavement sub-base reservoir layer porosity.

The required permeable pavement surface area is calculated using the following equation:

$$A_s = \frac{SWQDv}{\mathrm{d_t} \times n_t}$$

Where:

A_s = Permeable pavement surface area [ft^2];
SWQDv = Stormwater quality design volume [ft^3]; and
d_t = Depth of permeable pavement sub-base reservoir layer [ft]; and
n_t = Infiltration trench porosity.

Underlying Base Layers

The cross-section of a permeable pavement typically consists of the four layers discussed below:

Asphalt Layer

The surface asphalt layer consists of an open-graded asphalt mixture with a two- to four-inch depth depending on required bearing strength and permeable pavement design requirements. Permeable pavement contains approximately 16 percent voids, compared to 3 to 5 percent for conventional pavements, to allow quick stormwater runoff infiltration.

The asphalt layer must be laid over the top filter layer in one lift. The laying temperature should be between 240 and 260 degrees Fahrenheit with an ambient temperature above 50 degrees Fahrenheit.

Top Filter Layer

The top filter layer, which stabilizes the asphalt layer, consists of one to two inches of 0.5-inch-diameter crushed stone.

Reservoir Layer

The reservoir layer consists of 1.5- to 3-inch crushed stone. The depth of this layer depends on the desired storage volume, which is a function of the infiltration rate, void spaces, and in colder climates the depth of the frost line, but typically ranges from two to four feet. The reservoir layer must be constructed in lifts and lightly compacted. The base courses should be kept free of all dirt and debris during construction. The reservoir layer should be designed to completely drain in 96 hours.

Bottom Filter Layer

This bottom filter layer, which stabilizes the reservoir layer and is the interface between the reservoir layer and the geomembrane liner covering the underlying soil, consists of a two inch thick layer of 0.5-inch crushed stone.

Hydraulic Restriction Layer

The entire area where permeable pavement will be used must be lined with a geomembrane liner to prevent soil from migrating into the reservoir layer and reducing

storage capacity. The specifications of the geomembrane liner are presented in Table E-9. The entire permeable pavement area, including the sides, must be lined with geomembrane liner prior to placing the aggregate. Provide generous overlap at the seams.

Table E-9. Geomembrane Liner Specifications for Permeable Pavement

Parameter	Test Method	Specifications
Material		Nonwoven geomembrane liner
Unit weight		8 oz/yd^3 (minimum)
Filtration rate		0.08 in/sec (minimum)
Puncture strength	ASTM D-751 (Modified)	125 lbs (minimum)
Mullen burst strength	ASTM D-751	400 lb/in^2 (minimum)
Tensile strength	AST D-1682	300 lbs (minimum)
Equiv. opening size	US Standard Sieve	No. 80 (minimum)

Overflow Device

Provide an overflow device to convey high stormwater runoff flows to another stormwater quality control measure, the storm drain system, or receiving water, as appropriate. Place the overflow device a maximum of two inches above the level of the permeable pavement surface. Ensure that the two inch ponding depth is contained and does not flow out of the area at the ends or the sides.

Maintenance Requirements

Maintenance and regular inspections are important for proper function of permeable pavement without an underdrain. The following are general maintenance requirements:

- Inspect permeable pavement to determine if stormwater runoff is infiltrating properly at least twice during the wet season after significant storms. If infiltration is significantly reduced, remove surface aggregate by vacuuming. Dispose of and replace old aggregate with fresh aggregate as needed.
- Sweep permeable pavement as needed to clean it of leaves, debris, and sediment. Do not overlay permeable pavement with an impermeable surface.
- Prune vegetation and large shrubs/trees that limit access or interfere with permeable pavement operation. Rake and remove fallen leaves and debris from deciduous plant foliage. Remove poisonous, nuisance, dead, or odor-producing vegetation immediately. Mow grass to less than four inches and bag and remove grass clippings.
- Provide irrigation as needed.
- Exercise spill prevention measures when handling substances that can contaminate stormwater runoff. Implement a spill prevention plan at all non-residential sites and in areas where there is likelihood of spills.

