Appendix H

Water Resources Technical Report

PSOMAS

4^{th} and Hewitt
401 South Hewitt Street
Water Resources Technical Report

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1.0 Introduction

1.1 Project Description

The 4th and Hewitt Project (Project) involves the development of a commercial-use 18-story building with 3 levels of underground parking and 5 levels of above ground parking on a 1.31-acre site. The Project will consist of approximately 8,149 square feet of ground level food and beverage space, 311,682 square feet of office space, and 16,294 square feet of interior and exterior common areas. The Project Site currently includes surface parking lots and four buildings. One existing one-story building on the northwest corner of the Project Site will remain and the three other buildings on-site will be demolished. A new commercial building will be built on the eastern portion of the site with frontage along 4th Street and Hewitt Street, largely on what is currently an existing parking lot. A paseo area closed to vehicular traffic will be an added amenity for visitors. The Project Site is bounded by 4th Street to the north, Colyton Street to the west, Hewitt Street to the east, and existing properties to the south.

1.2 Scope of Work

This report provides a description of the surface water hydrology, surface water quality, and groundwater at the Project Site and an analysis of the Project's potential significance related to the impact on surface water hydrology, surface water quality, and groundwater.

2.0 Environmental Setting

2.1 Surface Water Hydrology

2.1.1 Regional

The Project Site is located within a watershed classified by the County of Los Angeles as the Los Angeles River Watershed. Surface water from this watershed is collected via underground storm drains and eventually drains to the Los Angeles River where it is discharged into the Pacific Ocean. A copy of this watershed map is provided in Section 7.0.

2.1.2 Local

Stormwater runoff is collected and conveyed to the surrounding public streets via sheet flow to the street gutter and eventually into the underground storm drain system, located to the south of the Project. A portion of the site on the east side of the property drains southeasterly to Hewitt Street. A portion of the site drains northerly to 4th Street via sheet flow and building downspout. The remainder of the site flows west to Colyton Street via sheet flow.

Stormwater collected in the street valley gutters on Colyton Street and Hewitt Street continues southerly until it enters the storm drain inlets connected to the existing City of Los Angeles underground storm drain system. The City storm drain routes to the south and to the east along 6th and 7th Street and eventually discharges into the Los Angeles River and into the Pacific Ocean. Stormwater collected in the street gutter on 4th Street continues westerly until it enters into the catch basins connected to the existing 90" Los Angeles County storm drain. The County storm drain routes southeasterly and eventually discharges into the Los Angeles River, separate from the City storm drain.

2.1.3 On-Site

The existing Project Site is comprised of four buildings and several at grade parking lots totaling approximately 1.31 acres with an average imperviousness of 98.5%. The site is bounded by 4th Street to the north, Colyton Street to the west, Hewitt Street to the east, and existing neighbors to the south.

In its existing condition, five subareas were defined: 1, 2, 3, 4 and 5 and are shown on the Existing Hydrology Exhibit in Section 7.0. Currently, there is building roof run-off from the existing A+D Museum, other on-site buildings, and surface water sheet flow from existing parking lots. The different subareas flow towards Colyton Street, 4th Street, and Hewitt Street.

A review of the FEMA's Flood Insurance Rate map (FIRM) shows that the Project Site is located within FEMA Zone X (Other Flood Areas). Refer to Section 7.0 for the FEMA FIRM. FEMA's zone designation for Zone X (Other Areas) is defined as "areas determined to be outside the 0.2% annual chance floodplain."

2.2 Surface Water Quality

2.2.1 Regional

The Project Site is located within the Central Subbasin of the Coastal Plain of the Los Angeles Groundwater Basin. This subbasin is bounded by a surface divide called the La Brea high to the north, by emergent less permeable Tertiary rocks of the Elysian, Repetto, Merced and Puente Hills on the northeast and east. The southeast boundary between Central Basin and Orange County Groundwater Basin roughly follows Coyote Creek. The southwest boundary is formed by the Newport Inglewood fault system and folded rocks of the Newport Inglewood uplift. Surface drainage flows across the Central Basin to the Pacific Ocean. Average annual precipitation ranges from 11 to 13 inches and averages 12 inches.[1]

The Project Site is within the Los Angeles River Watershed and is tributary to the Los Angeles River Reach 2 waterway. The Los Angeles River Reach 2 is listed on the 2012 Clean Water Act Section 303(d) list (approved by the EPA on June 26, 2015) as impaired due to the prevalence of the pollutants shown in Table 1, which is excerpted from the California Regional Water Quality Control Board, "Quality Limited Segments". Currently, this waterway's existing beneficial uses include groundwater recharge and warm freshwater habitat; potential uses include municipal and domestic supply, industrial service supply, and wildlife habitat.

Table 1 Receiving Waters for Urban Runoff from Site[2]

Receiving Waters	303(d) List Impairments[3]	Designated Beneficial Uses	Proximity to RARE Uses
Los Angeles River Reach 2	Ammonia, Coliform Bacteria, Copper, Lead, Nutrients (Algae), Oil, Trash	Existing/Intermittent: GWR, WARM Potential: MUN, IND, WILD	No

2.2.2 Local

The Riverside Flood Control and Conservation District performed a study on urban runoff. Table 2 lists the pollutants anticipated to be generated by the proposed land uses, which was extracted from this study. The City of Los Angeles does not have a similar table available at the time of this report. Because the Project falls under the category of commercial development, the following pollutants are potential: sediment/turbidity, nutrients, organic compounds, trash and debris, oxygen demanding substances, oil and grease, pesticides, and metals. Bacteria and viruses was ruled out as a potential pollutant due to non-involvement of animal waste for this Project.

[1] Department of Water Resources. California's Groundwater Bulletin 118. Coastal Plain of Los Angeles Groundwater Basin, Central Subbasin.

[2] California Regional Water Quality Control Board, Los Angeles Region. *Water Quality Control Plan Los Angeles Region*. June 13, 1994.

[3] Los Angeles Regional Water Quality Control Board. 2012 CWA Section 303(d*) List of Water Quality Limited Segments*. June 26, 2015.

Table 2 Potential Pollutants Generated by Land Use Type[4]

Type of Development (Land Use)	Sediment/ Turbidity	Nutrients	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Bacteria & Viruses	Oil & Grease	Pesticides	Metals
Commercial/ Industrial Development	P(1)	P(1)	P(5)	P	P(1)	P(3)	P	P(1)	P

Abbreviations: P=Potential N=Not expected

Notes:
(1) A potential pollutant if landscaping or open area exists on the Project Site
(2) A potential pollutant if the Project includes uncovered parking areas
(3) A potential pollutant if land use involves animal waste
(4) Specifically, petroleum hydrocarbons
(5) Specifically, solvents
(6) Bacterial indicators are routinely detected in pavement runoff.

A comparison of the pollutants existing in Los Angeles River Reach 2 based on the State 303(d) list (Table 1) and pollutants associated with the planned land use activities (Table 2) of the site show an overlap of **nutrients, trash and debris, oil and grease, and metals** as pollutants. These common pollutants are considered the pollutants of concern.

During a storm, there is a potential for these pollutants to be diffused by stormwater to a local storm drain system. The City of Los Angeles usually installs and maintains public catch basins inlets which may be fitted with metal grates, bars, or filtration baskets to capture pollutants prior to entering the local storm drain system.

2.2.3 On-Site

From visual inspections and surveyed data of the site, water quality treatment improvements are not present at the Project Site. Stormwater leaving the Project Site presently drains directly into the street gutter system via sheet flow and building scuppers, eventually entering into the public storm drain system. Existing potential pollutants at the Project Site likely exists based on the current land use: a parking lot and retail buildings. Oil and grease are such pollutants due to the existing uncovered parking lot which makes up a majority of the Project Site.

2.3 Groundwater

2.3.1 Regional

The Project Site is located within the Central Subbasin of the Los Angeles Coastal Plain Groundwater Basin. Groundwater generally flows southwesterly in the Los Angeles Coastal Plain Groundwater Basin. Groundwater enters the Central Basin through surface and subsurface flow and by direct percolation of precipitation, stream flow, and applied water; and replenishes the aquifers dominantly in the forebay areas where permeable sediments are exposed at ground surface. Natural replenishment of the subbasin's groundwater supply is largely from surface inflow through Whittier Narrows (and some underflow) from the San Gabriel Valley. Percolation into the Los Angeles Forebay Area is restricted due to paving and development of the surface of the forebay. Imported water purchased from Metropolitan Water District and recycled water from Whittier and San Jose Treatment Plants are used for artificial recharge in the Montebello Forebay at the Rio Hondo and San Gabriel River spreading grounds. The total storage capacity of the subbasin is approximately 13,800,000 acre-foot.[5]

[4] Riverside County Flood Control and Conservation District, Riverside County Water Quality Management Plan for Urban Runoff (July 24, 2006).
[5] Department of Water Resources. California's Groundwater Bulletin 118. Coastal Plain of Los Angeles Groundwater Basin, Central Subbasin.

2.3.2 Local

As mentioned previously groundwater is replenished via surface and subsurface flow, direct percolation, stream flows, and applied water. Three existing water quality stations, Z6127210, 01S13W34J001S, and 01S13W27Q002S, are located within one mile southeast and northeast of the Project Site. The last known sampling date for Station Z6127210 was on September 02, 1977, for Station 01S13W34J001S on July 24, 1951, and for Station 01S13W27Q002S on July 30, 1951. The data indicates a dissolved nitrate level of 14.4 mg/L at Station Z6127210 and less than the reporting limit of 0.1 mg/L at Station 01S13W34J001S.[6] According to the State Water Resources Control Board, while nitrate can form through natural processes, concentrations above the Maximum Contaminant Level (MCL) of 45 mg/L, if consumed, can pose serious health risks to pregnant women and infants. According to the California Groundwater Bulletin 118, data from 45 public water wells located within the Central Subbasin, resulted in an average Total Dissolved Solids (TDS) content of 720 mg/L ranging from 170 mg/L to 5,510 mg/L, which is higher than the maximum contaminant level of 500 mg/L as set by the EPA for secondary drinking water standards.[7]

2.3.3 On-Site

Based on review of the Los Angeles 7 ½ Minute Quadrangle Seismic Hazard Evaluation Report, the historic highest groundwater level in the vicinity of the Project Site is approximately 84 feet below ground surface.[8] However, a site-specific geotechnical report dated December 29, 2016 was completed for the Project by Geotechnologies, Inc. During field exploration at Boring 3, groundwater was encountered at a depth of 78 feet below existing grade. Therefore, the groundwater table on-site will be considered to be 78 feet below the ground surface.

3.0 Significant Thresholds

The methodology to determine the significance of a Project relating to the Project's impacts on water resources includes review of the environmental setting, Project impacts, and cumulative impacts. This section provides an overview of the factors taken into consideration when determining the significance.

3.1 Surface Water Hydrology

The City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant impact on surface water hydrology if it would:

- Cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources;
- Substantially reduce or increase the amount of surface water in a water body; or
- Result in permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow.

[6] State of California Department of Water Resources, Water Data Library, Water Quality Well Z6127210, 01S13W34J001S, and 01S13W27Q002S, available at: http://www.water.ca.gov/waterdatalibrary/index.cfm, accessed December 19, 2016.

[7] United States Environmental Protection Agency, Drinking Water Regulations and Contaminants, available at: https://www.epa.gov/dwregdev/drinking-water-regulations-and-contaminants, accessed December 19, 2016.

[8] Geotechnologies, Inc., Geotechnical Engineering Investigation, Proposed Mixed Use Structure, 405-411 South Hewitt Street, and 900-926 East 4th Street, and 412 Colyton Street, Los Angeles, California. December 29, 2016.

3.2 Surface Water Quality

The City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant impact on surface water quality if discharges associated with the project would create pollution, contamination or nuisance, as defined in Section 13050 of the California Water Code (CWC) or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body. The CEQA Thresholds Guide and CWC include the following definitions:

"Pollution" means an alteration of the quality of waters of the state to a degree which unreasonably affects either the following: 1) the waters for beneficial uses or 2) facilities which serve these beneficial uses. "Pollution" may include "Contamination".

"Contamination" means an impairment of the quality of the waters of the state by waste to a degree, which creates a hazard to the public health through poisoning or through the spread of disease. "Contamination" includes any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected.

"Nuisance" means anything which meets all of the following requirements: 1) is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property; 2) affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extend of the annoyance or damage inflicted upon individuals may be unequal; and 3) occurs during, or as a result of the treatment or disposal of wastes. [9]

3.3 Groundwater

The City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant impact on groundwater hydrology if it would:

- Change potable water levels sufficiently to:
    - Reduce the ability of a water utility to use the groundwater basin for public water supplies, conjunctive use purposes, storage of imported water, summer/winter peaking, or to respond to emergencies and drought;
    - Reduce yields of adjacent wells of well fields (public or private); or
    - Adversely change the rate or direction of flow of groundwater; or
- Result in demonstrable and sustain reduction of groundwater recharge capacity

The City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant impact on groundwater quality if it would:

- Affect the rate or change the direction of movement of existing contaminants;
- Expand the area affected by contaminants;
- Result in an increased level of groundwater contamination (including that from direct percolation, injection or salt water intrusion); or

[9] City of Los Angeles. LA CEQA Thresholds Guides. 2006

- Cause regulatory water quality standards at an existing production well to be violated, as defined in the California Code of Regulations (CCR), Title 22, Division 4, and Chapter 15 and in the Safe Drinking Water Act.

4.0 Methodology

4.1 Surface Water Hydrology

The purpose of this report is to evaluate the Project impacts by comparing the existing and proposed surface water hydrology. The drainage plan will be designed to address only the on-site drainage and only data for the on-site area will be compared.

The City of Los Angeles has adopted the Los Angeles County Department of Public Works' (LACDPW) method of hydrologic design as its basis of design per Special Order No. 007-1299 dated December 3, 1999. The LACDPW Hydrology Manual requires drainage facilities to meet the Urban Flood level of protection, known as the 25-year design storm. A 25-year design storm has a probability of 1/25 of being equaled or exceeded in any year. Additionally, the City's CEQA Threshold Guide establishes a 50-year design storm as the threshold to analyze potential impacts on surface water hydrology as a result of development. For the purposes of evaluating the threshold, a 50-year design storm will be evaluated in addition to the 25-year design storm.

The primary sources of data are the *LACDPW Hydrology / Sedimentation Manual and Appendices* (LACDPW 2006), and the Los Angeles County *Standard Urban Stormwater Mitigation Plan* (September 2002). To calculate the peak stormwater runoff, HydroCalc version 0.3.1-beta software was used, conforming to the LACDPW Hydrology Manual. HydroCalc is available for download through LACDPW's website and uses the Modified Rational Method to calculate the time of concentration, peak intensities, runoff coefficient, peak flow rate, and runoff volume for various storm events. The Modified Rational Method is given as:

$$Q = CIA$$

Where:

Q = Volumetric Flow Rate (cfs)
C = Runoff coefficient (dimensionless)
I = Rainfall Intensity at a given point in time (in/hr)
A = Basin Area (acres)

Site subarea drainage properties as well as data from the Isohyetal Map, namely the 50-year rainfall depth and soil type is gathered and used in the HydroCalc software. HydroCalc then calculates the peak stormwater runoff, Q, in addition to other variables.

4.2 Surface Water Quality

In 2003, the California State Water Resources Control board (SWRCB) adopted the Construction Activity Stormwater Permit (CGP)[10], which is "…required for all storm water discharges associated with construction activity where clearing, grading, and excavation results in a land disturbance of one or more acres." Under the CGP, the following Permit Registration Documents (PRD) must be submitted to SWRCB through the SMARTS website: a Notice of Intent (NOI), a Storm Water Pollution Prevention Plan

[10] Construction General Permit Water Quality Order 2009-0009-DWQ, Fact Sheet, website: http://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/constpermits/wqo_2009_0009_complete.pdf, accessed October 25, 2016.

(SWPPP), and other compliance related documents required by this CGP and mail the appropriate permit fee to the SWRCB.

The CGP requires all SWPPPs be written, amended, and certified by a Qualified SWPPP Developer, emphasizing BMPs, which are defined as “schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States.” The SWPPP has two major objectives:

- to help identify the sources of sediment and other pollutants that affect the quality of stormwater discharges; and

- to describe and ensure the implementation of BMPs to reduce or eliminate sediment and other pollutants in storm water and non-storm water discharges. The SWPPP must include BMPs that address source control, BMPs that address pollutant control, and BMPs that address treatment control.

Furthermore, the CGP requires a project that is enrolled for more than one continuous three-month period to submit information and annually certify that their site is in compliance with these requirements. The primary purpose of this requirement is to provide information needed for overall program evaluation and pubic information. The CGP requires that key personnel (e.g., Qualified SWPPP Developers, inspectors, etc.) have specific training or certifications to ensure their level of knowledge and skills are adequate to ensure their ability to design and evaluate project specifications that will comply with CGP requirements. Erosion control and drainage devices are required to be provided in accordance with the CGP and SWPPP as well as the MS4 Permit.

The City of Los Angeles has passed the Low Impact Development (LID) Ordinance, which the Project will need to comply with. The City developed their own technical manual, Development Best Management Practices Handbook – Low Impact Development Manual dated May 09, 2016, to serve as a guideline for the applicant to comply with the LID standards. The LID standards require on-site stormwater management techniques to be implemented and properly sized for stormwater runoff to infiltrate, evapotranspire, capture and use, and/or treated through high removal efficiency Best Management Practices on-site. The stormwater device or treatment must be able to treat the volume of water produced by a 0.75-inch, 24-hour rain event or the 85^{th} percentile 24-hour runoff event, whichever is greater, without any stormwater runoff leaving the Project Site to the Maximum Extent Feasible. The 85^{th} percentile depth can be found through LACDPW’s website at: http://dpw.lacounty.gov/wrd/hydrologygis/.

4.3 Groundwater

The Project’s potential groundwater impacts were evaluated based on data from the site specific geotechnical report dated December 29, 2016 by Geotechnologies, Inc. As stated in Section 2.3.3, groundwater was encountered at a depth of 78 feet below existing grade.

5.0 Project Impact Analysis

5.1 Construction

5.1.1 Surface Water Hydrology

Construction is anticipated to require excavation across the majority of the Project Site to a depth of approximately 38 feet to accommodate the subterranean parking levels. However, for purposes of providing a conservative estimate for the amount of soil that would be exported during site preparation, excavation to a dept of 42 feet is assumed in order to calculate the quantity of soil export. This excavation will occur on the majority of the Project Site with exception to the northwestern portion of the site, requiring soil export. Construction activities have the potential to temporarily alter the existing surface drainage pattern and flows of the Project by diverting existing surface flows via pumps.

To mitigate potential sediment and erosion from construction activities, the Project will be required to comply with all applicable City grading permit regulations. These regulations may include necessary measures, plans, and inspections to address potential sedimentation and erosion into the public right-of-way. Compliance with the City's applicable regulations will ensure that the Project will not result in substantial erosion, siltation, or flooding. As previously mentioned in Section 4.2, a NPDES CGP will be required to be filed with the State through the SMARTS website. The PRDs include a SWPPP that implements BMPs to provide erosion control measures or other source control measures preventing pollutants from discharging from the site. Therefore, with the SWPPP in conjunction with the City's permitting regulations, construction activities will have minimal effect on the Project Site's drainage pattern. Therefore, surface water hydrology impacts as a result of construction activities would be less than significant.

