Preliminary Hydrology Study

For TR 072939

Palm Heights Condominium Site Altadena, California

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Hydrology Study

A. Introduction

1.1 Purpose & Scope

The following Hydrology Study has been prepared for the development of the Palm Heights Development Inc, Palm Heights Site in the Altadena, CA to satisfy the Los Angeles County Department of Public Works Hydrology requirements for developments of this type.

The scope of this Study is as follows:

- Identification of existing conditions tributary drainage areas and calculation of total peak flow rates and run-on/run-off volumes impacting the project site.
- Identification of existing conditions on-site drainage areas and calculation of peak flow rates and runoff volumes for these areas.
- Identification of proposed on-site hydrologic conditions & site/drainage plan.
- Identification of floodplain(s) impacting the site.
- Identification of Water Quality/SUSMP Best Management Practices (BMPs) proposed for the project.
- Summary of Findings & Conclusion

1.2 Project Overview

The proposed project entails the construction of 18 condominium units on a site in the Altadena region of Los Angeles County, in the County of Los Angeles. The project site is located just north of 183 E Palm Avenue, Altadena CA.

Site Location

The eastern site is located northwesterly of the intersection of Palm Ave. and Raymond Avenue and consists of two parcels of approximately 3.22 acres total. This site is currently not being used with vacant buildings. Existing Grade at the site slopes south/southwest at approximately 5.3%.

The project involves the construction of 18 Condominium units, 1 Community Garden Area, an private asphalt drive and fire lane with sidewalks, security fences and gates, Temporary facilities ("move-on" facilities) for the construction stage of the project including construction lay down areas and construction/security trailers are also anticipated.

1.3 References

The following documents have been made part of this Study by reference:

1.) Los Angeles County Department of Public Works Hydrology Manual, January 2006.

B. Methodology

1.1 General Methodology

The requirements and recommendations found in the Los Angeles County Hydrology Manual (January 2006) provided by the Los Angeles County Department of Public Works was used as the basis for the methodology and calculations found in this Study. On-site and Off-site calculations were preformed for the 50-year, 24-hour storm using HydroCalc software (Kinematic Wave Method) provided by the County, per County requirements for the Los Angeles River watershed.

1.2 Sources of Topography

For existing conditions tributary (off-site) areas, 20' topographic contours generated from USGS elevation data in addition to applicable USGS quadrangles were used for all elevation values. For the existing condition on-site area, 1' topographic contours generated from a field survey

1.3 Soil Classifications & Rainfall Intensity Values

The soil classifications and rainfall values used in this study are tabulated below. For the purposes of this study, "non- burned" soils conditions have been considered for on-site areas to calculate peak flow rate calculations. Since the site and surrounding properties are developed, a Fire Factor of 0.00 has been applied per the County Hydrology Manual requirements for Time of Concentration (TC) calculations.

Rainfall values for all drainage subareas were taken from the Pasadena 50-year 24-hour isohyet map provided in the Los Angeles County Hydrology Manual. Refer to Exhibit "D" for a copy of the Soil/Rainfall map with the approximate site location shown.

1.4 Time of Concentration (TC) Calculations

Time of Concentration (TC) values for both existing and developed drainage subareas were calculated using the **HydroCalc software (Kinematic Wave Method)** provided by the County. For existing and proposed conditions subareas, separate TC watercourses from the most hydrologically remote point of each subarea to the outlet of each subarea were delineated per County requirements; as shown on Exhibits "E & F".

For this Study, the peak flow rates/runoff volumes of the HydroCalc software were used.

C. FEMA Floodplain Identification & Considerations

Per FEMA Map No. 06037C1375F (Effective Date - September 26, 2008), the project site is currently impacted by a Zone "X" floodplain. Zone "X" is identified by FEMA as areas of 0.2% (500-Year) annual chance of flood; areas of 1% (100-Year) annual chance of flood with depths of less than 1 foot or areas with drainage areas less than 1 sq mile; and areas protected by levees from 1% annual chance (100-Year) of flood. Refer to Exhibit "C" for surrounding area FIRM map. This site is not with in County adopted floodway.

D. Existing Conditions Tributary & On-Site Drainage Areas Discussion

1.1 Overview

A field investigation was conducted on June 10, 2013 to verify the drainage characteristics of the site and surroundings. The photos on the following pages were taken during the investigation to substantiate the findings included in this study.

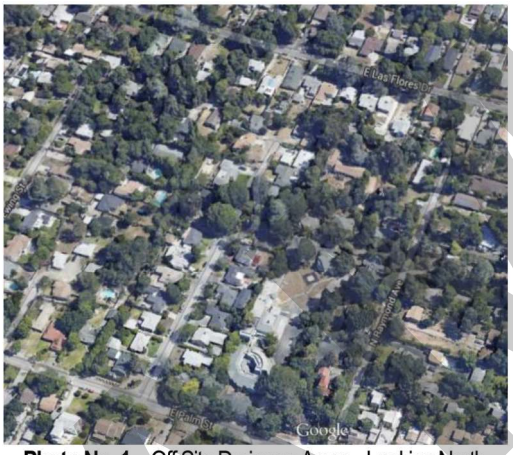


Photo No. 1 – Off Site Drainage Areas - Looking North.