- Eliminate standing water to prevent vector breeding.
- Inspect overflow devices for obstructions or debris, which should be removed immediately. Repair or replace damaged pipes upon discovery.
- Provide safe and efficient access to permeable pavement. Egress and ingress routes must be maintained to design standards. Roadways must be maintained to accommodate size and weight of vehicles if applicable.
- Remove obstacles that may prevent maintenance personnel and/or equipment access to the permeable pavement.
- Limit and control application of pesticides (using Integrated Pest Management practices) and fertilizers to reduce potential pollutant runoff.
- Fill and compact holes in the ground located in and around permeable pavement.
- Identify and control sources of erosion damage when native soil is exposed near the overflow device.
- Add gravel or ground cover if erosion occurs due to vehicular or pedestrian traffic.

A summary of potential problems that may need to be addressed by maintenance activities is presented in Table E-10.

The County requires execution of a maintenance agreement to be recorded by the property owner for the on-going maintenance of any privately-maintained stormwater quality control measures. The property owner is responsible for compliance with the maintenance agreement. A sample maintenance agreement is presented in Appendix H.

Table E-10. Permeable Pavement Troubleshooting Summary

Problem	Conditions When Maintenance Is Needed	Maintenance Required
Vegetation	Overgrown vegetation	Mow and trim vegetation.
	Presence of invasive, poisonous, nuisance, or noxious vegetation or weeds	Remove this vegetation.
	Excessive loss of turf or ground cover	Replant and/or reseed as needed.
Trash and Debris	Trash and debris present	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	Eroded areas at overflow structures	Fill eroded areas and re-grade if necessary.
	Accumulation of sediment, debris, and oil/grease on surface, inlet or overflow structures	Remove sediment, debris, and/or oil/grease.
Water Drainage Rate	Standing water	Vacuum aggregate to remove sediment. Replace aggregate if necessary.

EXHIBIT H

Peak Flow Hydrologic Analysis

File location: C:/Users/Cantwell/Desktop/2712 Park Ave-before - Subarea 1A.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	2712 Park Ave-before
Subarea ID	Subarea 1A
Area (ac)	0.29
Flow Path Length (ft)	168.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	1.0
Percent Impervious	0.5
Soil Type	12
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.6598
Developed Runoff Coefficient (Cd)	0.7799
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.0861
Burned Peak Flow Rate (cfs)	0.0861
24-Hr Clear Runoff Volume (ac-ft)	0.0125
24-Hr Clear Runoff Volume (cu-ft)	545.8285