5.1.2 Surface Water Quality

As discussed in Section 5.1.1, the SWPPP and the City's permitting regulations requires BMPs be implemented to control and eliminate pollutants resulting from construction activities. Thus compliance with the NPDES CGP and local permitting regulations will ensure that the Project would not substantially impact the Project Site water quality in a manner that would result in contamination. The BMPs on-site will include measures to address erosion control, sediment control, tracking control, wind erosion, non-stormwater controls and waste and materials management. In order to comply with the NPDES and local regulations, the surface water quality will be managed through BMP implementation. Thus, surface water quality impacts resulting from construction activities would be less than significant.

5.1.3 Groundwater

As previously stated in Section 2.3 of this report, the groundwater table is approximately 78 feet below ground surface. The excavation depth of up to 38 feet for the subterranean parking is well above the groundwater level and is not expected to encounter groundwater. Perched water zones can possibly be encountered during excavation in areas where borings were not drilled. Should perched groundwater be encountered, it would be directed to a dewatering system and discharged in accordance with all applicable rules and regulations under the NPDES CGP regulations and the City's grading permit conditions. Thus, potential construction-related groundwater hydrology impacts would be less than significant.

As previously stated in Section 2.3 of this report, the closest recorded monitoring well reported that dissolved nitrates were encountered in the groundwater of 14.4 mg/L on September 02, 1977. Currently, the site is not known to contribute pollutants to the groundwater table. During construction of the Project, the existing parking lot and three existing buildings will be demolished. Compliance with all applicable federal, state, and local requirements in relation to the handling, storage and disposal of hazardous waste, would reduce the potential for the construction of the Project to release contaminants into groundwater that could affect existing contaminants, expand the area or increase the level of groundwater contamination, or cause a violation of regulatory water quality standards at an existing production well. Thus, potential construction-related groundwater quality impacts would be less than significant.

5.2 Operation

5.2.1 Surface Water Hydrology

The existing Project Site currently consists of a paved surface parking lot and four buildings with minimal landscape, resulting in 98.5% impervious surface coverage. The Project will consist of an 18-story structure and will also incorporate the addition of landscaped areas with direct exposure to rainwater. By adding more landscaped areas the Project Site will result in lower imperviousness. The average imperviousness of the Project Site will be approximately 94%, resulting in a reduction in stormwater runoff compared to the existing site.

Stormwater runoff will drain to Colyton Street, 4th Street, and Hewitt Street, as to not maintain the existing drainage pattern. A portion of the existing drainage originally sheet flowing to Colyton Street will be collected and comingled with the portion of the site designed to drain to 4th Street. To comply with the City's LID Ordinance, the site will collect and treat the volume of rainwater resulting from the 85th percentile, 24-hour storm event internally and discharge stormwater that exceeds this volume. The Existing Hydrology Exhibit in Section 7.0 shows five different subareas, Subareas 1 through 5. The Proposed Hydrology Exhibit in Section 7.0 shows three different subareas, Subareas 1 through 3. Subarea 5 in the existing hydrology and Subarea 3 in the proposed hydrology depicts the same areas. Flows discharging onto 4th Street will eventually discharge to the Los Angeles River to the east. Flows discharging onto Colyton Street will eventually discharge to the Los Angeles River to the east. Therefore the drainage pattern is maintained.

Rainfall and soil characteristics for the Project Site are given in Isohyetal Map Figure LACDPW 1-HI.19 and is provided in Section 7.0. The 50-year (24-hour) rainfall isohyet nearest the Project area is approximately 5.92-inches. The isohyets for all of the storm events, based on factors from the LACDPW Hydrology Manual in Table 5.3.1, are as listed:

- 25-Year 24-Hour: 5.20-inches
- 50-Year 24-Hour: 5.92-inches

As shown on the Isohyetal Map, the soil classification of the Project Site falls predominantly into Soil Type 006. While the Project area to be disturbed is approximately 1.07 acres, the Project limits including the existing A+D building that will remain is 1.31 acres. For the purposes of the hydrologic analysis, the Project limit of 1.31 acres will be analyzed. As mentioned the calculations were performed with the HydroCalc software conforming to the LACDPW Hydrology Manual, which has been adopted by the City of Los Angeles for storm drain facility design. Output from the calculations are found in Section 7.0. Table 3 and Table 4 summarizes the runoff rates:

Table 3 Existing Runoff Rates[11]

Drainage Area	Area (acres)	% Impervious	Q_{25} (cfs)	Q_{50} (cfs)
1	0.14	100	0.14	0.16
2	0.09	100	0.50	0.57
3	0.10	100	0.25	0.29
4	0.33	100	0.92	1.05
5	0.65	97	1.81	2.06
Existing Total	**1.31**	**98.5**	**3.62**	**4.13**

Table 4 Proposed Runoff Rates

Drainage Area	Area (acres)	% Impervious	Q_{25} (cfs)	Q_{50} (cfs)
1	0.04	100	0.11	0.13
2	0.62	96	1.45	1.78
3	0.65	93	1.80	2.06
Proposed Total	**1.31**	**94.6**	**3.36**	**3.97**

[11] In order to properly determine the reduction of the flow rate from existing to proposed, the total peak runoff rates were added and analyzed in Table 5.

Table 5 below summarizes the hydrology results:

Table 5 Existing and Proposed Hydrology Summary

Condition	Area (acres)	Q_{25} (cfs)	Q_{50} (cfs)
Existing	1.31	3.62	4.14
Proposed	1.31	3.36	3.97
Difference	0	-0.26	-0.17
% Decrease from Existing to Proposed Condition	**0%**	**-7.2%**	**-4.1%**

As discussed above, based on the drainage patterns and flow paths of stormwater that are tributary to a common point or area within the Project Site, the boundaries of the drainage areas would remain as under existing conditions. Therefore, the flow patterns and discharge points under existing conditions would be maintained with the Project. The Project Site behaves in a similar manner as paved or impervious surfaces. Thus, while existing paved areas of the existing parking lot would be replaced by new impervious surfaces such as a building rooftop, from a hydrological perspective, these areas would be considered to have the same properties as existing impervious surfaces during an intense rain event and may also be reduced or slowed down due to a lower impervious area with the addition of landscaped areas. The results of the runoff rates, Table 5, confirm this theory, comparing the existing and proposed total peak runoff flows from the Project Site to the public right-of-way. Based on the above comparison, the operation of the Project would not result in flooding, and would not impact the capacity of the existing storm drain system. Accordingly, operation of the Project would result in a less than significant impact on surface water hydrology.

5.2.2 Surface Water Quality

The Project falls under the jurisdiction of the City of Los Angeles Department of Public Works, which follows the 2016 Low Impact Development (LID) Manual design guidelines. Stormwater best management practices (BMP) proposed for the Project will be designed to address the pollutants of concern identified in Section 2.2.2. Source and Treatment Control Best Management Practices (BMPs) are required for this Project under the State Regional Water Quality Control Board Standard Urban Stormwater Mitigation Plan (SUSMP) and City of Los Angeles Low Impact Development (LID) Standards Manual. The purpose of this surface water quality section is:

- To meet City of Los Angeles Department of Public Works requirements;
- To document that the City of Los Angeles LID requirements will be met;
- To determine the proposed development's impact on existing hydrologic conditions;
- To identify the pollutants of concern and provide BMPs that will mitigate those pollutants of concern; and
- To provide sufficient detailed information to support detailed hydraulic design of stormwater treatment systems.

Table 6 summarizes the efficiency of general categories of BMPs in treating different types of pollutants. The pollutants of concern for this Project's planned use and the receiving water are **nutrients, trash and debris, oil and grease, and metals.** The selected Treatment Control BMP addresses these four pollutants of concern.

Table 6 Treatment Control BMP Selection Matrix[12]

Los Angeles River Reach 2 Pollutant of Concern (Yes/No)	**Treatment Control BMP Categories**							
	Veg. Swale /Veg. Filter Strips	Detention Basins	**Planter Box /Infiltration Basins & Trenches**	Wet Ponds or Wetlands	Sand Filter or Filtration	Water Quality Inlets	Hydro-dynamic Separator Systems	Manufactured / Proprietary Devices
Sediment/Turbidity	H/M	M	H/M	H/M	H/M	L	H/M (L for turbidity)	U
No								
Nutrients	L	M	H/M	H/M	L/M	L	L	U
Yes			✓					
Organic Compounds	U	U	U	U	H/M	L	L	U
No								
Trash & Debris	L	M	U	U	H/M	M	H/M	U
Yes			✓					
Oxygen Demanding Substances	L	M	H/M	H/M	H/M	L	L	U
No								
Bacteria & Viruses	U	U	H/M	U	H/M	L	L	U
No			✓					
Oils & Grease	H/M	M	U	U	H/M	M	L/M	U
Yes			✓					
Pesticides (non-soil bound)	U	U	U	U	U	L	L	U
No								
Metals	H/M	M	H	H	H	L	L	U
Yes			✓					
Abbreviations: L: Low removal efficiency H/M: High or medium removal efficiency U: Unknown removal efficiency								

5.2.2.1 Site Design BMPs

Currently, there are no known stormwater treatment BMPs at the existing Project Site, meaning stormwater, with potential pollutants, will sheet flow from the site into the public right-of-way. Following the construction of the Project, stormwater will be treated by the proposed BMPs prior to discharging to the public right-of-way, providing water quality treatment not previously provided in the existing condition.

5.2.2.1.1 Minimize Stormwater Pollutants of Concern

The Project Site will minimize pollutants of concern by maximizing the reduction of pollutant loadings to the Maximum Extent Practicable. The pollutants of concern – namely, **trash and debris, nutrients, oil and grease and metals** – will be addressed through a pre-treatment device connected to the drywell within the Project Site.

[12] County of Los Angeles Department of Public Works, Stormwater Best Management Practice Design and Maintenance Manual (May 2009)

5.2.2.1.2 Conserve Natural Areas

The Project Site in its existing condition contains little to no natural areas. The Project will propose to add more landscaped areas to reduce the existing impervious areas.

5.2.2.2 Source Control BMPs

5.2.2.2.1 Protect Slopes and Channels

There are no unprotected slopes or unlined channels onsite. The entire area to be developed will be either vegetated or hardscaped.

5.2.2.2.2 Provide Storm Drain System Stenciling and Signage

Stenciling will be provided for public storm drains near the vicinity of the Project.

5.2.2.3 Treatment Control BMPs

5.2.2.3.1 Mitigation Design (Volumetric or Flow based)

Volume-based or flow-based design standards may be used separately or in combination. Volume-based criteria are used in the sizing of the drywell. The LID requirements, approved by the Regional Water Quality Control Board, call for the treatment of the peak mitigation flow rate or volume of runoff produced by either the 0.75-inch or the 85th percentile rainfall event, whichever is greater. The rainfall intensity of the 85th percentile rainfall is 0.97 inch, therefore the 85th percentile rainfall event governs.

The City of LA prioritizes LID BMP selection in the following order: infiltration, capture and use, City approved Bio-Filtration/Retention System BMP (high removal efficiency), any combination of the previous, and lastly hydromodification. Based on regional soils report data, it is assumed that the infiltration rate could be 25 in/hr. A percolation test will need to be performed to confirm the estimated infiltration rate. According to the City's LID guidelines, an infiltration rate less than or equal to 0.3 in/hr is considered infeasible. Based on the estimated infiltration rate, infiltration may be a potential solution. The runoff at the site will be routed, pretreated and then enter into the dry well for infiltration. High flow outlets for the drywell system will be routed to discharge as per existing conditions described in Section 2.1.

The LID calculation methodology was used to calculate the required treatment volume generated from the 85th percentile rainfall and to size the additional storage volume adequately. HydroCalc was used to determine the peak mitigation flow rate, Qpm. However, since the selected BMP is a volume based BMP, only the volume is relevant in the design. LID Calculations are provided in Section 7.0. The results are summarized in the tables below.

Table 7 Proposed Condition LID Results

Subarea	Project Site Area [ac]	BMP Type	85th percentile Q_{pm} [cfs]	85th percentile V_M [ft^3][13]
1	0.04	-	0.02	137
2	0.62	Infiltration	0.15	1,879
3	0.65	Infiltration	0.20	1,910
Total	**1.31**	**-**	**0.37**	**3,926**

[13] The total volume (Vm) of stormwater runoff to be mitigated was calculated by analyzing the Project area as one area. Using this Vm and the appropriate BMP calculation from the City of LA LID manual, Table 7 shows the requirements for the area.

Table 8 Summary SUSMP/LID Mitigation BMPs

Area[14]	Area [ac]	Impervious Area [ac]	Required Additional Storage Volume V_M [ft^3] [15]	BMP Type	Proposed Treatment V_M [ft^3]	% Treated	Impervious Area Untreated [ac]
1	0.04	0.04	137	Infiltration	-	100%	-
2	0.62	0.59	1,879	Infiltration	-	100%	-
3	0.65	0.60	1,910	Infiltration	-	100%	-
Total	**1.31**	**1.23**	**3,926**	**Infiltration**	**4,000**	**100%**	**0**

The selected BMP for the site will have the capacity to capture and infiltrate 3,926 ft^3 of stormwater runoff. Rainwater cistern tanks are commercially available in various sizes and can be constructed to meet the storage size requirements. Other options include building a waterproof structure to hold the required volume. A custom-built waterproof room can provide 4,000 ft^3 of storage, thus, this proposed BMP, or equivalent, is able to provide 100% treatment.

In addition, as part of the LID for the Project to manage post construction stormwater runoff, the Project would include the installation of floor drains, planter drains, and roof downspouts through the Project Site to collect roof and site runoff and direct stormwater away from the structures through a series of underground storm drain pipes. This onsite stormwater conveyance system would serve to prevent onsite flooding and nuisance water on the Project Site. Because the infiltration system will require the stormwater from the Project be treated prior to discharging to the public right-of-way, in accordance with the City's LID Ordinance, the operation of the Project would result in a less than significant impact on surface water quality.

5.2.3 Groundwater

After construction, the Project Site will have less impervious coverage than the existing condition. The stormwater will be infiltrated on-site before being discharged into the public storm drain system. Therefore, the Project's potential operational groundwater hydrology impacts would be less than significant.

As opposed to the Project's existing condition where stormwater BMPs are not in place, the proposed Project will include BMPs that reduce possible contaminants generated by the Project's planned uses. Stormwater has the potential to be infiltrated on-site prior to discharge to the public storm drain system. Therefore, the Project's potential operational groundwater quality impacts would be less than significant.

5.3 Cumulative Impacts

5.3.1 Surface Water Hydrology

Based on the above, the Project would not result in an incremental impact on either on-site or off-site flooding during a 25-year or 50-year storm event. The Project will reduce existing stormwater flow from the Project Site. Through the nature of the local permitting process, the City will require stormwater management for all related and future projects in accordance with the LID guidelines. In addition, the City will continue to review future development projects to ensure sufficient local and regional infrastructure is

[14] BMP required calculation based on City of LA LID manual.
[15] Additional Storage Volume calculated after deducting the 3-hr infiltration volume and storage in the dry well.

available to accommodate stormwater runoff. Therefore, potential cumulative impacts associated with the Project on surface water hydrology would be less than significant.

5.3.2 Surface Water Quality

The Project can implement an infiltration system, unless a geotechnical investigation deems this to be infeasible, which will result in improved water quality to the Los Angeles River Watershed as compared to the existing Project condition. In addition, the Project and other future development projects will be reviewed and required by the City to be designed in order to comply with LID requirements. Therefore, based on the Project's less than significant impacts and required compliance with applicable water quality regulations, potential cumulative impacts to surface water quality would be less than significant.

5.3.3 Groundwater

Historic groundwater within the vicinity of the Project Site was determined to be at a depth of 84 feet below ground surface. The anticipated excavation for this Project is up to 38 feet below ground surface in order to accommodate the subterranean parking levels. Groundwater is not expected to be encountered during construction. However, if any perched groundwater is encountered during construction or if proven through a geotechnical investigation during the design phase, it would need to be directed to a dewatering system and discharged in accordance with all applicable NPDES CGP regulations and local regulations. As a result of these regulations, no significant groundwater hydrology impacts would result at the Project Site or within the larger groundwater basin.

No impacts to the groundwater table nor the existing groundwater quality are anticipated due to the deep infiltration process which uses the soil to naturally filter contaminants before being released to the water table. Future and other proposed projects will be reviewed and required to comply with local and state regulations. Therefore, potential cumulative impacts to groundwater quality would be less than significant.