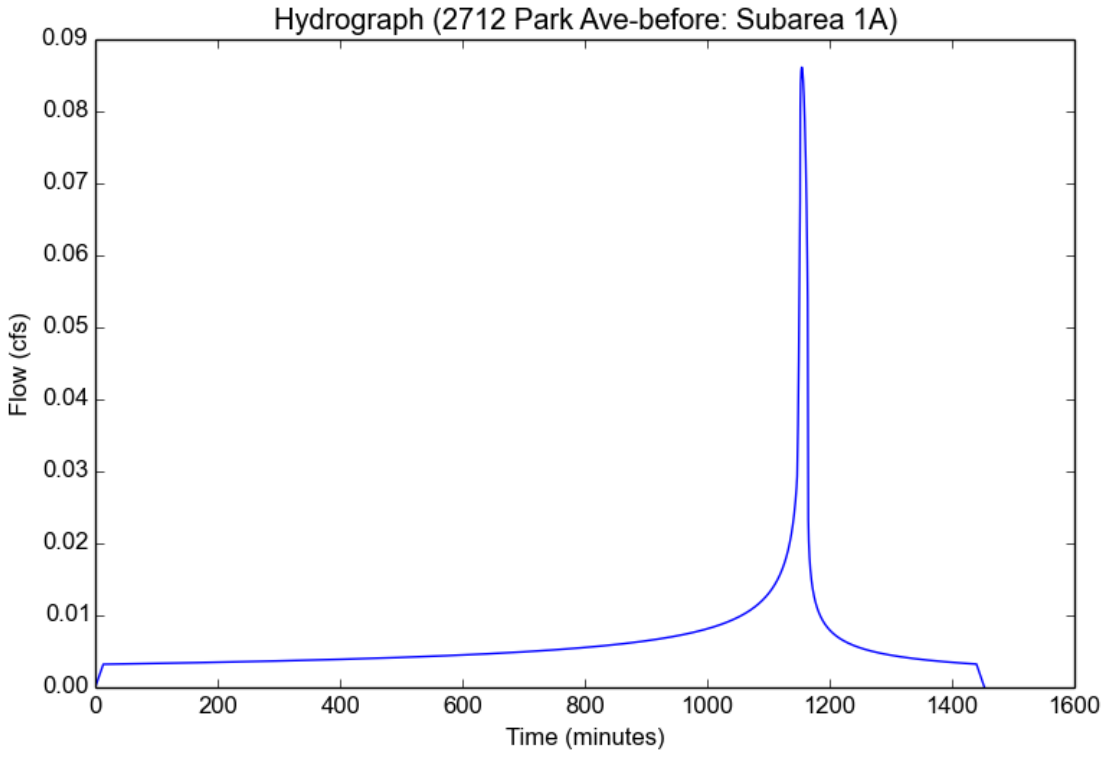


EXHIBIT J

Peak Flow Hydrologic Analysis

File location: C:/Users/Cantwell/Desktop/2712 Park Ave-after - Subarea 1A.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	2712 Park Ave-after
Subarea ID	Subarea 1A
Area (ac)	0.29
Flow Path Length (ft)	211.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	1.0
Percent Impervious	0.61
Soil Type	12
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.356
Undeveloped Runoff Coefficient (Cu)	0.6436
Developed Runoff Coefficient (Cd)	0.8
Time of Concentration (min)	15.0
Clear Peak Flow Rate (cfs)	0.0826
Burned Peak Flow Rate (cfs)	0.0826
24-Hr Clear Runoff Volume (ac-ft)	0.0145
24-Hr Clear Runoff Volume (cu-ft)	632.471

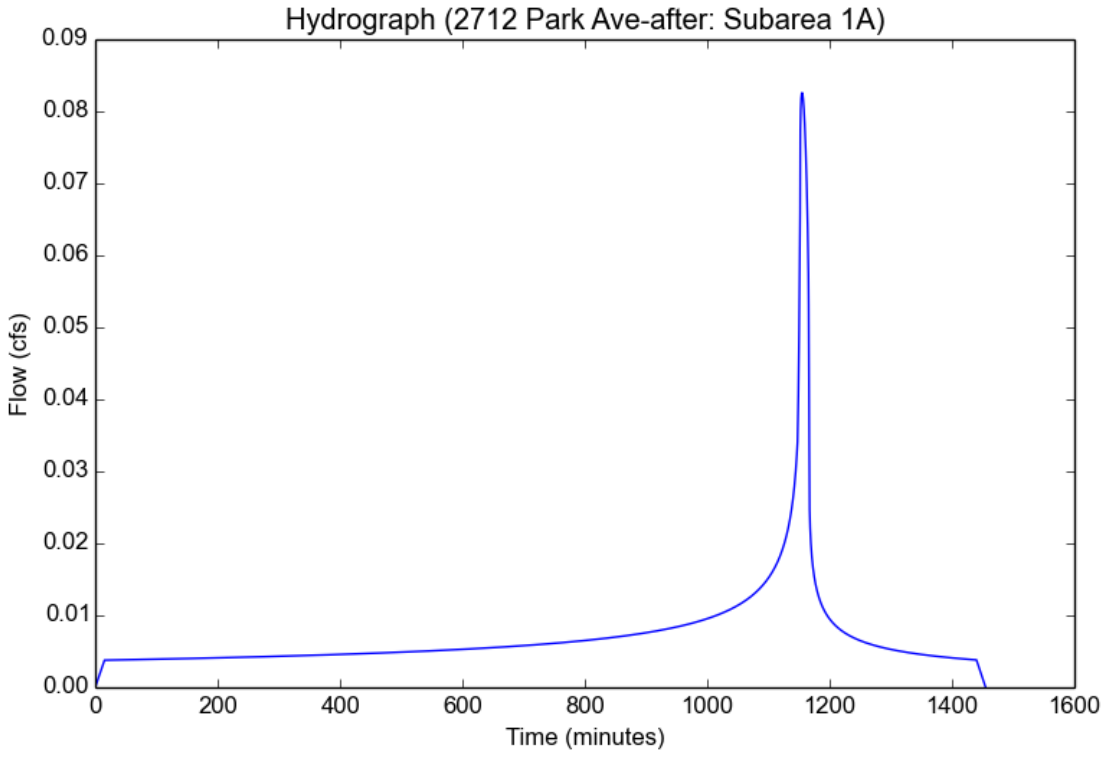


EXHIBIT K

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 #_____TRACT NO._____LOT NO._____

ADDRESS: _____

_____

Owner is aware of the requirements of the County of Los Angeles' Green Building Standards Code, Title 31, Section 4.106.4 (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

EXHIBIT L

RECORDING REQUEST BY AND MAIL TO:

County of Los Angeles
Department of Public Works

Building and Safety – Drainage and Grading Section
Land Development – Drainage and Grading Section

P.O. Box 1460
Alhambra, California 91802-1460

Space above this line is for Recorder's use

COVENANT FOR MAINTENANCE OF WATER QUALITY (WQ) DEVICES

I (we) _____, hereby certify that I (we) am (are) the legal owner(s) of Tract # _____, and as such owners for the mutual benefit of future purchasers, their heirs, successors, and assigns, do hereby fix the following protective conditions to which their property, or portions thereof, shall be held, sold and/or conveyed.

That owner(s) shall maintain the WQ system shown on attached Exhibit A map and on Grading Plan GPC # _____, on file in the office of the Director of Public Works, in a good and functional condition at least once a year and retain proof of the inspection. The owner(s) shall perform this responsibility, unless the County discharges this obligation through a subsequently recorded written instrument.

The undersigned also covenants and agrees for himself, his heirs, successors, and assigns, to indemnify, defend, and save harmless the County, its agents, officers and employees from and against any and all liability, expenses, including defense costs and legal fees, and claims for damages of any nature whatsoever, including, but not limited to, bodily injury, death, personal injury, or property damage arising from or connected with the construction or maintenance of said work.

Owner(s):

By: _____ Date: _____

By: _____ Date: _____

GENERAL NOTES

1. All grading and consturction shall conform to the California Building Code, latest edition and the State Model Water Efficiency Landscape Ordinance unless specified on these plans.
2. Any modifications of or changes to approved grading plans must be approved by the Building Official.
3. No grading shall be started without first notifying the Building Official. A Pre-grading meeting at the site is required before the start of the grading with the following people present: Owner, grading contractor, design civil engineer, soils engineer, geologist, City grading inpector(s) or their representatives and when required the archeologist or other jurisdictional agencies. Permittee or his agent are responsible for arranging Pre-grade meeting and must notify the Building Official at least two business days prior to the proposed pre-grade meeting.
4. Approval of these plans reflect solely the review of plans in accordance with the California Building Code and does not reflect any position by the City of La Verne regarding the status of any title issues relating to the land on which the improvements may be constructed. Any disputes relatign to the title are solely a private matter not involving the City of La Verne.
5. All grading and construction activities shall comply with the City of La Verne Municipal Code Chapter 8, Section 20.020 D (1) that controls and restricts the use of construction and grading equipment from the hours of 8:00 PM to 7:00 AM and on Sundays and holidays.
6. The location of all utilities is the responsibility of the Permitee.
7. All export of material from the site must go to a permitted site approved by the Building Official or a legal dumpsite. Receipts for acceptance of excess material by a dumpsite are required and must be provided to the Building Official upon request.
8. A copy of the grading permit and approved grading plans must be in the possession of a responsible person and available at the site at alll times.
9. Site boundaries, easements, drainage devices, restricted use areas shall be located per construction staking by Field Engineer or licensed surveyor. Prior to grading, as requested by the Building Official, all property lines, easements and restricted use areas shall be staked.
10. No grading or construction shall occur within the protected zone of any heritage or significant tree as regulated by Chapter 18, Section 78.160 of the City of La Verne Zoning Code.
11. Where a grading permit is issued and the Building Official determines that the grading will not be completed prior to November 1, the owner of the site on which grading is being performed shall, on or before October 1, file or cause to be filed with the Building Official an Erosion and Sediment Control Plan per the City of La Verne Watershed Management Program.
12. Transfer of Responsibility: If the Field Engineer, the Soils Engineer or the Engineering Geologist in writing to accept responsibility withing the area of technical competence for approval upon in writing to accept responsibility withing the area of technical competence for approval upon completion of the work. It shall be the duty of the permitee to notify the Building Official in of record is changed during grading, the work shall be stopped until the replacement has agreed completion of the work. It shall be the duty of the permitee to notify the Building Official in writing of such change prior to the recommencement of such grading.