6.0 Level of Significance

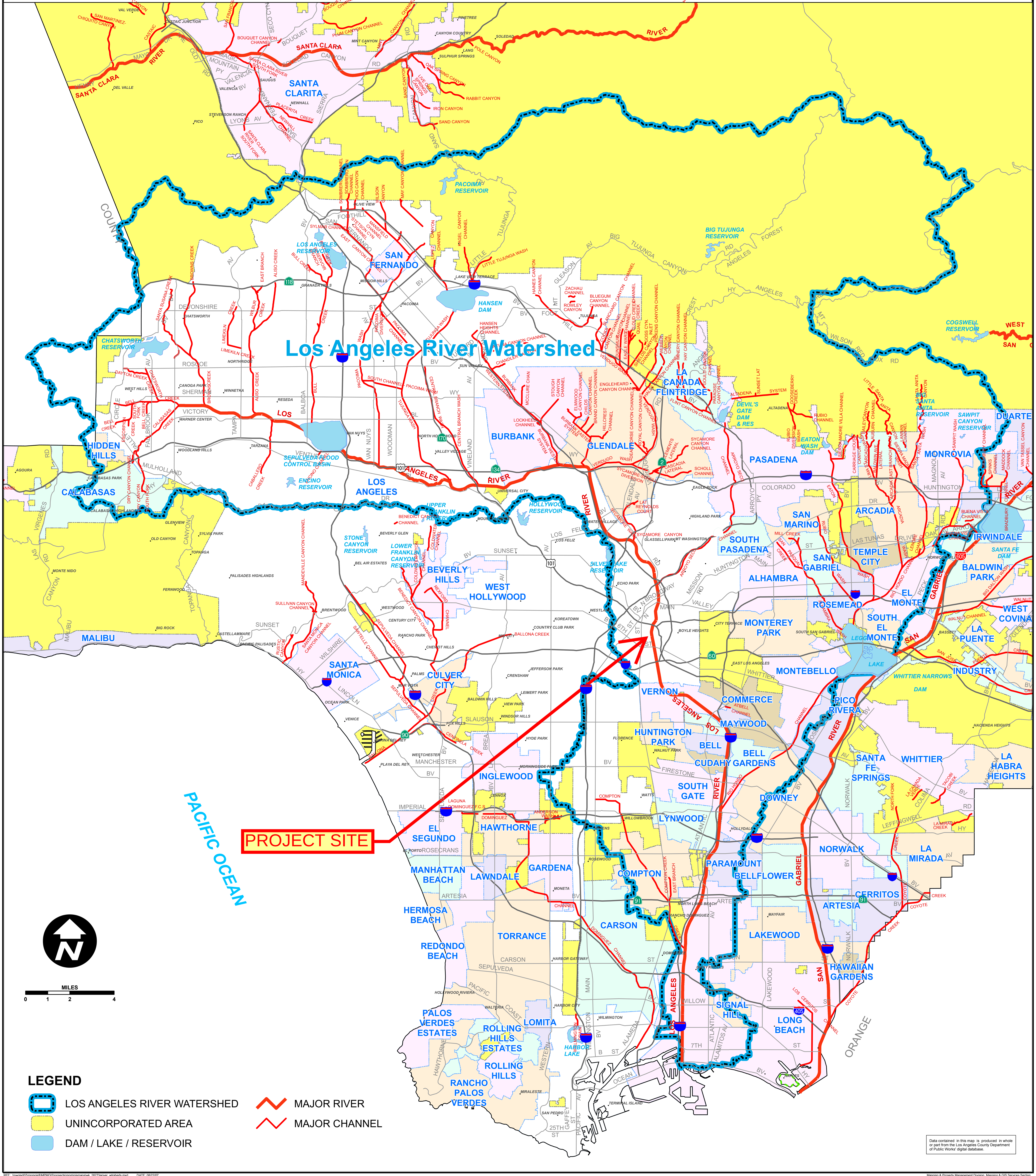
6.1 Significance Summary

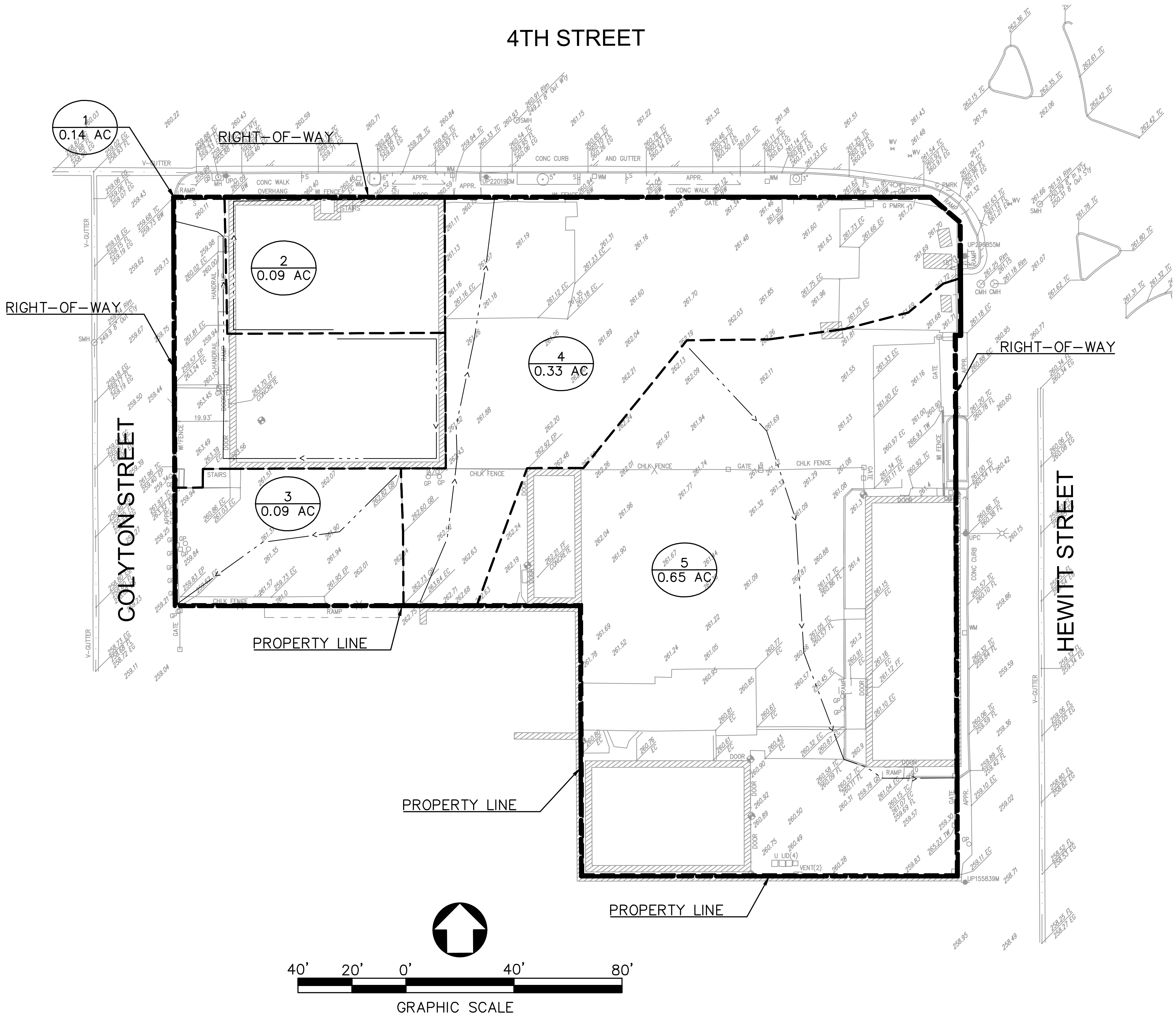
Based on the analysis contained in this report, the Project would not substantially increase the amount of surface water in a water body, and it will not result in a permanent adverse change to the movement of surface water that would result in an incremental effect on the capacity of the existing storm drain system. Additionally, the Project Site is not located within a FEMA or City of Los Angeles designation 100- or 500-year flood plain, nor is it located within a potential inundation area as designed by the City of Los Angeles General Plan Safety Element. With compliance under the SWPPP, SUSMP, and the City's LID Ordinance, there are no significant impacts for surface water hydrology, surface water quality, or groundwater as a result of the construction and operation of this Project.

7.0 Attachments

COUNTY OF LOS ANGELES

LOS ANGELES RIVER WATERSHED





Note: For reduced sized prints, original scale is in inches

LEGEND:

- PROPERTY/RIGHT-OF-WAY LINE
- TC FLOW PATH
- DRAINAGE SUB-AREA BOUNDARY
- 1 / 0.53 AC — SUB-AREA DESIGNATION AND ACREAGE

HYDROLOGY INFORMATION:

50-YEAR 24-HOUR ISOHYET: 5.92 INCHES

LACDPW SOIL CLASSIFICATION: 006

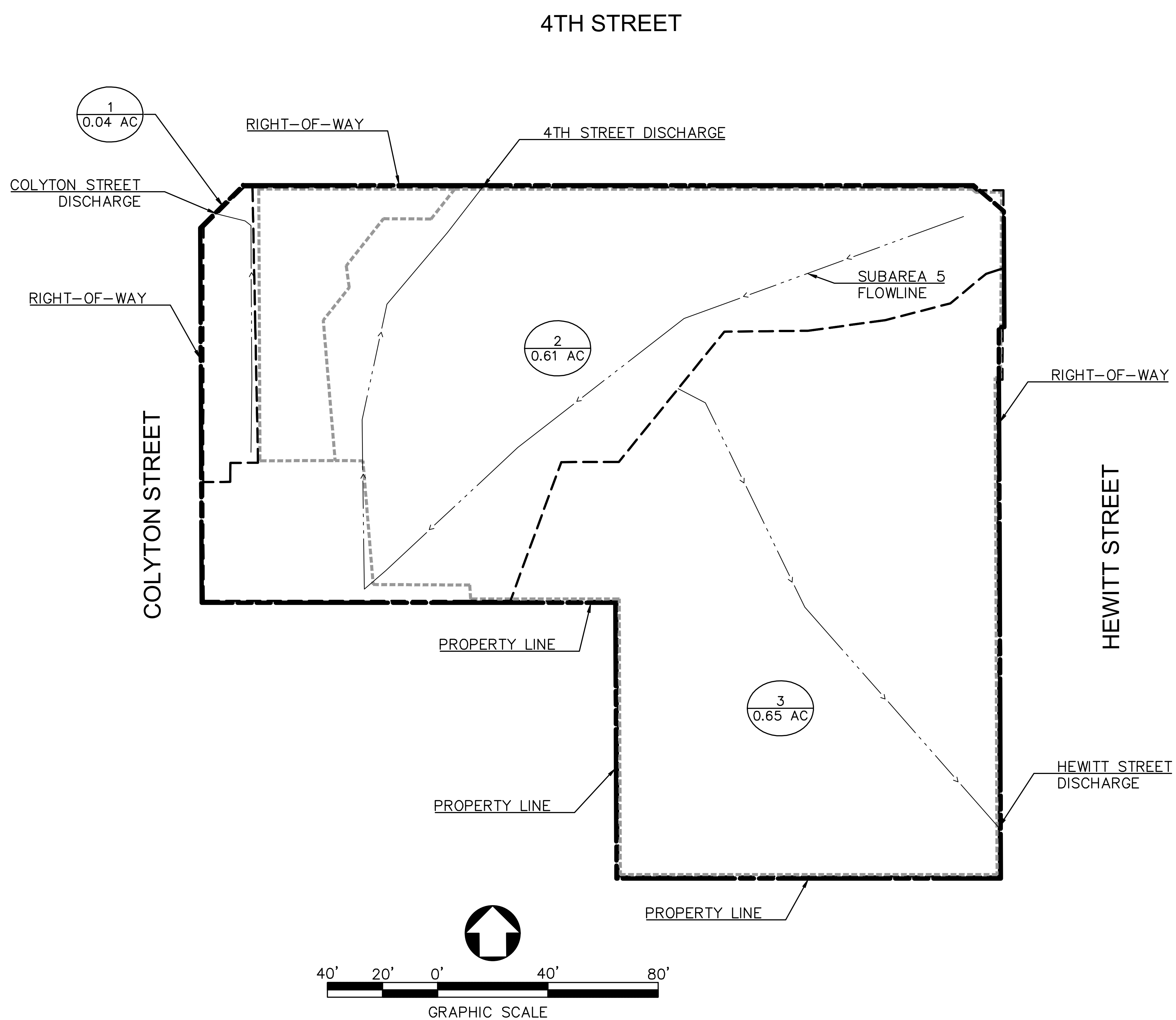
NOTES:

PROPERTY LINE AND RIGHT-OF-WAY LINE WERE OFFSET FOR DISPLAY PURPOSES ON THIS EXHIBIT.

405 Hewitt
Existing Hydrology Exhibit

PSOMAS

DATE: 10-26-16 REVISED ON: 10-26-16
JOB No:1LIG060100
SHEET 1 OF 1



Note: For reduced sized prints, original scale is in inches

LEGEND:

PROPERTY/RIGHT-OF-WAY LINE

TC FLOW PATH

DRAINAGE SUBAREA BOUNDARY

PROPOSED BUILDING OUTLINE

1 / 0.53 AC — SUBAREA DESIGNATION AND ACREAGE

HYDROLOGY INFORMATION:

50-YEAR 24-HOUR ISOHYET:	5.92 INCHES
LACDPW SOIL CLASSIFICATION:	006

NOTES:

PROPERTY LINE AND RIGHT-OF-WAY LINE WERE OFFSET FOR DISPLAY PURPOSES ON THIS EXHIBIT.

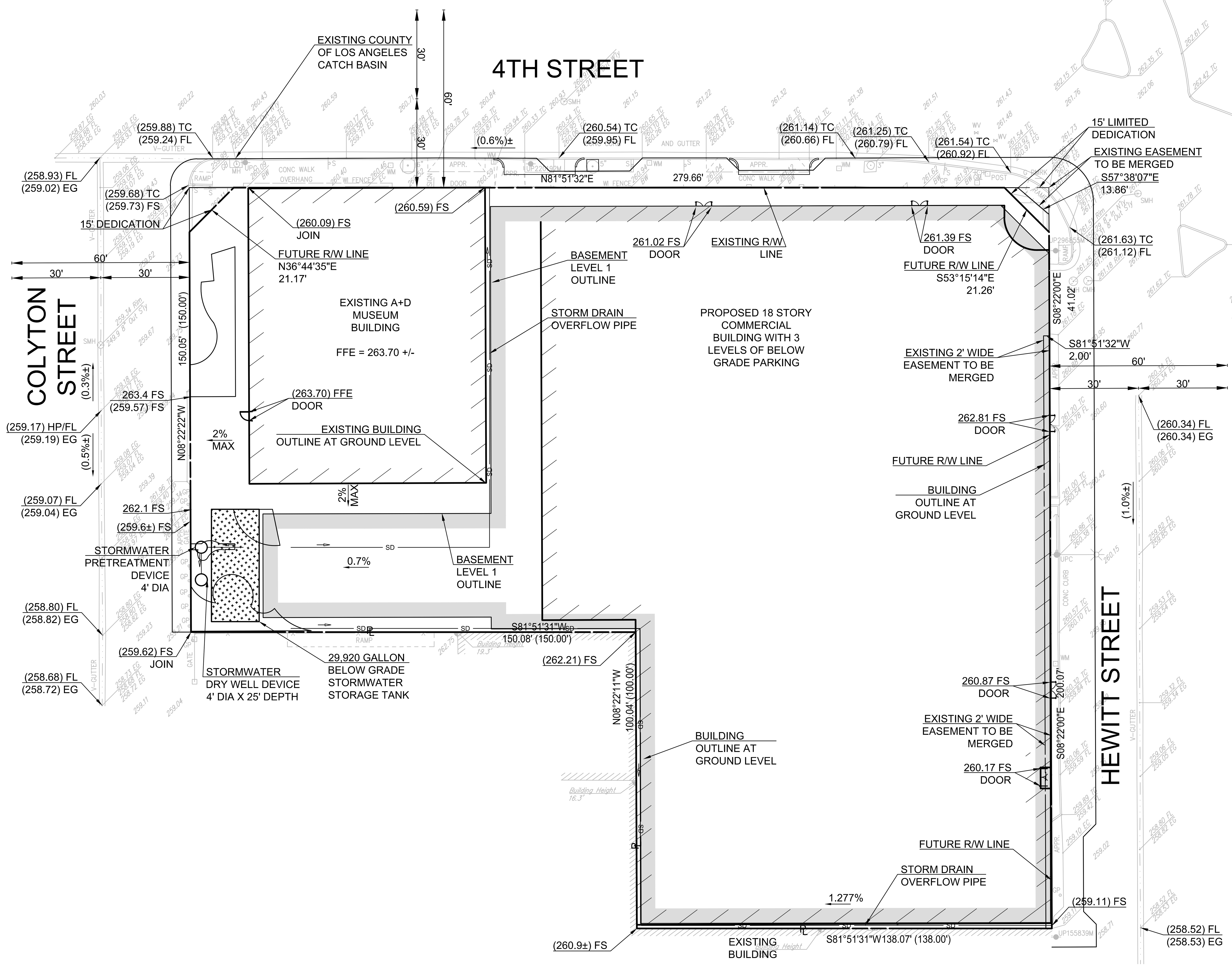
PODIUM DRAINAGE TO BE CONVEYED TO STREET VIA BUILDING PLUMBING SYSTEM.

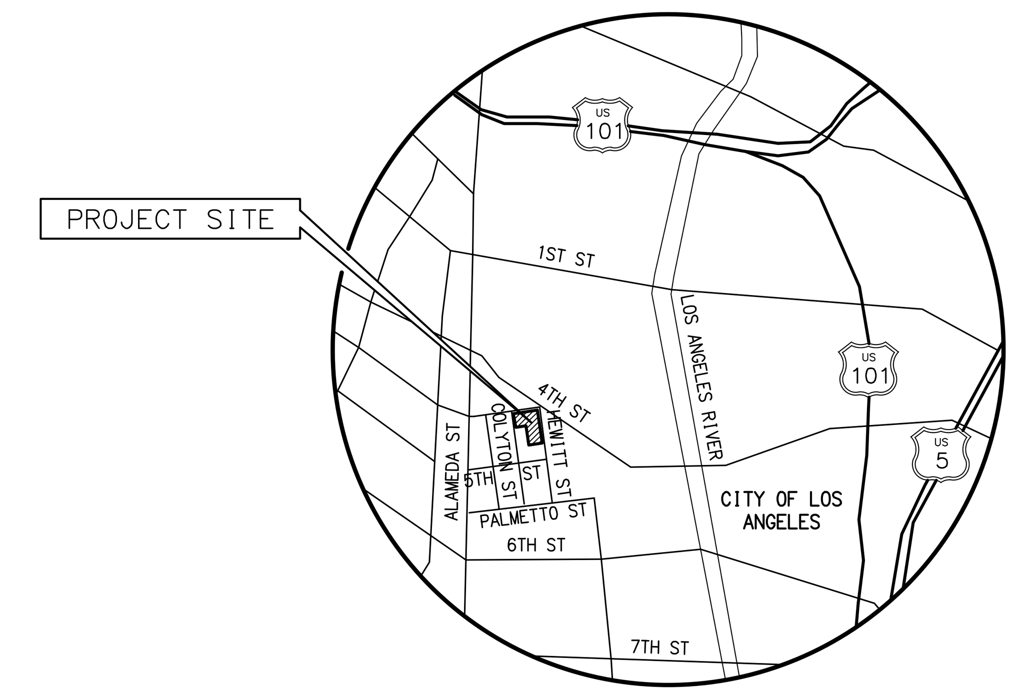
405 Hewitt
Proposed Hydrology
Exhibit

PSOMAS

DATE: 10-26-16 REVISED ON: 10-26-16
JOB No:1LIG060100

SHEET 1 OF 1





VICINITY MAP
NOT TO SCALE

LEGEND:

- LIMIT OF STORM WATER TANK
- 4' DIA INFILTRATION DRYWELL
- SURFACE FLOW DIRECTION
- PIPE FLOW DIRECTION
- LIMIT OF BUILDING AT GROUND LEVEL
- LIMIT OF BASEMENT BELOW GRADE

GENERAL NOTES:

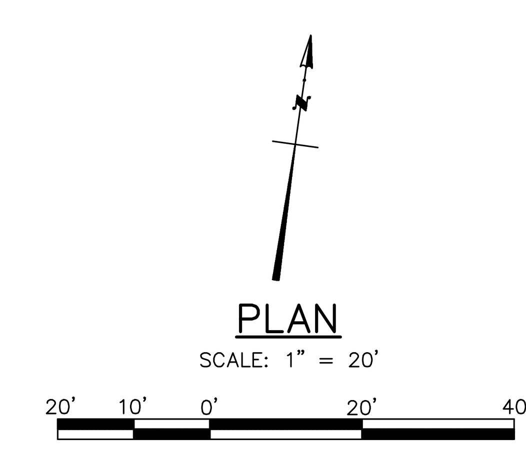
PLUMBING SYSTEM TO ROUTE STORM WATER RUNOFF TO STORAGE TANK. RUNOFF TO BE PLUMBED TO STORM WATER PRE-TREATMENT DEVICE AND DRY WELL INFILTRATION SYSTEM. OVERFLOW DISCHARGE TO HEWITT STREET AND 4TH STREET.

ESTIMATED EARTHWORK QUANTITIES:

RAW CUT	75,200	CY.
RAW FILL	0	CY.
OVEREXCAVATION AND RECOMPACTION @ 0'	0	CY.
TOTAL EXPORT	75,200	CY.

THE ABOVE LISTED QUANTITIES REFLECT THE ENGINEER'S ESTIMATE OF THE EARTHWORK VOLUMES. BULKING IS NOT CONSIDERED IN EXPORT.

THESE QUANTITIES ARE FOR DESIGN AND BONDING PURPOSES ONLY, AND NOT FOR CONTRACT PURPOSES. THE CONTRACTOR IS RESPONSIBLE FOR COMPUTING HIS OWN QUANTITIES.



PLAN
SCALE: 1" = 20'

\\pprod.psomas.com\corp\panzura\projects\LA_Projects\1LIG060100\ENGR\EXHIBIT\C-EXHB-12-Grading Drainage.dwg
1/5/2017 10:12:33 AM

Legendary Investors Group
401 S. Hewitt, Los Angeles, CA 90013

Gensler
500 South Figueroa Street
Los Angeles, California 90071
United States
Tel 213.327.3600
Fax 213.327.3601

WALTER P MOORE
707 Wilshire Blvd., Suite 2100
Los Angeles, CA 90017
Tel 213.292.6500
Fax 213.292.6600

ARC
277 S. Lake Street
Burbank, CA 91502
Tel 818.508.6300
Fax 818.508.7050

RIOS CLEMENTI HALE STUDIOS

WALKER PARKING CONSULTANTS
606 S. Olive St. Suite 1100
Los Angeles, CA 90014
Tel 213.488.4911

PSOMAS
555 Flower St., Suite 4300
Los Angeles, CA 90071
Tel 213.223.1400

Date	Description

Seal / Signature

NOT FOR CONSTRUCTION

Project Name
4th & Hewitt Complex

Project Number
05.1291.000

Description
PRELIMINARY GRADING AND DRAINAGE PLAN

Scale
AS SHOWN

C1.0

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later and from National Geospatial Intelligence Agency imagery produced at a scale of 1:4,000 from photography dated 2003 or later.

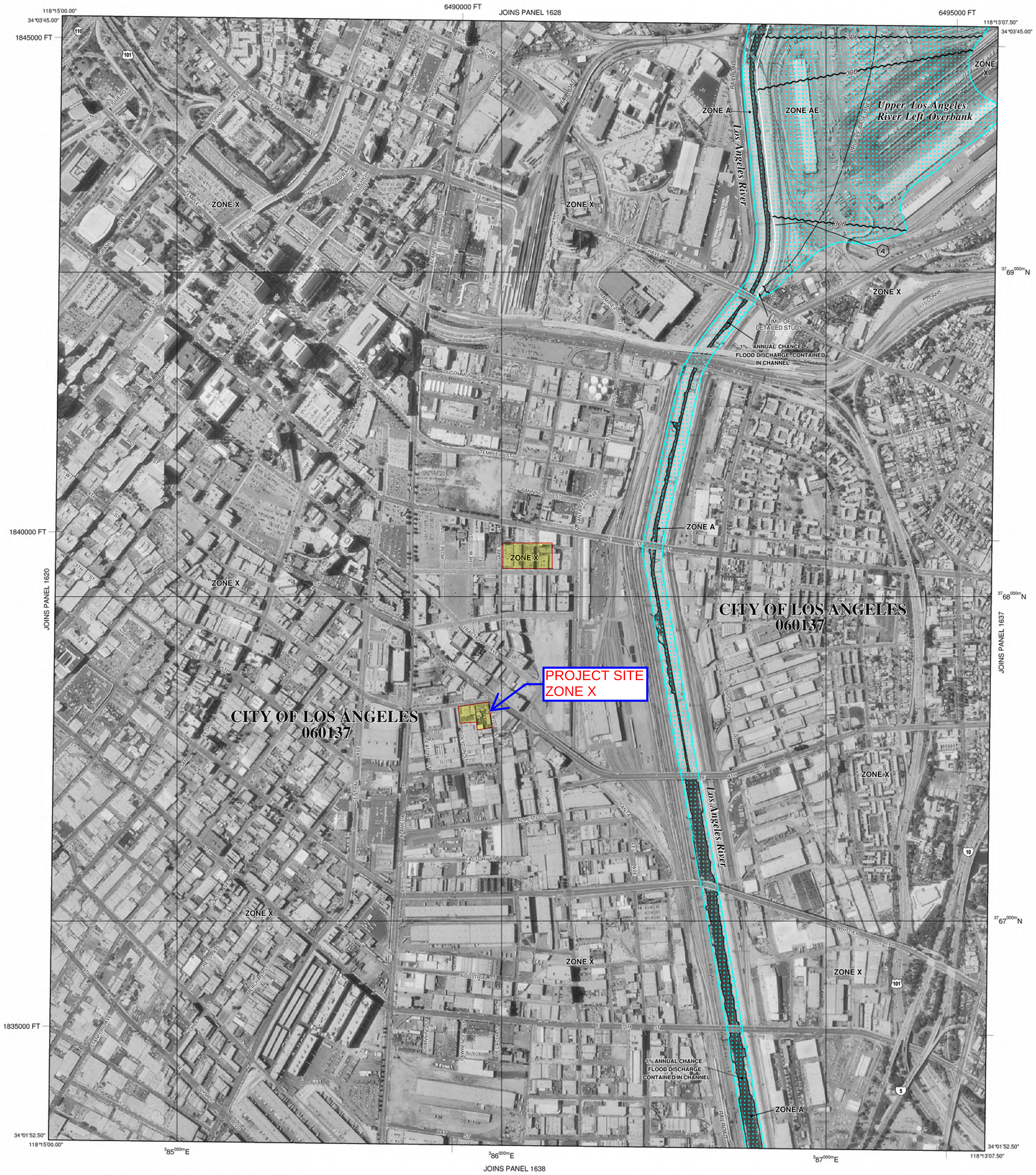
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

~~ 513 ~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)——(A)	Cross section line
(23)- - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N	1000-meter Universal Transverse Mercator grid values, zone 11
6000000 FT	5000-foot grid ticks: California State Plane coordinate system, V zone (FIPSZONE 0405), Lambert Conformal Conic
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 26, 2008
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1636F

FIRM
FLOOD INSURANCE RATE MAP
LOS ANGELES COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1636 OF 2350
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

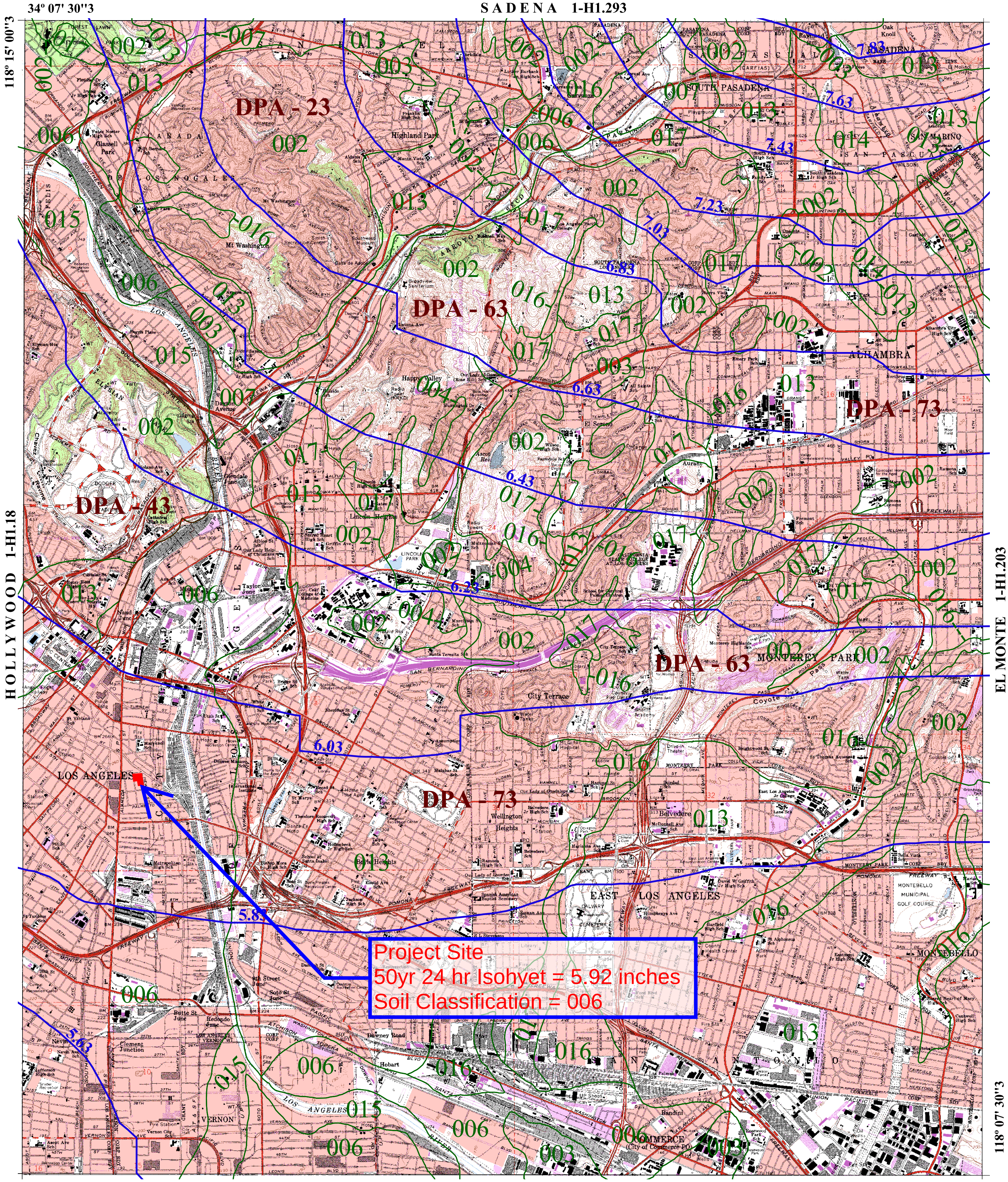
COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES, CITY OF	060137	1636	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06037C1636F

EFFECTIVE DATE
SEPTEMBER 26, 2008

Federal Emergency Management Agency



016 SOIL3 CLASSIFICATION3 REA3

7.23 INCHES OF3 RAINFALL3

DPA - 63 DEBRIS3 OTENTIAL3 REA3

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.8783

10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.7143

LOS ANGELES3
50-YEAR 24-HOUR ISOHYET3

1-H1.19

Department of Public Works
dpw.lacounty.gov

search our site..

Hydrology Map A GIS viewer application to view the data for the hydrology manual.

LAYERS

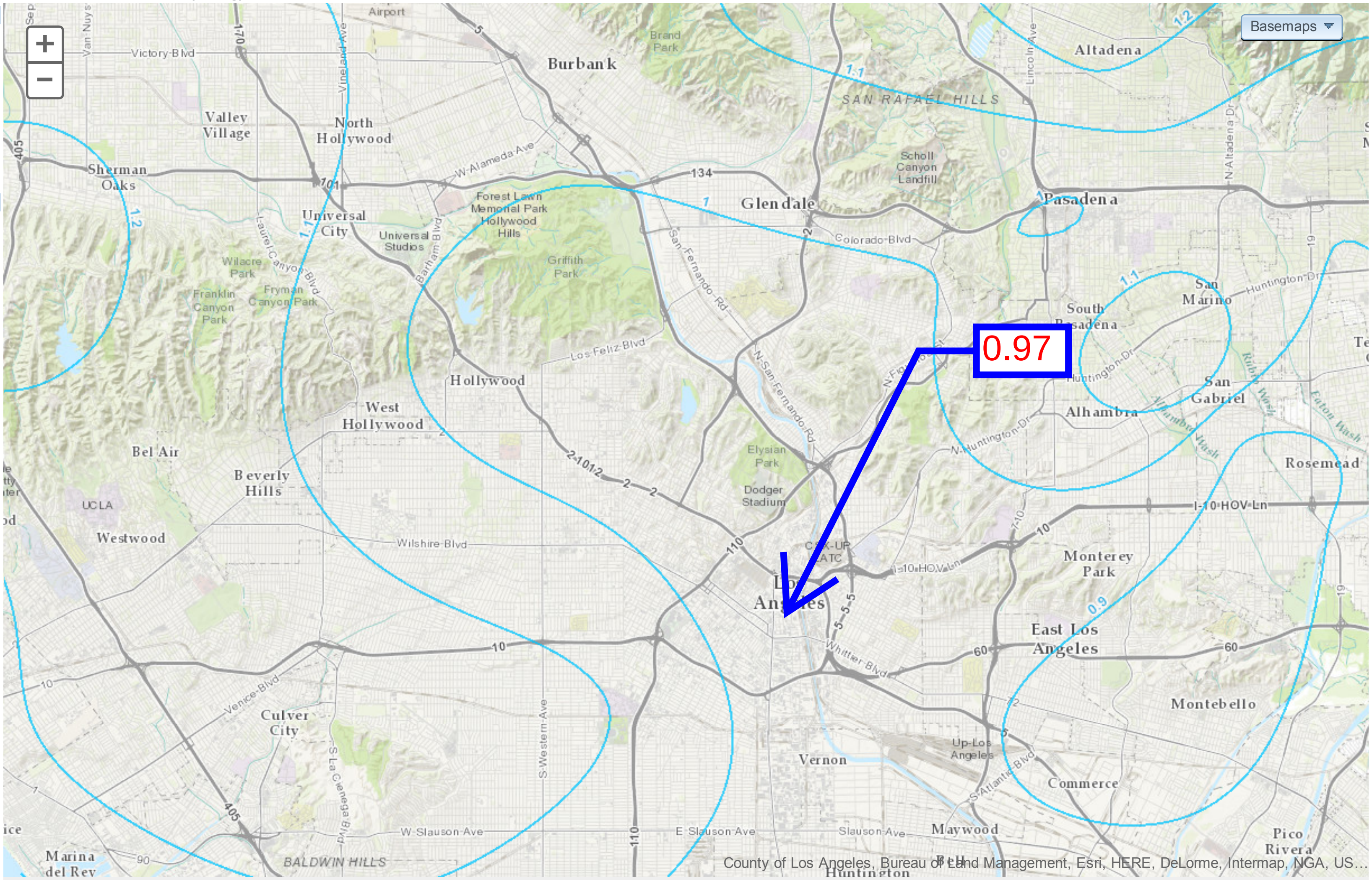
- 50yr Two Tenths (Rainfall)
- DPA Zones
- Soils 2004
- TG Page
- Final 85th Percentile, 24-hr Rainfall
- Final 95th Percentile, 24-hr Rainfall
- 1-year, 1-hour Rainfall Intensity

SEARCH

Zoom to TG Page:

Enter Address, Cross Street, or Parcel No.: (ex: 900 S. Fremont Ave., Fremont@Valley, 5342005904)

Search



Map Tips

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Peak Flow Hydrologic Analysis

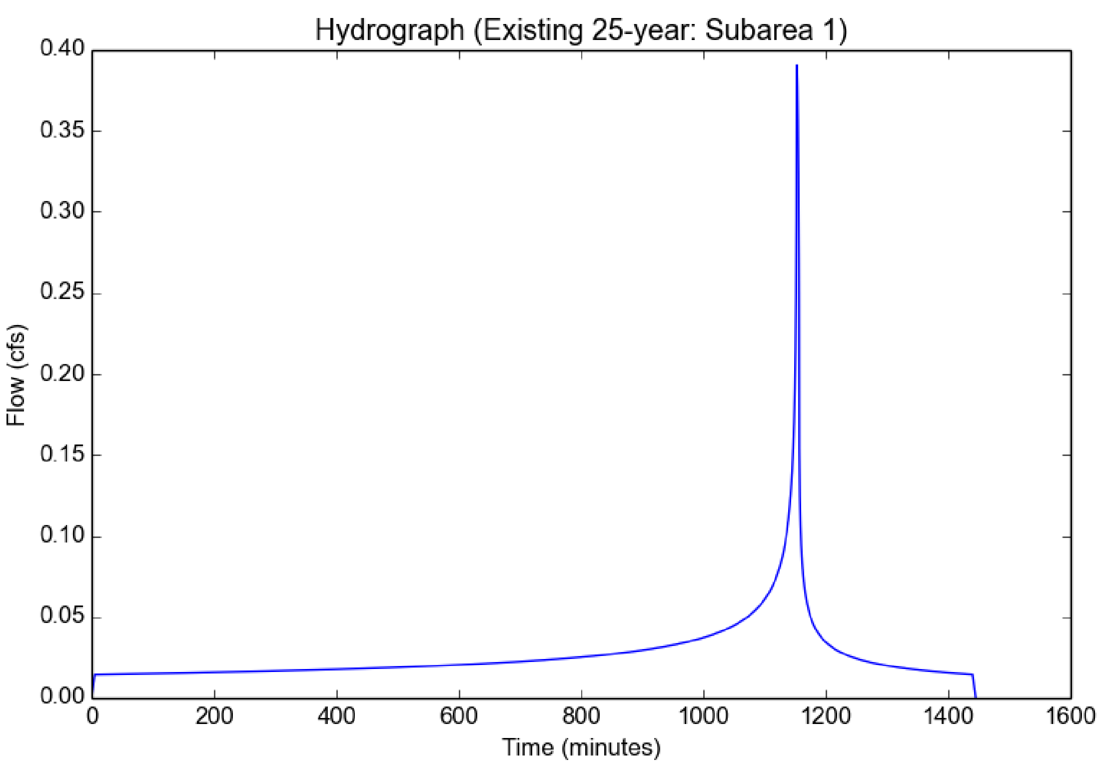
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 25-year - Subarea 1.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 25-year
Subarea ID	Subarea 1
Area (ac)	0.14
Flow Path Length (ft)	261.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.3907
Burned Peak Flow Rate (cfs)	0.3907
24-Hr Clear Runoff Volume (ac-ft)	0.0541
24-Hr Clear Runoff Volume (cu-ft)	2357.7047



Peak Flow Hydrologic Analysis

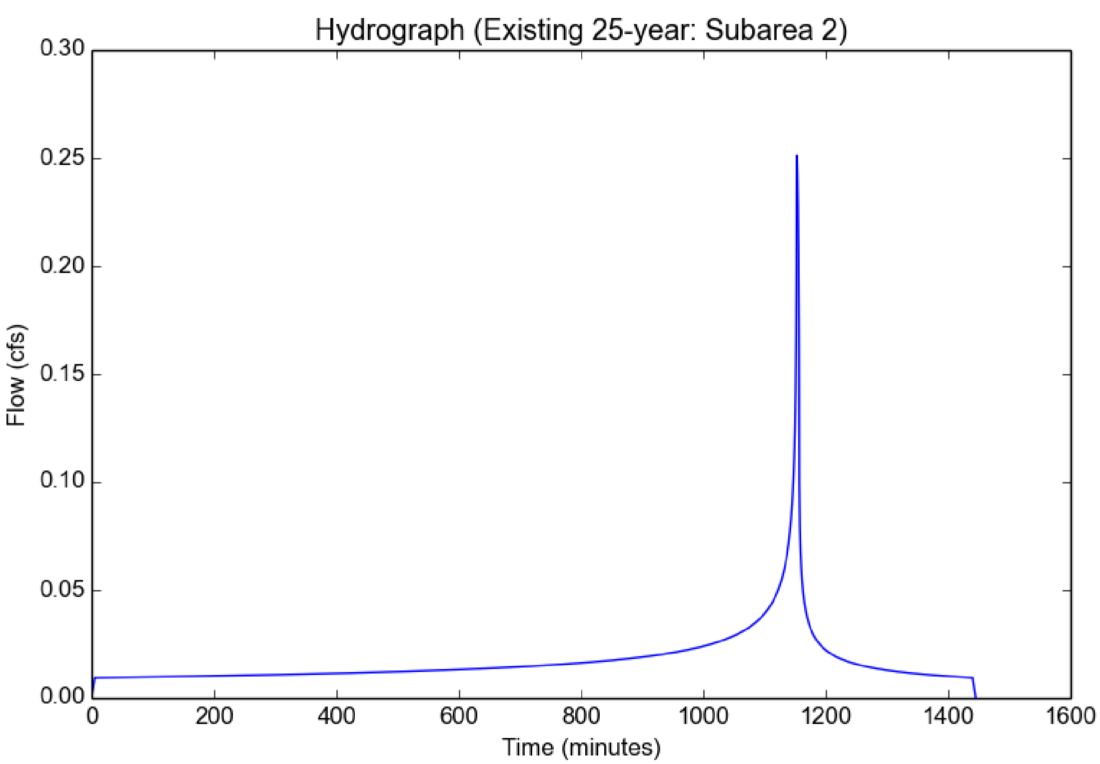
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 25-year - Subarea 2.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 25-year
Subarea ID	Subarea 2
Area (ac)	0.09
Flow Path Length (ft)	160.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.2512
Burned Peak Flow Rate (cfs)	0.2512
24-Hr Clear Runoff Volume (ac-ft)	0.0348
24-Hr Clear Runoff Volume (cu-ft)	1515.6673