INSPECTION NOTES

13. The permittee or his agent shall notify the Building Official at least one working day in advance of required inspections at the following stages of work:
    a. Pre-grade - Before the start of any earth disturbing activity or construction.
    b. Initial - When the site has been cleared of vegetation and unapproved fill has been scarified, benched or otherwise prepared for fill. Fill shall not be placed prior to this inspection. Note: Prior to any construction activities including grading, all storm water pollution prevention measures including erosion control devices which contain sediments must be installed.
    c. Rough - When approximate final elevations have been established; drainage terraces, swales and berms installed at the top of the slope and the statements required by this Section have been received.
    d. Final - When grading has been completed; all drainage devices installed; slope planting established; irrigation systems installed and the As-Built plans, required statements and reportshave been submitted and approved.
14. In addition to the inspection required by the Builsing Official for grading, reports and statements shall be submitted to the Building Official in accordance with Appendix J, Section 105 of the California Building Code, latest edition.
15. Unless otherwise directed by the Building Official the Field Engineer for all engineered grading projects shall prepare routine inspecion reports as required under AppendixJ, Section 105 of the California Building Code, latest edition. These reports, known as "Report of Grading Activities" shall be submitted to the Building Official as follows:
    a. Bi-weekly during times whan grading of 400 cubic yards or more per week is occuring on site;
    b. Monthly, at all other times; and
    c. At any other time when requested by the Building Official.

    Such "Report of Grading Activities" shall certify to the Building Official that the Field Engineer has inspected the grading site and related activities and has found them in compliance with the approved grading plans and specifications, the California Building Code, all grading permit conditions and all other applicable ordinances and requirements. This form is available from the City of La Verne Department of Community Development. Failure to provide inspection reports will result in issuance of a "Stop Work Order".
15. All graded sites must have drainage swales, berms and other drainage devices installed prior to rough grading approval per Appendix J, Section 105 of the California Building Code, latest edition.
16. The grading contractor shall submit the statement to the grading inspector as required by Appendix J, Section 105 of the California Building Code, latest edition.
17. Final grading must be approved before occupancy of buildings will be allowed per Appendix J, Section 105 of the California Building Code, latest edition.

DRAINAGE NOTES

18. Roof drainage must be diverted from graded slopes.
19. Provisions shall be made for contributory drainage at all times.
    accordance with the approved plans and specifications and in conformance with the

GENERAL GEOTECHNICAL NOTES

20. All work must be in compliance with the recommendations included in the geotechnical consultant's report(s) and the approved grading plans and specifications.
21. Grading operations must be conducted under periodic inspections by the geotechnical consultants with monthly inspection reports to be submitted the City of La Verne's geotechnical consultant.
22. The Soil Engineer shall provide sufficient inspections during the preparation of the natural ground and the placement and compaction of the fill to be satisfied that the work is being performed in accordance with the plan and applicable Code requirements.
23. Rough grading must be approved by a final engineering geology and soils engineering report. An As-Built Geologic Map must be included in the final geology report. PRovide a final report that verifies work was done in accordance with report recommendations and code provisions. The final report(s) must be submitted to the City's geotechnical consultant for review and approval.
24. Foundation, wall and pool excavations must be inspected and approved by the consulting geologist and soil engineer prior to the placing of steel or concrete.
25. Building pads located in cut/fill transition areas shall be over excavated a minimum of three (3) feet below the proposed bttom of footing.