Peak Flow Hydrologic Analysis

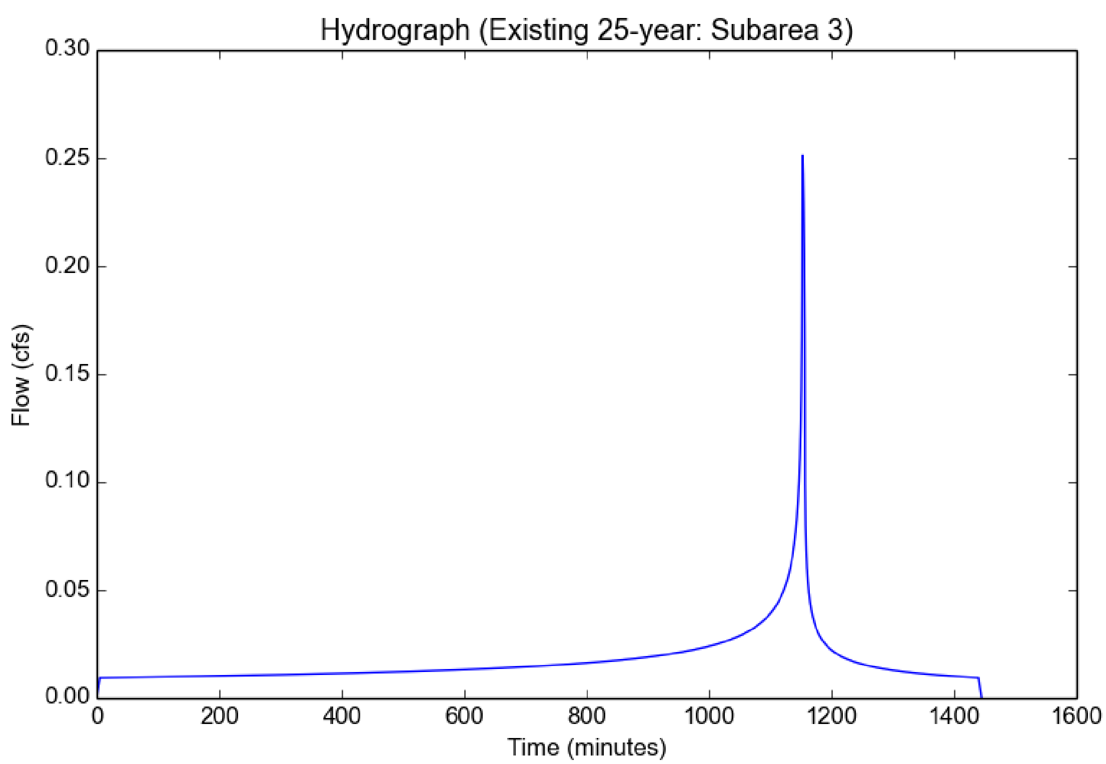
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 25-year - Subarea 3.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 25-year
Subarea ID	Subarea 3
Area (ac)	0.09
Flow Path Length (ft)	98.0
Flow Path Slope (vft/hft)	0.0327
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.2512
Burned Peak Flow Rate (cfs)	0.2512
24-Hr Clear Runoff Volume (ac-ft)	0.0348
24-Hr Clear Runoff Volume (cu-ft)	1515.6673



Peak Flow Hydrologic Analysis

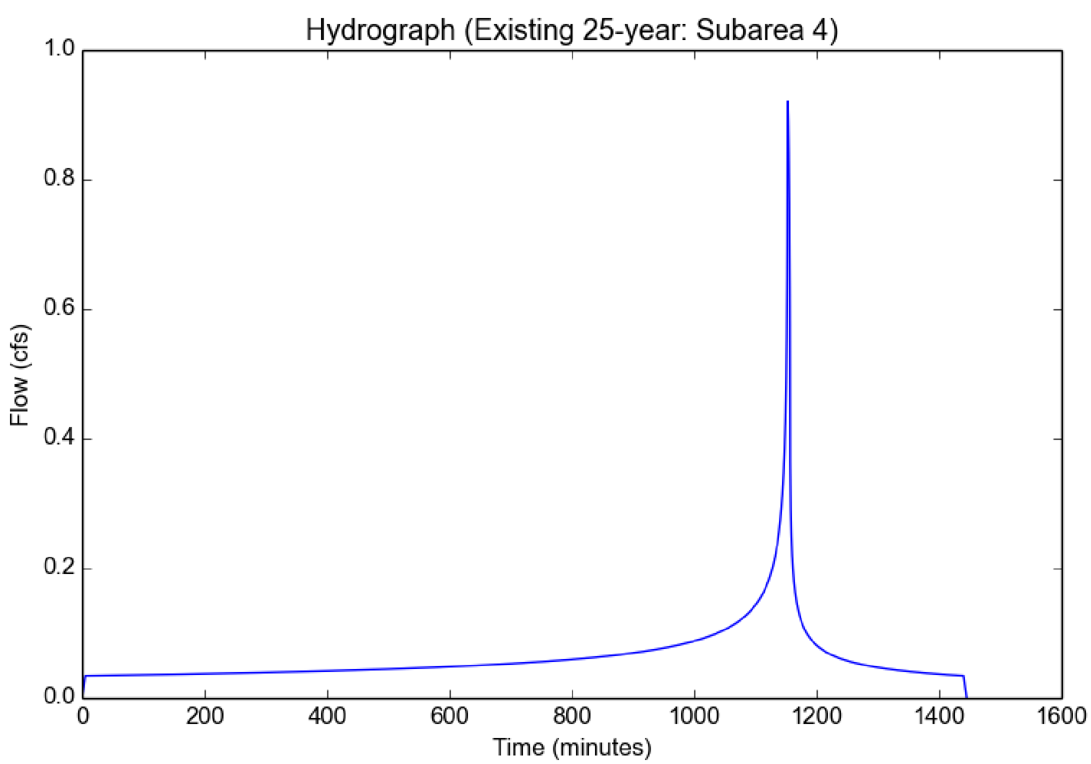
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 25-year - Subarea 4.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 25-year
Subarea ID	Subarea 4
Area (ac)	0.33
Flow Path Length (ft)	153.0
Flow Path Slope (vft/hft)	0.0131
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.921
Burned Peak Flow Rate (cfs)	0.921
24-Hr Clear Runoff Volume (ac-ft)	0.1276
24-Hr Clear Runoff Volume (cu-ft)	5557.4467



Peak Flow Hydrologic Analysis

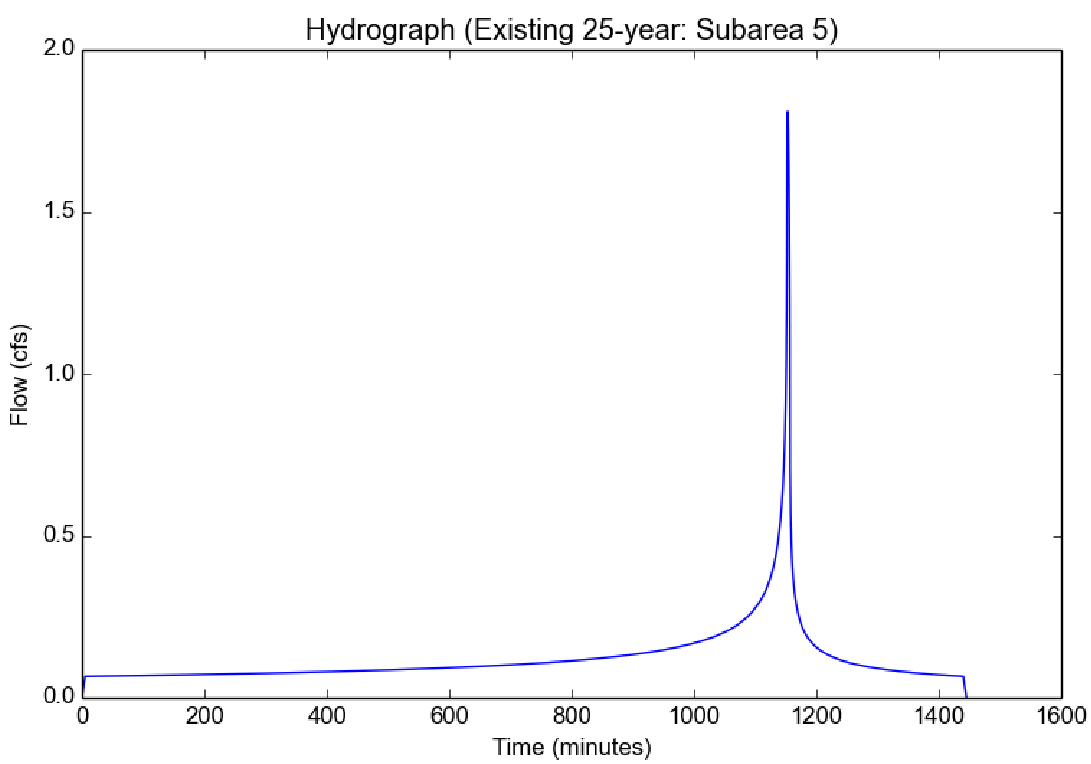
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 25-year - Subarea 5.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 25-year
Subarea ID	Subarea 5
Area (ac)	0.65
Flow Path Length (ft)	211.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	0.97
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.8979
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.8099
Burned Peak Flow Rate (cfs)	1.8099
24-Hr Clear Runoff Volume (ac-ft)	0.2454
24-Hr Clear Runoff Volume (cu-ft)	10690.5997



Peak Flow Hydrologic Analysis

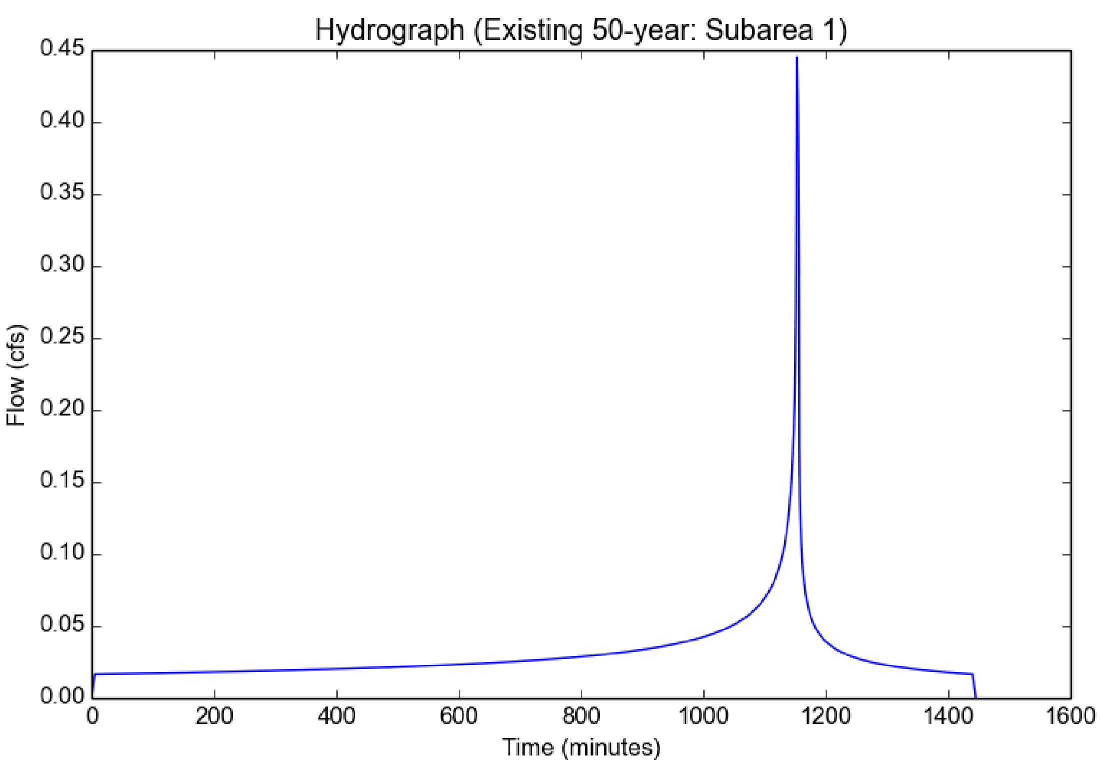
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 50-year - Subarea 1.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 50-year
Subarea ID	Subarea 1
Area (ac)	0.14
Flow Path Length (ft)	261.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.445
Burned Peak Flow Rate (cfs)	0.445
24-Hr Clear Runoff Volume (ac-ft)	0.0616
24-Hr Clear Runoff Volume (cu-ft)	2685.3128



Peak Flow Hydrologic Analysis

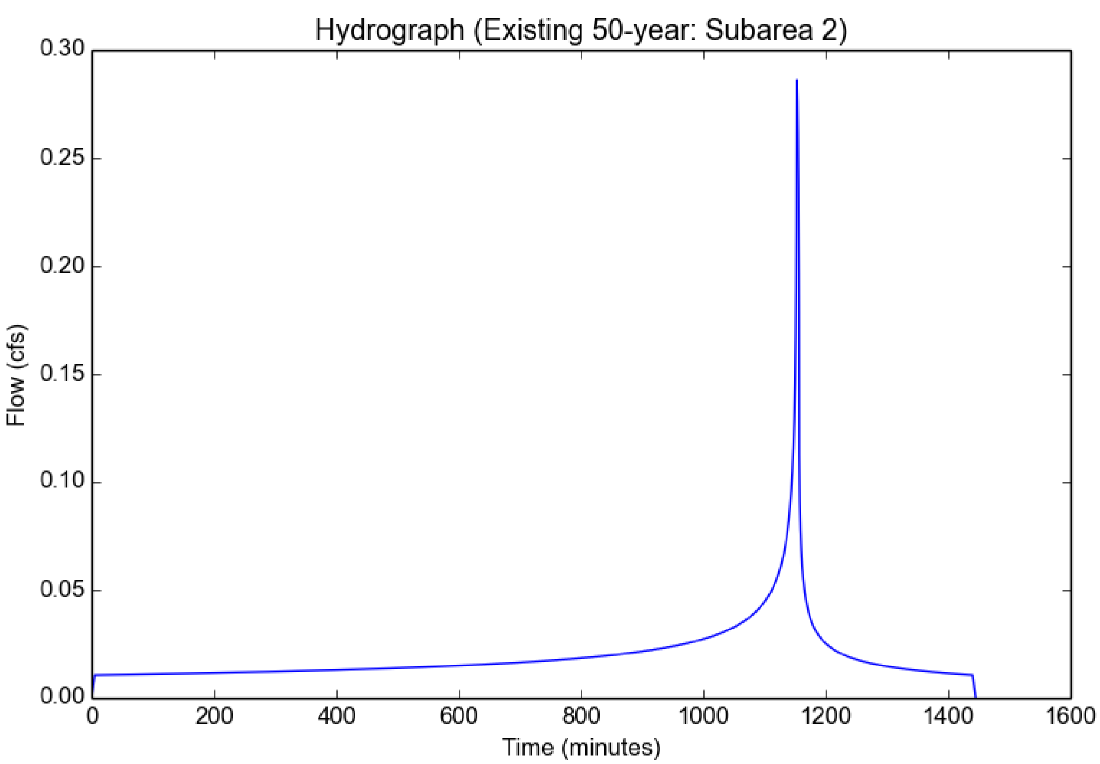
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 50-year - Subarea 2.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 50-year
Subarea ID	Subarea 2
Area (ac)	0.09
Flow Path Length (ft)	160.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.2861
Burned Peak Flow Rate (cfs)	0.2861
24-Hr Clear Runoff Volume (ac-ft)	0.0396
24-Hr Clear Runoff Volume (cu-ft)	1726.2725



Peak Flow Hydrologic Analysis

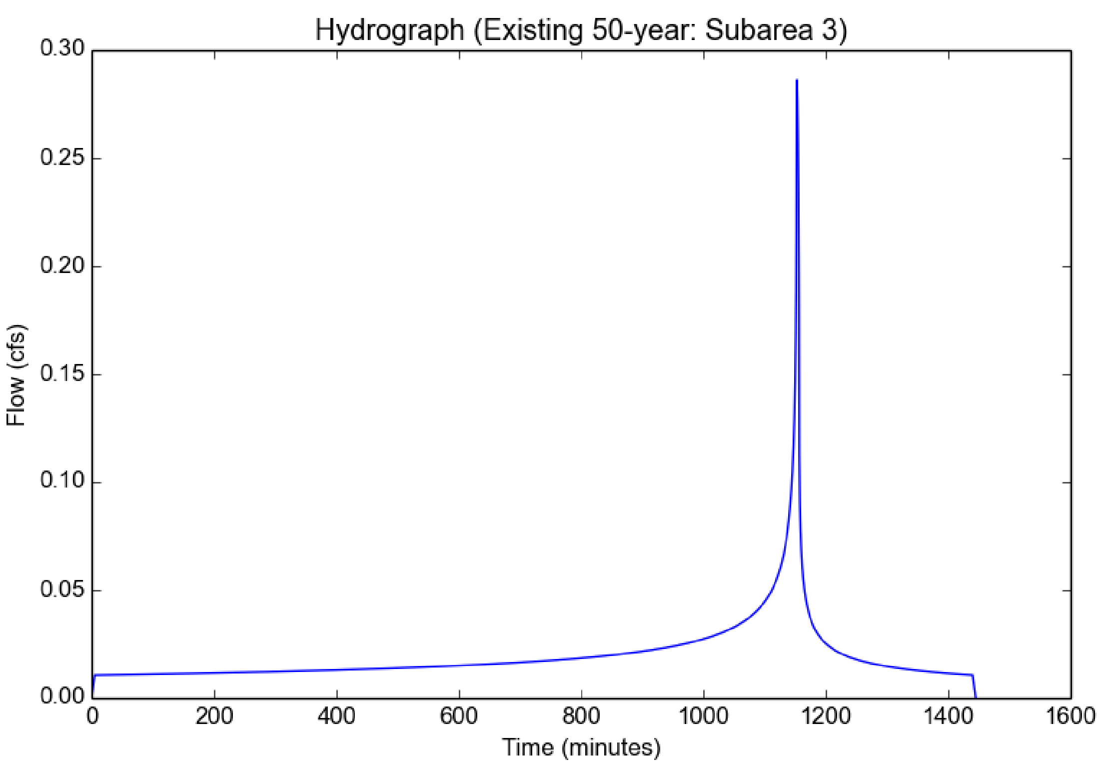
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 50-year - Subarea 3.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 50-year
Subarea ID	Subarea 3
Area (ac)	0.09
Flow Path Length (ft)	98.0
Flow Path Slope (vft/hft)	0.0327
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.2861
Burned Peak Flow Rate (cfs)	0.2861
24-Hr Clear Runoff Volume (ac-ft)	0.0396
24-Hr Clear Runoff Volume (cu-ft)	1726.2725