FILL NOTES

26. All fill shall be compacted to the following relative compaction criteria:
    a. 90 percent of maximum dry density within 40 feet below finish grade.
    b. The relative maximum compaction shall be determined by A.S.T.M. soil compaction test D1557-91 where applicable. Where not applicable a test acceptable to the Building Official shall be used.
27. Field density shall be determined by a method acceptable to the Building Official. However not less than 10% of the required density tests, uniformly distributed, shall be obtained by the Sand Cone Method.
28. Sufficient tests of the fill soils shall be made to determine the relative compaction of the fill in accordance with the following minimum guidelines:
    a. One test for each two-foot vertical lift.
    b. One test for each 1,000 cubic yards of material placed.
    c. One test at the location of the final slope for each building site(lot) in each four-foot vertical lift or or portion thereof.
    d. One test in the vicinity of each building pad for each four-foot vertical lift portion thereof.
29. Sufficient tests of fill soils shall be mad to verify that the soil properties comply with the design requirements as determined by the Soil Engineer including soil types, shear strength parameters and corresponding unit weights in accordance with the following guidelines:
    a. Prior and subsequent to placement of the fill, shear tests shal be taken on each type of soil or soil mixture used for all slopes steeper that three (3) horizontal to one vertical.
    b. Shear test results for the proposed fill material must meet or exceed the design values in the geotechnical report to determine slope stability requirements. Otherwise the slope must be reevaluated using the actual shear test value of the fill material that is in place.
    c. Fill soils shall be free of deleterious material.
30. Fill shall not be placed until stripping of vegetation, removal of unsuitable soils and installation of subdrain (if any) have been inspected and approved by the Soil Engineer. The Building Official may require a "Standard Test Method for moisture, ash, organic matter, peat or other organic soils" ASTM D-2974-87 on any suspect material. Detrimental amounts of organic shall not be permitted in fills. Soil containing small amounts of roots may be allowed provided that the roots are in a quantity and distributed in a manner that will not be detrimental to the future use of the site and the Soils Engineer approves the use of such material.
31. Rock or similar material greater than 12 inches in diameter shall not be placed in the fill unless recommendations for such placement have been submitted by the Soils Engineer and approved in advance by the Building Official. Location, extent and elevation of rock disposal areas must be shown on an "As Built" grading plan.
32. Continuous inspection by the Soils Engineer, or a responsible representative, shall be provided during all fill placement and compaction operations where fills have a depth greater than 30 feet or slope surface steeper than 2:1. (Appendix J, Section 105 of the California Building Code, latest edition).
33. All subdrain outlets are to be surveyed for line and elevation. Subdrain information must be shown on an As Built grading plan.
34. Fill slopes in excess of 2:1 steepness ratio are to be constructed by placement of soil at sufficient distance beyond the proposed finish slope to allow compaction equipment to be operated at the outer limits of the final slope surface. The excess fill is to be removed prior to the completion of rough grading. Other construction procedures may be used when it isdemonstrated to the satisfaction of the Building Official that the angle of slope, construction method and other factors will have equivalent effect. (Appendix J, Section 105 of the California Building Code, latest edition)

PLANTING AND IRRIGATION NOTES

35. The planting and irrigation systems shall be installed as soon as practical after rough grading. Priot to final grading approval all required slope planting must be well established.
36. Landscape irrigation system shall be designed and maintained to prevent spray on structures.
37. Prior to rough grade approval this project requires a landscape permit. Landscape plans in compliance with the "Model Water Efficient Landscape Ordinance" Title 23, Chapter 2.7 of California Code of Regulations be submitted to the City of La Verne Department of Community Development. To obtain a Landscape Permit approved plans and water purveyor acknowledgement must be submitted to the Building Official.

BASIS OF BEARINGS

THE BEARING OF N17°30'00"E FOR THE CENTER LINE OF PARK AVENUE AS SHOWN ON TRACT NO. 17459, M.B. 428, 13-15 WAS USED AS THE BASIS OF BEARINGS FOR THIS PLAN.

REGISTERED PROFESSIONAL ENGINEER
RICHARD W. CANTWELL
C 29011
EXP. 3/31/27
STATE OF CALIFORNIA

NOTE

TOTPGRAPHIC SURVEY WAS CONDUCTED BY T & M SURVEYING (PLS 9309) ON sEPTEMBER 26, 2024.