Peak Flow Hydrologic Analysis

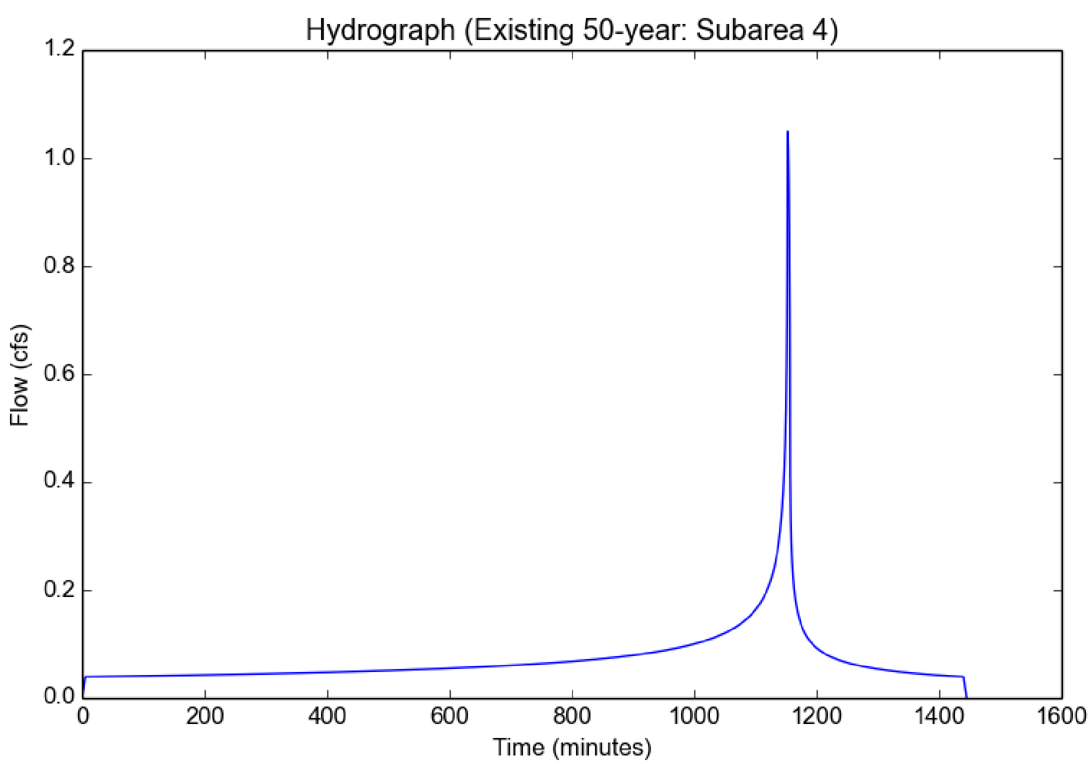
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 50-year - Subarea 4.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 50-year
Subarea ID	Subarea 4
Area (ac)	0.33
Flow Path Length (ft)	153.0
Flow Path Slope (vft/hft)	0.0131
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.049
Burned Peak Flow Rate (cfs)	1.049
24-Hr Clear Runoff Volume (ac-ft)	0.1453
24-Hr Clear Runoff Volume (cu-ft)	6329.666



Peak Flow Hydrologic Analysis

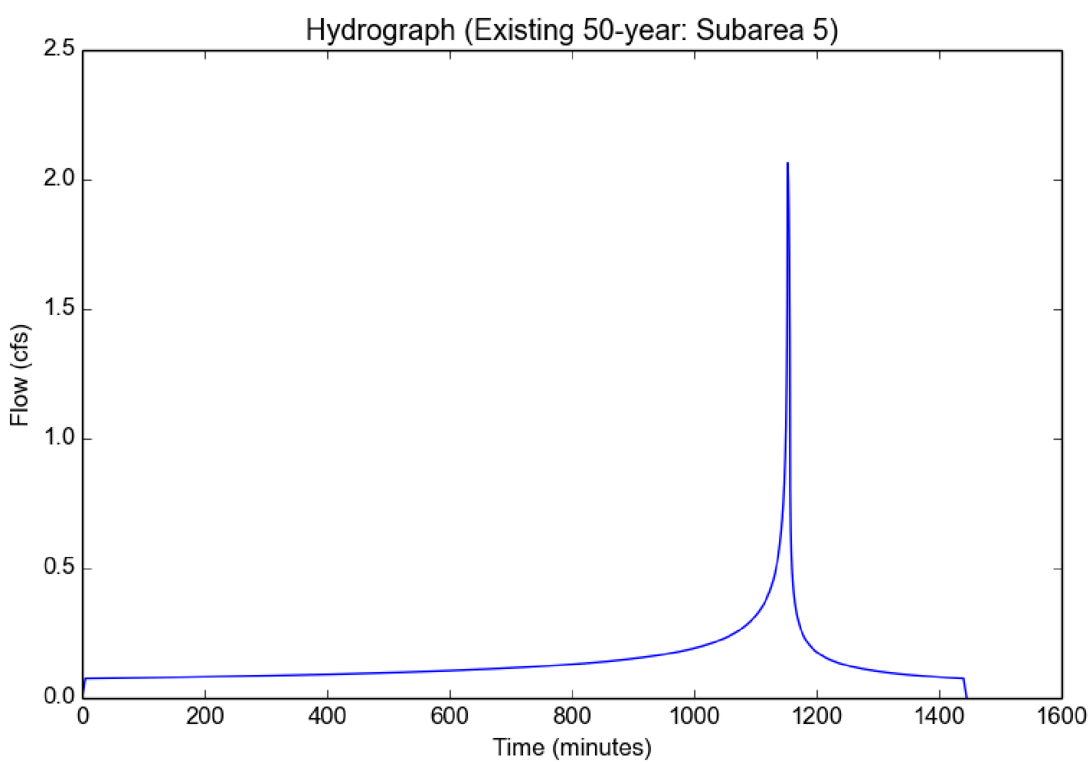
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Existing 50-year - Subarea 5.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Existing 50-year
Subarea ID	Subarea 5
Area (ac)	0.65
Flow Path Length (ft)	211.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	0.97
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.8988
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.0634
Burned Peak Flow Rate (cfs)	2.0634
24-Hr Clear Runoff Volume (ac-ft)	0.2797
24-Hr Clear Runoff Volume (cu-ft)	12182.7856



Peak Flow Hydrologic Analysis

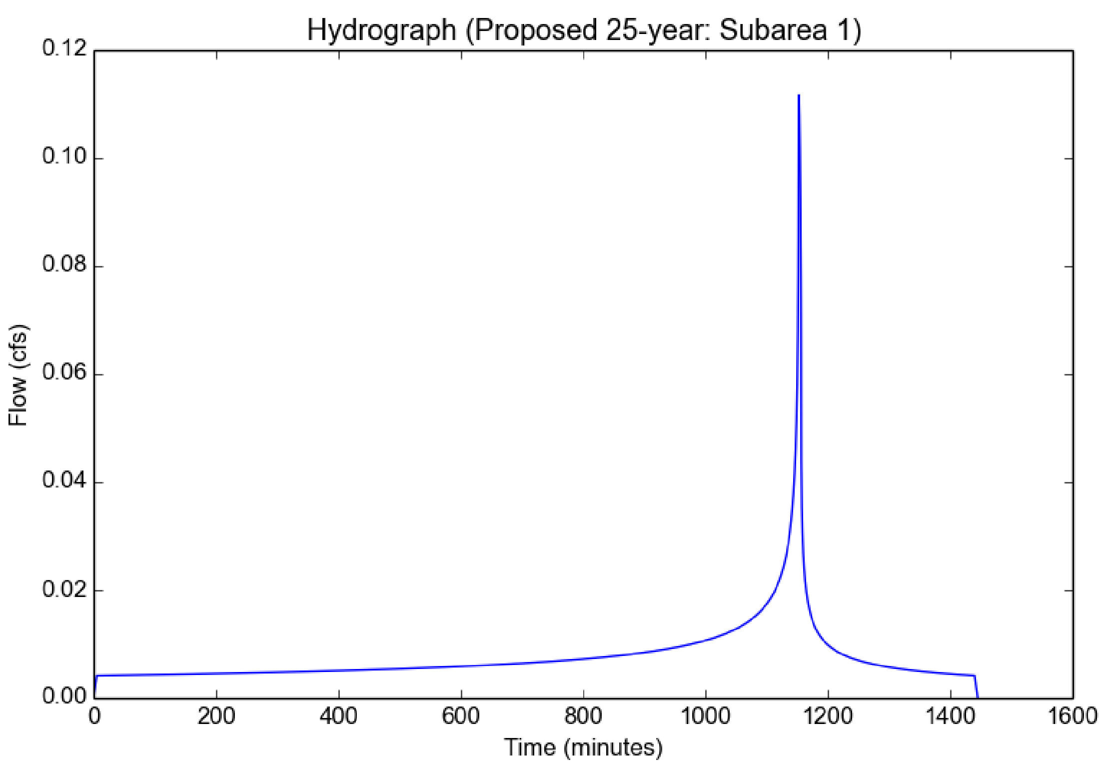
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 25-year - Subarea 1.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Proposed 25-year
Subarea ID	Subarea 1
Area (ac)	0.04
Flow Path Length (ft)	95.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.1116
Burned Peak Flow Rate (cfs)	0.1116
24-Hr Clear Runoff Volume (ac-ft)	0.0155
24-Hr Clear Runoff Volume (cu-ft)	673.6299



Peak Flow Hydrologic Analysis

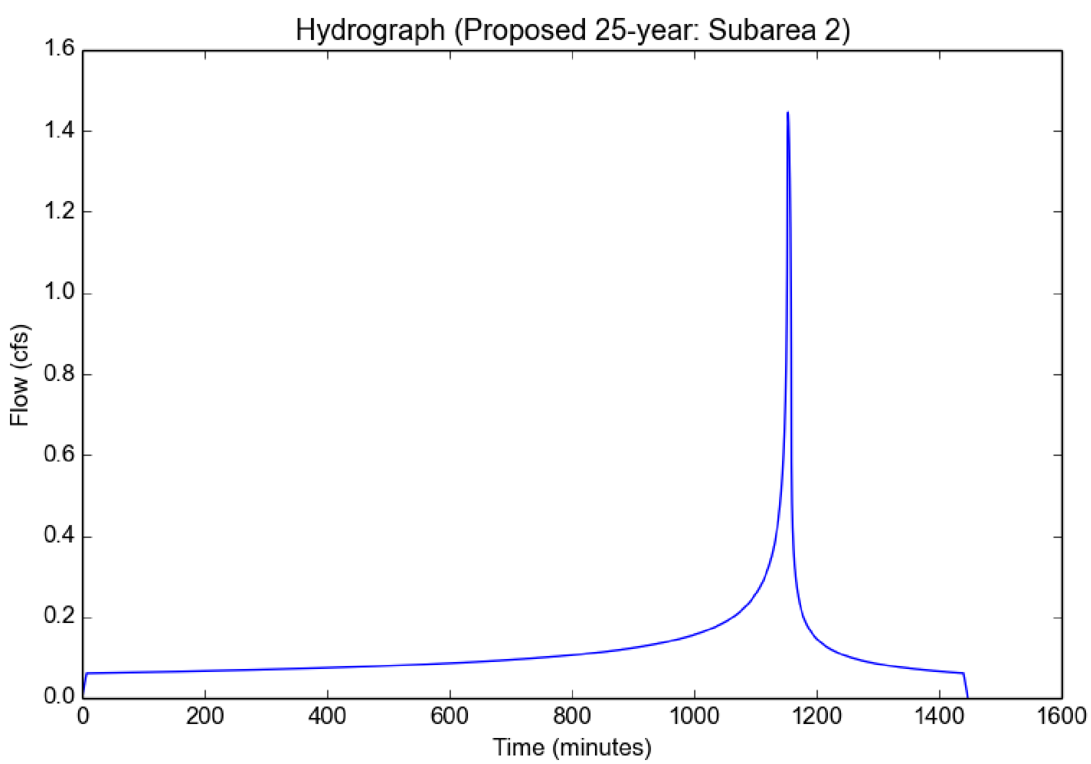
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 25-year - Subarea 2.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Proposed 25-year
Subarea ID	Subarea 2
Area (ac)	0.61
Flow Path Length (ft)	419.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	0.96
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	2.6475
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8959
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	1.4469
Burned Peak Flow Rate (cfs)	1.4469
24-Hr Clear Runoff Volume (ac-ft)	0.2285
24-Hr Clear Runoff Volume (cu-ft)	9952.4309



Peak Flow Hydrologic Analysis

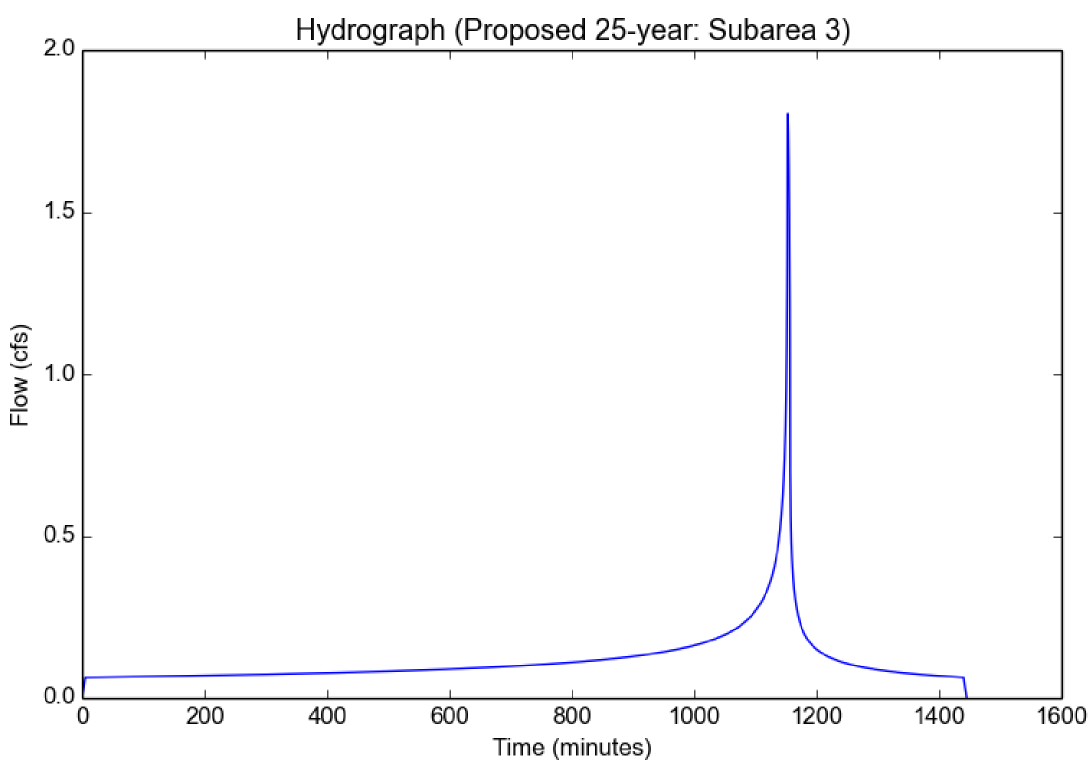
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 25-year - Subarea 3.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Proposed 25-year
Subarea ID	Subarea 3
Area (ac)	0.65
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	0.93
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1978
Peak Intensity (in/hr)	3.1011
Undeveloped Runoff Coefficient (Cu)	0.8294
Developed Runoff Coefficient (Cd)	0.8951
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.8042
Burned Peak Flow Rate (cfs)	1.8042
24-Hr Clear Runoff Volume (ac-ft)	0.2376
24-Hr Clear Runoff Volume (cu-ft)	10349.418



Peak Flow Hydrologic Analysis

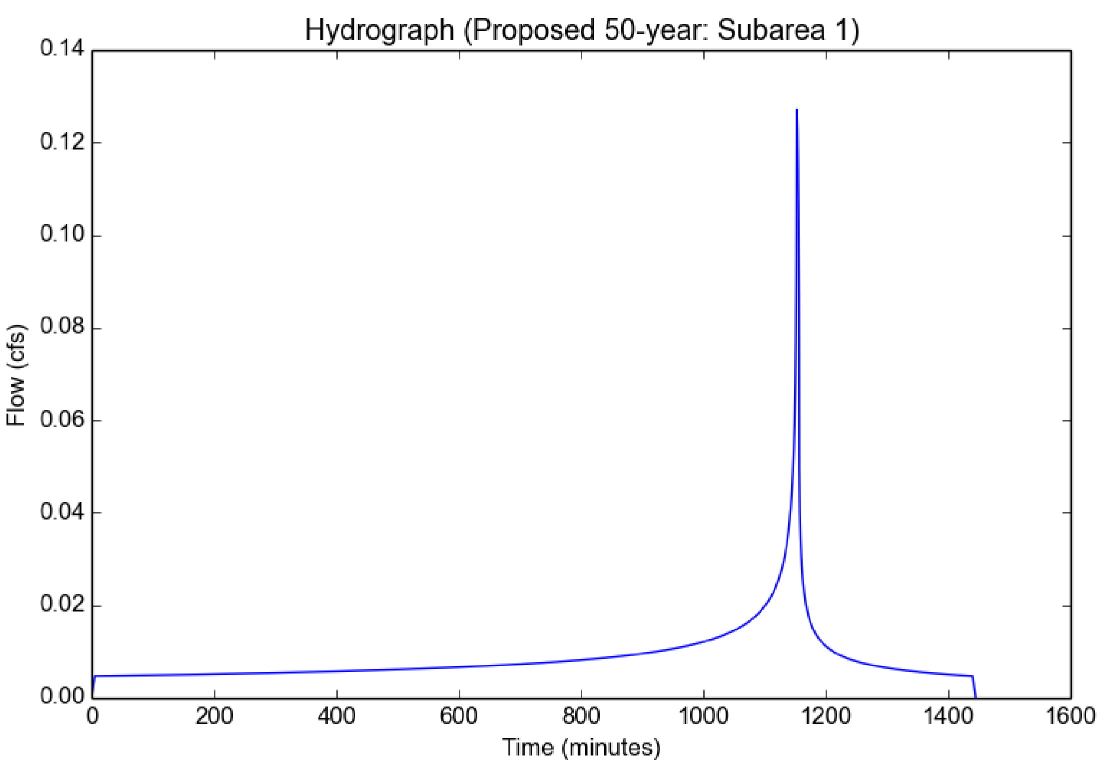
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 50-year - Subarea 1.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Proposed 50-year
Subarea ID	Subarea 1
Area (ac)	0.04
Flow Path Length (ft)	95.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	5.92
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.1272
Burned Peak Flow Rate (cfs)	0.1272
24-Hr Clear Runoff Volume (ac-ft)	0.0176
24-Hr Clear Runoff Volume (cu-ft)	767.2322



Peak Flow Hydrologic Analysis

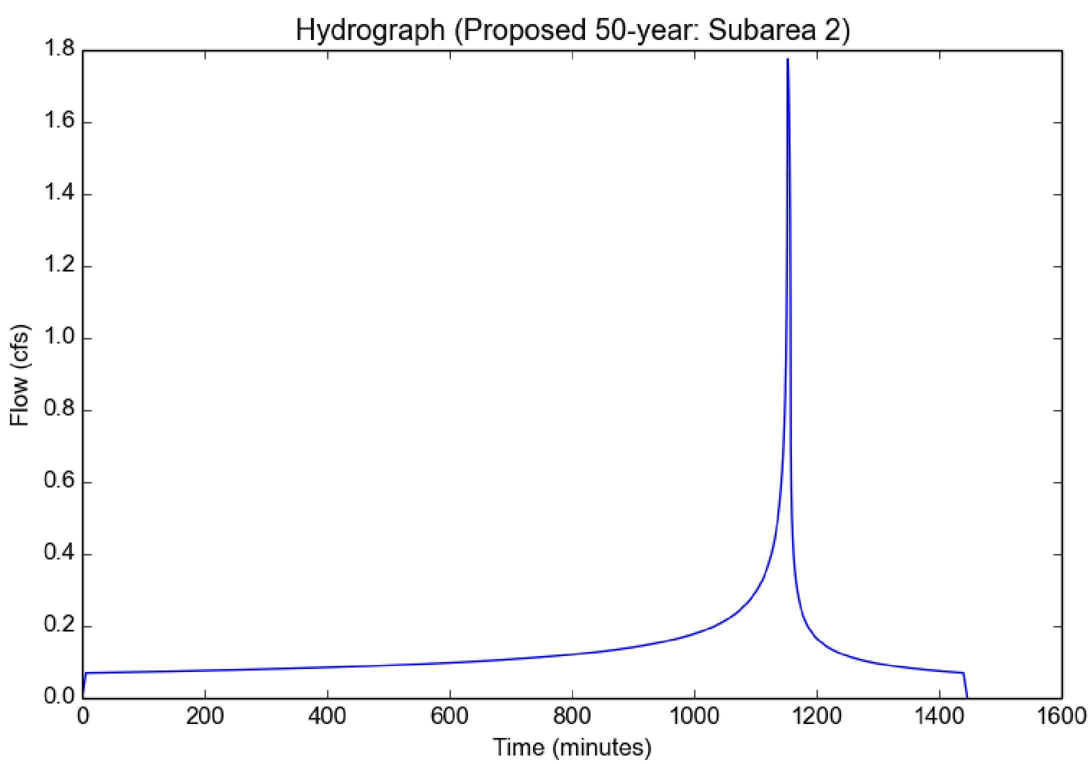
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 50-year - Subarea 2.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Proposed 50-year
Subarea ID	Subarea 2
Area (ac)	0.61
Flow Path Length (ft)	419.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	0.96
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.242
Undeveloped Runoff Coefficient (Cu)	0.8393
Developed Runoff Coefficient (Cd)	0.8976
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	1.775
Burned Peak Flow Rate (cfs)	1.775
24-Hr Clear Runoff Volume (ac-ft)	0.2604
24-Hr Clear Runoff Volume (cu-ft)	11343.8225



Peak Flow Hydrologic Analysis

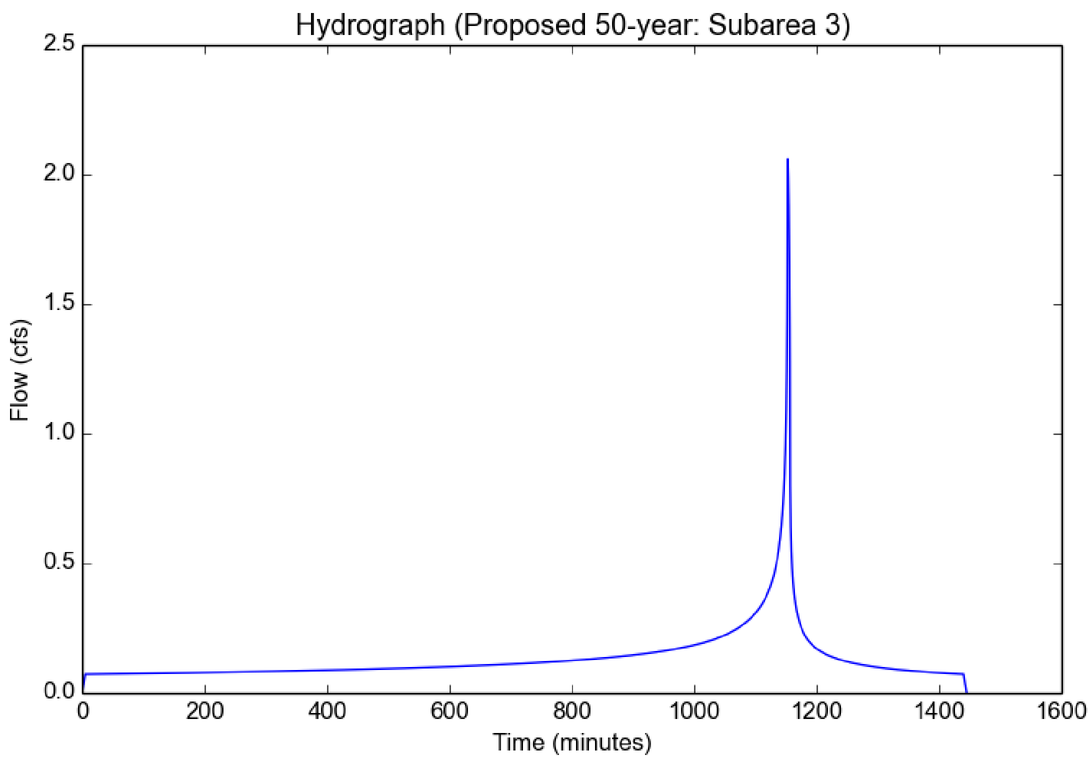
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 50-year - Subarea 3.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Proposed 50-year
Subarea ID	Subarea 3
Area (ac)	0.65
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	5.92
Percent Impervious	0.93
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.92
Peak Intensity (in/hr)	3.532
Undeveloped Runoff Coefficient (Cu)	0.8586
Developed Runoff Coefficient (Cd)	0.8971
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.0596
Burned Peak Flow Rate (cfs)	2.0596
24-Hr Clear Runoff Volume (ac-ft)	0.271
24-Hr Clear Runoff Volume (cu-ft)	11803.1344



Peak Flow Hydrologic Analysis

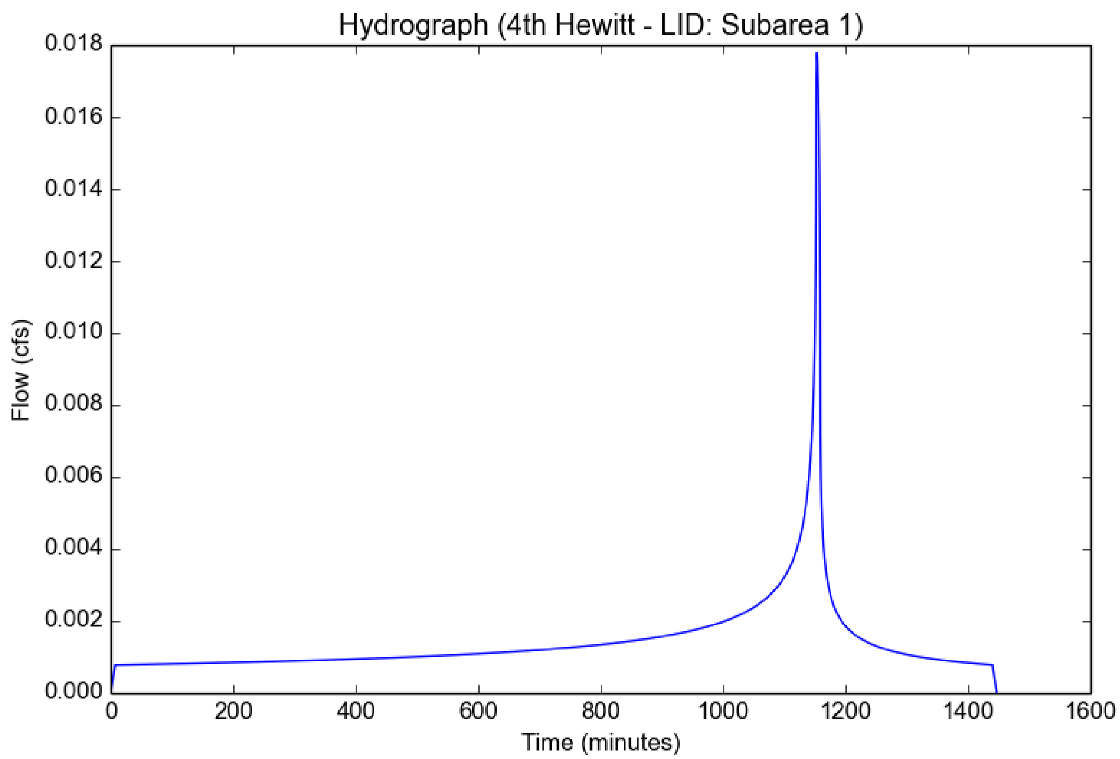
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 85th - Subarea 1.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	4th Hewitt - LID
Subarea ID	Subarea 1
Area (ac)	0.04
Flow Path Length (ft)	95.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	0.97
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.97
Peak Intensity (in/hr)	0.4941
Undeveloped Runoff Coefficient (Cu)	0.3132
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	0.0178
Burned Peak Flow Rate (cfs)	0.0178
24-Hr Clear Runoff Volume (ac-ft)	0.0029
24-Hr Clear Runoff Volume (cu-ft)	125.7121



Peak Flow Hydrologic Analysis

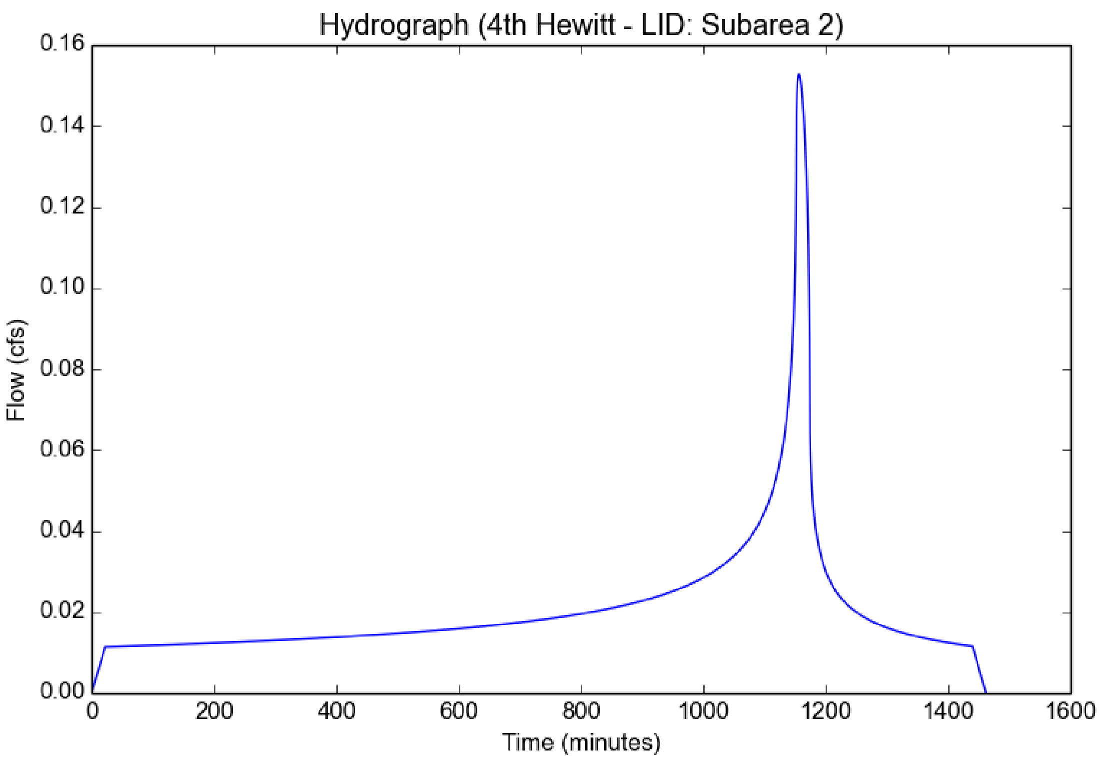
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 85th - Subarea 2.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	4th Hewitt - LID
Subarea ID	Subarea 2
Area (ac)	0.61
Flow Path Length (ft)	419.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	0.97
Percent Impervious	0.96
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.97
Peak Intensity (in/hr)	0.2884
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.868
Time of Concentration (min)	22.0
Clear Peak Flow Rate (cfs)	0.1527
Burned Peak Flow Rate (cfs)	0.1527
24-Hr Clear Runoff Volume (ac-ft)	0.0424
24-Hr Clear Runoff Volume (cu-ft)	1848.9555



Peak Flow Hydrologic Analysis

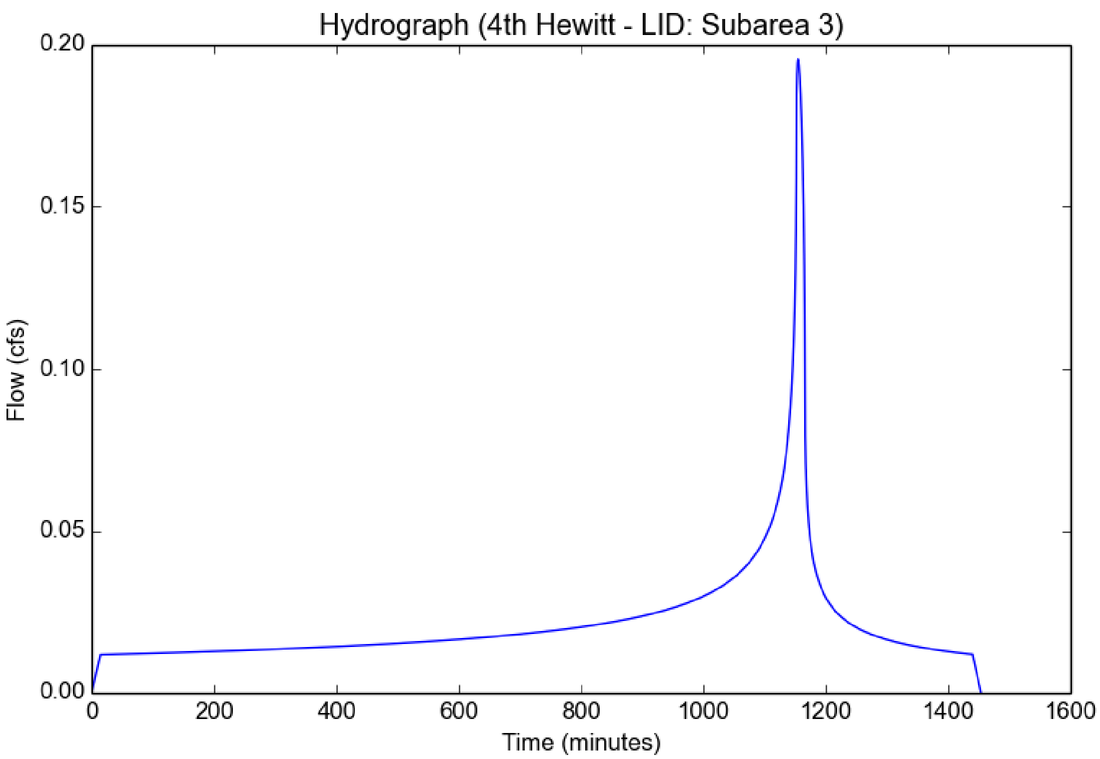
File location: W:/1LIG060100/ENGR/DOCS/EIR Hydrology Report/Attachments - Water Resources TR/Hydro Calc/Proposed 85th - Subarea 3.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	4th Hewitt - LID
Subarea ID	Subarea 3
Area (ac)	0.65
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	0.97
Percent Impervious	0.93
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.97
Peak Intensity (in/hr)	0.3567
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.844
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.1957
Burned Peak Flow Rate (cfs)	0.1957
24-Hr Clear Runoff Volume (ac-ft)	0.044
24-Hr Clear Runoff Volume (cu-ft)	1915.7159



4th and Hewitt Volume Calculations - Area 1:

Givens:

Area	sqft	acre
Area Total	1,843	0.043
Impervious, Ai	1,843	0.043
Pervious, Ap	0	0
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**1,843**	**0.043**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	0	0
TOTAL Pervious	**0**	**0**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

***Note these are landscaped areas exposed to the sky.**

****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile		(Per City of LA requirement)
Design Storm Intensity =	0.97	in	(Per LA County Hydrology GIS)
$K_{sat,\ Measured}$ =	25	in/hr	(Estimated per Nearby Project)
Drawdown Time, T =	96	hr	(Per City of LA LID Manual Table 4.2)
Factor of Safety, FS =	6		(Per City of LA LID Manual Table 4.2)
Gravel void ratio =	40%		
Number of Drywells =	0		
Shape =	Cylindrical		
Dry Well Shaft Inside Diameter (ID) =	4	ft	
Dry Well Infiltration Diameter =	4	ft	
Depth per Dry Well =	1	ft	

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(0.043*0.9)+[(0+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 137 ft^3 or 1,100 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**137**	**ft^3**	**or**	**1,100 Gallons**

ii. Determine $K_{Sat,\ Design}$:

$K_{sat,\ Design}$ = $K_{sat,\ Measured}$ / FS

$K_{sat,\ Design}$ = 25 in/hr / 6

$K_{sat,\ Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12\ in/ft}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{137\ ft3 \times 12\ in/ft}{4.17\ in/hr \times 96\ hr}$$

A_{min} =	**4**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r}\ ft$$

$$h = \frac{4 - \pi 2^2}{2\pi 2}\ ft$$

h =	**-1**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well,}$ (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = πr2h x 0.4

$V_{storage\ Dry\ Well}$ = π2^2 (-1) x 0.4

$V_{storage\ Dry\ Well}$ =	**-5**	**ft^3**

v. Determine 3-hr Infiltration Volume, V_{3-hr}:

$$V_{3-hr} = A_{min} \times \frac{K_{sat,Design}}{12\ in/ft} \times 3\ hr$$

$$V_{3-hr} = 4 \times \frac{4.17}{12\ in/ft} \times 3\ hr$$

V_{3-hr} =	**4**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + V_{3-hr})

$V_{Additional\ Storage}$ = 137 - (-5 + 4)

$V_{Additional\ Storage}$ =	**138**	**ft^3**

Project No, 1LIG060100
405 Hewitt Street
Los Angeles, CA 90013

4th and Hewitt Volume Calculations - Area 2:

Givens:

Area	sqft	acre
Area Total	26,771	0.615
Impervious, Ai	25,700	0.59
Pervious, Ap	1,071	0.025
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**26,771**	**0.615**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	1,071	0.025
TOTAL Pervious	**1,071**	**0.025**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

***Note these are landscaped areas exposed to the sky.**

****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile		(Per City of LA requirement)
Design Storm Intensity =	0.97	in	(Per LA County Hydrology GIS)
$K_{sat,\ Measured}$ =	25	in/hr	(Estimated per Nearby Project)
Drawdown Time, T =	96	hr	(Per City of LA LID Manual Table 4.2)
Factor of Safety, FS =	6		(Per City of LA LID Manual Table 4.2)
Gravel void ratio =	40%		
Number of Drywells =	1		
Shape =	Cylindrical		
Dry Well Shaft Inside Diameter (ID) =	4	ft	
Dry Well Shaft Depth =	30	ft	
Dry Well Infiltration Diameter =	6	ft	
Depth per Dry Well =	1	ft	