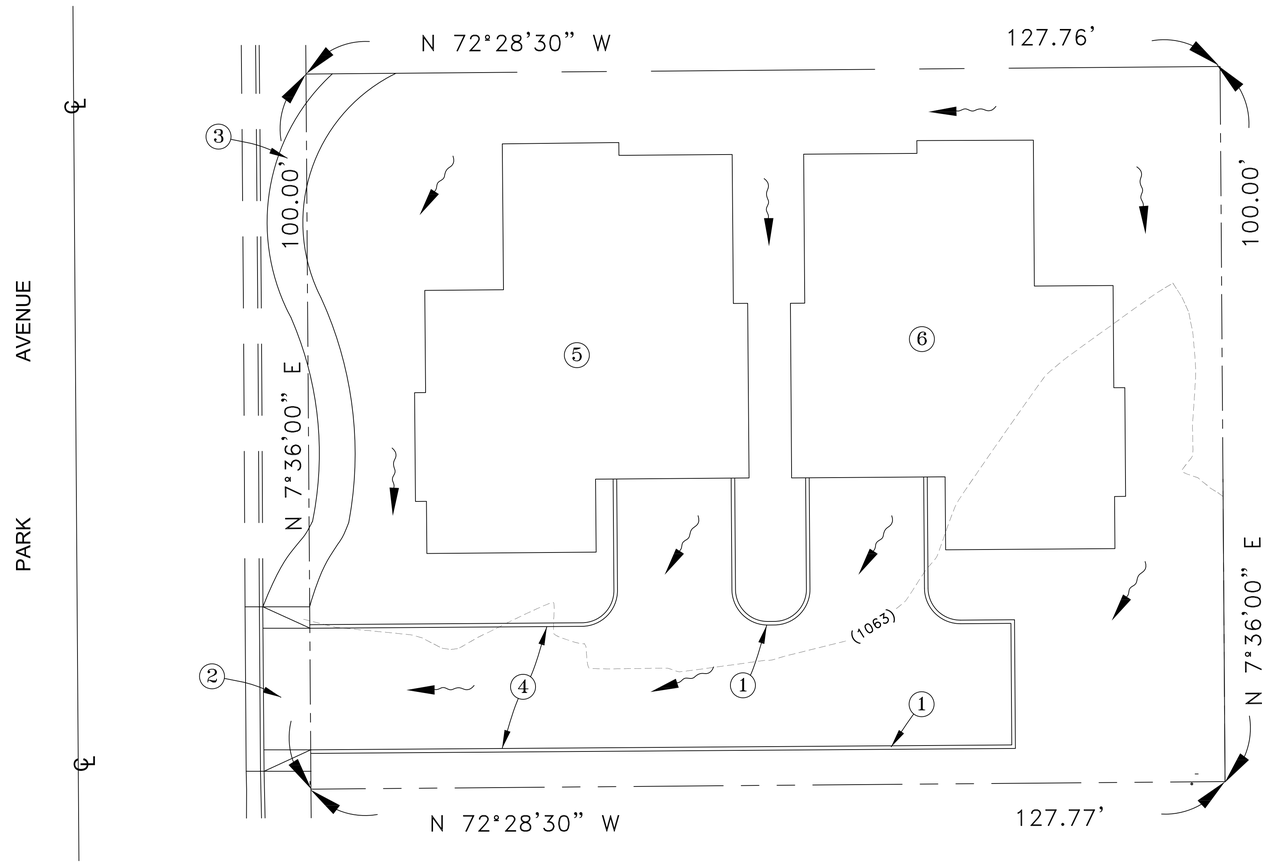
REVISIONS	REFERENCES

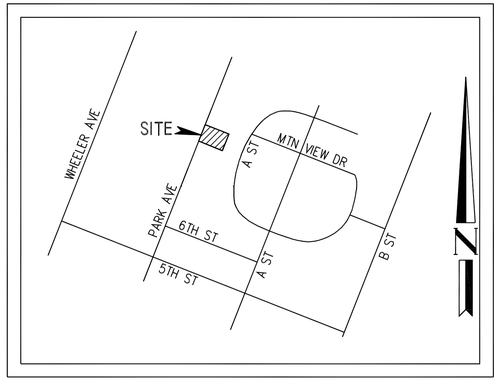
RICHARD W. CANTWELL, PE
CONSULTING CIVIL ENGINEER
2334 CLUB VISTA DR.
GLENDORA, CA 91741
(626) 335-3055

ENGINEERING SCALE:	DATE:
DRAWN: RC	2/28/25
CHECKED:	
RECOMMENDED:	
APPROVED:	

GENERAL GRADING NOTES

Hillcrest Gateway Project
2730, 2712 & 2692 Park Avenue
2675,& 2681 A Street
La Verne, CA. 91750





VICINITY MAP
NTS

CONSTRUCTION NOTES

1. Construct 6" PCC curb per City Standard
2. Construct 6" PCC drive approach per City Standard W=17', X=3'
3. Construct 4" PCC meandering sidewalk per City Standard
4. Construct 6" porous PCC pavement on 6" crushed aggregate base
5. Install 200 gallon rain barrel at each roof downspout.

REGISTERED PROFESSIONAL ENGINEER
RICHARD W. CANTWELL
C 29011
EXP. 3/31/27
CIVIL
STATE OF CALIFORNIA

REVISIONS	REFERENCES			
		RICHARD W. CANTWELL, PE CONSULTING CIVIL ENGINEER 2334 CLUB VISTA DR. GLENDORA, CA 91741 (626) 335-3055	ENGINEERING SCALE: 1" = 10' DRAWN: RC CHECKED: RECOMMENDED: APPROVED:	DATE: 2/28/25

CONCEPTUAL SITE GRADING PLAN

Hillcrest Gateway Project
2730 Park Avenue
La Verne, CA. 91750

EXHIBIT K (3)