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(0.59*0.9)+[(0.025+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 1879 ft^3 or 14,100 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**1879**	**ft^3**	**or**	**14,100 Gallons**

ii. Determine $K_{Sat,\ Design}$:

$K_{sat,\ Design}$ = $K_{sat,\ Measured}$ / FS

$K_{sat,\ Design}$ = 25 in/hr / 6

$K_{sat,\ Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12 \text{ in/ft}}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{1879 \text{ ft3} \times 12 \text{ in/ft}}{4.17 \text{ in/hr} \times 96 \text{ hr}}$$

A_{min} =	**56**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r} \text{ ft}$$

$$h = \frac{56 - \pi 3^2}{2\pi 3} \text{ ft}$$

h =	**1**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well}$, (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = πr2h x 0.4

$V_{storage\ Dry\ Well}$ = π3^2 (1) x 0.4

$V_{storage\ Dry\ Well}$ =	**11**	**ft^3**

v. Determine 3-hr Infiltration Volume, $V_{3\text{-}hr}$:

$$V_{3\text{-}hr} = A_{min} \times \frac{K_{sat,Design}}{12 \text{ in/ft}} \times 3 \text{ hr}$$

$$V_{3\text{-}hr} = 56 \times \frac{4.17}{12 \text{ in/ft}} \times 3 \text{ hr}$$

$V_{3\text{-}hr}$ =	**58**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + $V_{3\text{-}hr}$)

$V_{Additional\ Storage}$ = 1879 - (11 + 58)

$V_{Additional\ Storage}$ =	**1810**	**ft^3**

4th and Hewitt Volume Calculations - Area 3:

Givens:

Area	sqft	acre
Area Total	28,446	0.654
Impervious, Ai	25,927	0.596
Pervious, Ap	2,519	0.058
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**28,446**	**0.654**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	2,519	0.058
TOTAL Pervious	**2,519**	**0.058**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

***Note these are landscaped areas exposed to the sky.**

****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile		(Per City of LA requirement)
Design Storm Intensity =	0.97	in	(Per LA County Hydrology GIS)
$K_{sat,\ Measured}$ =	25	in/hr	(Estimated per Nearby Project)
Drawdown Time, T =	96	hr	(Per City of LA LID Manual Table 4.2)
Factor of Safety, FS =	6		(Per City of LA LID Manual Table 4.2)
Gravel void ratio =	40%		
Number of Drywells =	13		
Shape =	Cylindrical		
Dry Well Shaft Inside Diameter (ID) =	4	ft	
Dry Well Infiltration Diameter =	6	ft	
Depth per Dry Well =	25	ft	

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(0.596*0.9)+[(0.058+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 1910 ft^3 or 14,300 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**1910**	**ft^3**	**or**	**14,300 Gallons**

ii. Determine $K_{Sat,\ Design}$:

$K_{sat,\ Design}$ = $K_{sat,\ Measured}$ / FS

$K_{sat,\ Design}$ = 25 in/hr / 6

$K_{sat,\ Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12 \text{ in/ft}}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{1910 \text{ ft3} \times 12 \text{ in/ft}}{4.17 \text{ in/hr} \times 96 \text{ hr}}$$

A_{min} =	**57**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r} \text{ ft}$$

$$h = \frac{57 - \pi 3^2}{2\pi 3} \text{ ft}$$

h =	**2**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well,}$ (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = $\pi r 2h \times 0.4$

$V_{storage\ Dry\ Well}$ = $\pi 3^2\ (2) \times 0.4$

$V_{storage\ Dry\ Well}$ =	**23**	**ft^3**

v. Determine 3-hr Infiltration Volume, $V_{3\text{-}hr}$:

$$V_{3\text{-}hr} = A_{min} \times \frac{K_{sat,Design}}{12 \text{ in/ft}} \times 3 \text{ hr}$$

$$V_{3\text{-}hr} = 57 \times \frac{4.17}{12 \text{ in/ft}} \times 3 \text{ hr}$$

$V_{3\text{-}hr}$ =	**59**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + $V_{3\text{-}hr}$)

$V_{Additional\ Storage}$ = 1910 - (23 + 59)

$V_{Additional\ Storage}$ =	**1828**	**ft^3**

Project No, 1LIG060100
405 Hewitt Street
Los Angeles, CA 90013

4th and Hewitt Volume Calculations - Whole Site:

Givens:

Area	sqft	acre
Area Total	57,060	1.31
Impervious, Ai	53,470	1.228
Pervious, Ap	3,590	0.083
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**57,060**	**1.31**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	3,590	0.083
TOTAL Pervious	**3,590**	**0.083**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

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****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile		(Per City of LA requirement)
Design Storm Intensity =	0.97	in	(Per LA County Hydrology GIS)
$K_{sat,\ Measured}$ =	25	in/hr	(Estimated per Nearby Project)
Drawdown Time, T =	96	hr	(Per City of LA LID Manual Table 4.4)
Factor of Safety, FS =	6		(Per City of LA LID Manual Table 4.4 note b)
Gravel void ratio =	40%		
Number of Drywells =	1		
Shape =	Cylindrical		
Dry Well Shaft Inside Diameter (ID) =	4	ft	
Dry Well Infiltration Diameter =	6	ft	
Depth per Dry Well =	10	ft	

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(1.228*0.9)+[(0.083+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 3,921 ft^3 or 29,400 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**3,921**	**ft^3**	**or**	**29,400 Gallons**

ii. Determine $K_{Sat,\ Design}$:

$K_{sat,\ Design}$ = $K_{sat,\ Measured}$ / FS

$K_{sat,\ Design}$ = 25 in/hr / 6

$K_{sat,\ Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12\ in/ft}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{3921\ ft3 \times 12\ in/ft}{4.17\ in/hr \times 96\ hr}$$

A_{min} =	**118**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r}\ ft$$

$$h = \frac{118 - \pi 3^2}{2\pi 3}\ ft$$

h =	**5**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well}$, (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = πr2h x 0.4

$V_{storage\ Dry\ Well}$ = π3^2 (5) x 0.4

$V_{storage\ Dry\ Well}$ =	**57**	**ft^3**

v. Determine 3-hr Infiltration Volume, $V_{3\text{-}hr}$:

$$V_{3\text{-}hr} = A_{min} \times \frac{K_{sat,Design}}{12\ in/ft} \times 3\ hr$$

$$V_{3\text{-}hr} = 118 \times \frac{4.17}{12\ in/ft} \times 3\ hr$$

$V_{3\text{-}hr}$ =	**123**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + $V_{3\text{-}hr}$)

$V_{Additional\ Storage}$ = 3921 - (57 + 123)

$V_{Additional\ Storage}$ =	**3,741**	**ft^3**

4th and Hewitt Volume Calculations - Area 1:

Givens:

Area	sqft	acre
Area Total	1,843	0.043
Impervious, Ai	1,843	0.043
Pervious, Ap	0	0
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**1,843**	**0.043**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	0	0
TOTAL Pervious	**0**	**0**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

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****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile	
Design Storm Intensity =	0.97	in
$K_{sat, Measured}$ =	25	in/hr
Drawdown Time, T =	96	hr
Factor of Safety, FS =	6	
Gravel void ratio =	40%	
Number of Drywells =	0	
Shape =	Cylindrical	
Dry Well Shaft Inside Diameter (ID) =	4	ft
Dry Well Infiltration Diameter =	4	ft
Depth per Dry Well =	1	ft

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(0.043*0.9)+[(0+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 137 ft^3 or 1,100 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**137**	**ft^3**	**or**	**1,100 Gallons**

ii. Determine $K_{Sat, Design}$:

$K_{sat, Design}$ = $K_{sat, Measured}$ / FS

$K_{sat, Design}$ = 25 in/hr / 6

$K_{sat, Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12 \text{ in/ft}}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{137 \text{ ft3} \times 12 \text{ in/ft}}{4.17 \text{ in/hr} \times 96 \text{ hr}}$$

A_{min} =	**4**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r} \text{ ft}$$

$$h = \frac{4 - \pi 2^2}{2\pi * 2} \text{ ft}$$

h =	**0**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well}$, (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = πr2h x 0.4

$V_{storage\ Dry\ Well}$ = π2^2 (0) x 0.4

$V_{storage\ Dry\ Well}$ =	**0**	**ft^3**

v. Determine 3-hr Infiltration Volume, V_{3-hr}:

$$V_{3-hr} = A_{min} \times \frac{K_{sat,Design}}{12 \text{ in/ft}} \times 3 \text{ hr}$$

$$V_{3-hr} = 4 \times \frac{4.17}{12 \text{ in/ft}} \times 3 \text{ hr}$$

V_{3-hr} =	**4**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + V_{3-hr})

$V_{Additional\ Storage}$ = 137 - (0 + 4)

$V_{Additional\ Storage}$ =	**133**	**ft^3**

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4th and Hewitt Volume Calculations - Area 2:

Givens:

Area	sqft	acre
Area Total	26,771	0.615
Impervious, Ai	25,700	0.59
Pervious, Ap	1,071	0.025
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**26,771**	**0.615**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	1,071	0.025
TOTAL Pervious	**1,071**	**0.025**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

***Note these are landscaped areas exposed to the sky.**

****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile		(Per City of LA requirement)
Design Storm Intensity =	0.97	in	(Per LA County Hydrology GIS)
$K_{sat, Measured}$ =	25	in/hr	(Estimated per Nearby Project)
Drawdown Time, T =	96	hr	(Per City of LA LID Manual Table 4.4)
Factor of Safety, FS =	6		(Per City of LA LID Manual Table 4.4 note b)
Gravel void ratio =	40%		
Number of Drywells =	1		
Shape =	Cylindrical		
Dry Well Shaft Inside Diameter (ID) =	4	ft	
Dry Well Shaft Depth =	30	ft	
Dry Well Infiltration Diameter =	6	ft	
Depth per Dry Well =	1	ft	

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(0.59*0.9)+[(0.025+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 1,879 ft^3 or 14,100 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**1,879**	**ft^3**	**or**	**14,100 Gallons**

ii. Determine $K_{Sat, Design}$:

$K_{sat, Design}$ = $K_{sat, Measured}$ / FS

$K_{sat, Design}$ = 25 in/hr / 6

$K_{sat, Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12 \text{ in/ft}}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{1879 \text{ ft3} \times 12 \text{ in/ft}}{4.17 \text{ in/hr} \times 96 \text{ hr}}$$

A_{min} =	**56**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r} \text{ ft}$$

$$h = \frac{56 - \pi 3^2}{2\pi 3} \text{ ft}$$

h =	**1**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well}$, (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = πr2h x 0.4

$V_{storage\ Dry\ Well}$ = π3^2 (1) x 0.4

$V_{storage\ Dry\ Well}$ =	**11**	**ft^3**

v. Determine 3-hr Infiltration Volume, V_{3-hr}:

$$V_{3-hr} = A_{min} \times \frac{K_{sat,Design}}{12 \text{ in/ft}} \times 3 \text{ hr}$$

$$V_{3-hr} = 56 \times \frac{4.17}{12 \text{ in/ft}} \times 3 \text{ hr}$$

V_{3-hr} =	**58**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + V_{3-hr})

$V_{Additional\ Storage}$ = 1879 - (11 + 58)

$V_{Additional\ Storage}$ =	**1,810**	**ft^3**

4th and Hewitt Volume Calculations - Area 3:

Givens:

Area	sqft	acre
Area Total	28,446	0.654
Impervious, Ai	25,927	0.596
Pervious, Ap	2,519	0.058
Undeveloped Area, Au	0	0
Exempt Area	0	0
TOTAL	**28,446**	**0.654**
Landscaped Areas Counted Towards Mitigation Volume*		
Landscaped Area	2,519	0.058
TOTAL Pervious	**2,519**	**0.058**
Landscaped Areas Counted Towards ETWU**		
Additional Landscaped Area	0	0
TOTAL Additional Pervious	**0**	**0**
Exempt Area***		
Pool	0	0
TOTAL Exempt	**0**	**0.00**

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****Note these are additional landscaped areas NOT EXPOSED to the sky.**

*****Note these are water features exposed to the sky.**

Design Storm =	85th Percentile		(Per City of LA requirement)
Design Storm Intensity =	0.97	in	(Per LA County Hydrology GIS)
$K_{sat,\ Measured}$ =	25	in/hr	(Estimated per Nearby Project)
Drawdown Time, T =	96	hr	(Per City of LA LID Manual Table 4.4)
Factor of Safety, FS =	6		(Per City of LA LID Manual Table 4.4 note b)
Gravel void ratio =	40%		
Number of Drywells =	1		
Shape =	Cylindrical		
Dry Well Shaft Inside Diameter (ID) =	4	ft	
Dry Well Infiltration Diameter =	6	ft	
Depth per Dry Well =	25	ft	

i. Determine the Mitigation Volume (V_M):

V_M (ft^3) = 85th Percentile Intensity (in) * Catchment Area (acres) * (3630 cuft/1ac-in)

where Catchment Area (acres) = (Impervious Area * 0.9) + [(Pervious area + Undeveloped area) * 0.1]

V_M (ft^3) = 0.97*[(0.596*0.9)+[(0.058+0)*0.1]] * 3630 ft^3

V_M (ft^3) = 1,910 ft^3 or 14,300 Gallons

The design will be an infiltration system, therefore,

V_M (ft^3) =	**1,910**	**ft^3**	**or**	**14,300 Gallons**

ii. Determine $K_{Sat,\ Design}$:

$K_{sat,\ Design}$ = $K_{sat,\ Measured}$ / FS

$K_{sat,\ Design}$ = 25 in/hr / 6

$K_{sat,\ Design}$ =	**4.17**	**in/hr**

ii. Determine Minimum Bottom Infiltration, A_{min}:

$$A_{min} = \frac{V_M \times 12\ \text{in/ft}}{K_{sat,Design} \times T}$$

$$A_{min} = \frac{1910\ \text{ft3} \times 12\ \text{in/ft}}{4.17\ \text{in/hr} \times 96\ \text{hr}}$$

A_{min} =	**57**	**ft^2**

iii. Determine dry well depth for the infiltration zone, h:

$$h = \frac{A_{min} - \pi r^2}{2\pi r}\ \text{ft}$$

$$h = \frac{57 - \pi 3^2}{2\pi 3}\ \text{ft}$$

h =	**2**	**ft**

iv. Determine Dry Well Storage Volume, $V_{storage\ Dry\ Well}$, (Assuming entirely filled with gravel):

$V_{storage\ Dry\ Well}$ = $V_{Storage\ Dry\ Well}$ * Void Ratio

$V_{storage\ Dry\ Well}$ = πr2h x 0.4

$V_{storage\ Dry\ Well}$ = π3^2 (2) x 0.4

$V_{storage\ Dry\ Well}$ =	**23**	**ft^3**

v. Determine 3-hr Infiltration Volume, $V_{3\text{-}hr}$:

$$V_{3\text{-}hr} = A_{min} \times \frac{K_{sat,Design}}{12\ \text{in/ft}} \times 3\ \text{hr}$$

$$V_{3\text{-}hr} = 57 \times \frac{4.17}{12\ \text{in/ft}} \times 3\ \text{hr}$$

$V_{3\text{-}hr}$ =	**59**	**ft^3**

vi. Determine the Additional Required Storage Volume, $V_{Additional\ Storage}$:

$V_{Additional\ Storage}$ = V_M - ($V_{Storage\ Dry\ Well}$ + $V_{3\text{-}hr}$)

$V_{Additional\ Storage}$ = 1910 - (23 + 59)

$V_{Additional\ Storage}$ =	**1,828**	**ft^3**

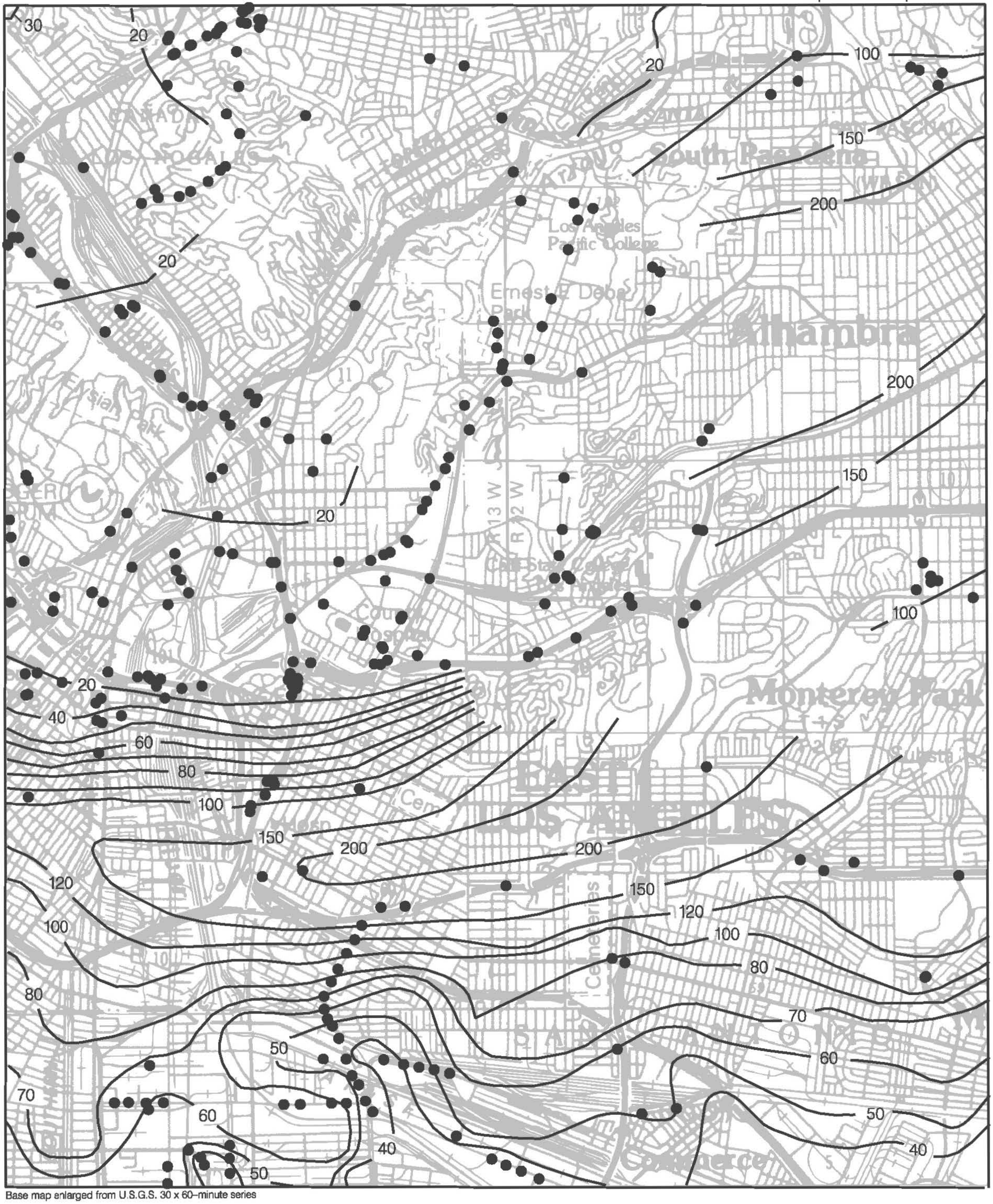

Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, Los Angeles Quadrangle.

● Borehole Site

30 Depth to ground water in feet

ONE MILE

SCALE