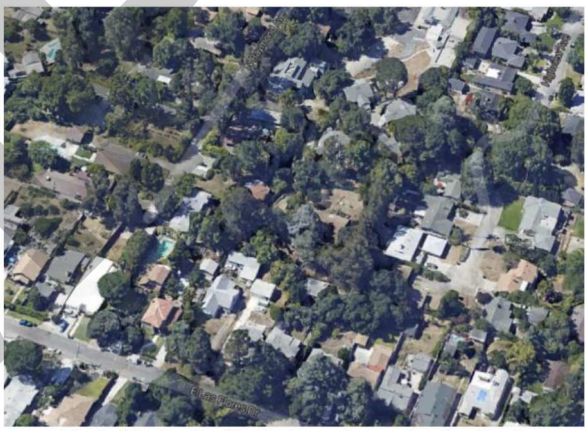


Photo No. 2 – On Site Drainage Areas - Looking South

1.2 Existing Conditions Off-Site Areas

Along Las Flores there is an existing curb and gutter with Storm Drain in the street that picks up drainage North of Right of Way. The area South of Las Flores and the North side of our proposed project area are the tributary water area for our drainage. This tributary area is filled with Single Family Residential properties.

Photo No. 3 – Las Flores - Looking South

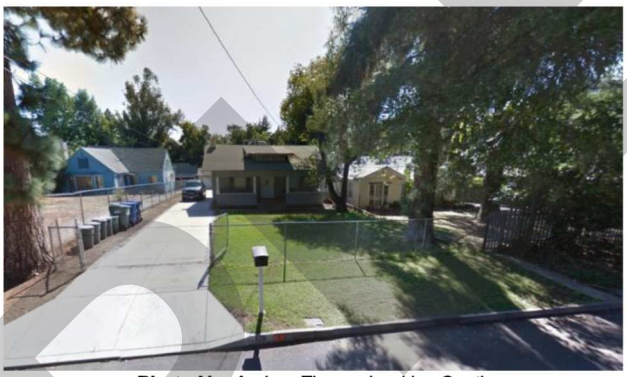


Photo No. 4 – Las Flores - Looking South

1.3 Existing Conditions On-Site Areas

The site is surrounded by Single Family Residential properties. Upstream run-off is captured and flows from the north end of the property to a concrete swale. This swale connect to a drain that flows captured water under the driveway to an open "U" drain located east of the center driveway.

Photo No. 9 – Existing On-Site

Photo No. 10 – Existing On-Site

1.4 Existing Rock "U" channel

As discussed above, an existing rock "U" drainage channel is located on the west side of the driveway from North to South on the eastern side of the main driveway. This channel currently accepts all tributary flows from the site. Channel drains to existing 60 inch storm drain pipe that flows under Palm Street. Photos of the existing channel are included below:

Photo No. 11 – "U" Drainage Channel looking South

Photo No. 12 – "U" Drainage Channel looking North

E. Existing Conditions Hydrology Calculations & Summary

1.1 Existing Conditions Drainage Areas – Time of Concentration (TC) Calculations

Exhibit "E" illustrates the existing hydraulic conditions for this site.

Calculations were performed using the County HydroCalc software for all existing conditions, off-site/on–site drainage subareas. Refer to *Attachment 1* for input/output calculations for the subareas. Due to the size of the small size of the watershed these calculated values were used, and no other calculations were needed. Per County requirements, the minimum calculated TC value was five (5) minutes.

Table 1 – Existing Conditions Input Data – 25 & 50-Year/24-Hour Events (Non-Burn)

Name	Area (acres)	Flow Length (ft)	Slope	Rainfall Depth (in)	Impervious Fraction	Soil	Burn Factor	Bulk Factor
2-A	1.08	375	0.0747	9.4	0.42	7	0	0
2-B	1.73	384	0.0911	9.4	0.42	7	0	0
2-C	3.50	667	0.0495	9.4	0.68	7	0	0
Cumulative 2A, 2B, 2C	6.31	1051	0.0580	9.4	0.56	7	0	0

Table 2 – Existing Conditions Calculations Summary – 25-Year/24-Hour Event (Non-Burn)

Name	TC (min)	Q_{25} (cfs)	V_{25} (acre-ft)
2-A	5	4.47	0.35
2-B	5	7.16	0.56
2-C	5	14.95	1.59
Cumulative 2A, 2B, 2C	7	22.21	2.49

Table 3 – Existing Conditions Calculations Summary – 50-Year/24-Hour Event (Non-Burn)

Name	TC (min)	Q_{50} (cfs)	V_{50} (acre-ft)
2-A	5	5.18	0.41
2-B	5	8.29	0.65
2-C	5	17.18	1.82
Cumulative 2A, 2B, 2C	6	27.90	2.86

F. Proposed Conditions Hydrology & Site/Drainage Plan

1.1 Analysis

Exhibit "F" illustrates the proposed conditions hydrology plan for this site. The project is not anticipated to result in an increase in the existing 50-year or 100-year peak flows and/or runoff volumes. This project will result in a decrease in impervious area. The site is being redeveloped from a high school to condominiums.

Calculations were performed using the County HydroCalc software for all proposed conditions, off-site/on–site drainage subareas. Refer to *Attachment 2* for input/output calculations for the subareas. Due to the size of the small size of the watershed these calculated values were used, and no other calculations were needed. Per County requirements, the minimum calculated TC value was five (5) minutes.

Table 4 – Proposed Conditions Input Data – 25 & 50-Year/24-Hour Events (Non-Burn)

Name	Area (acres)	Flow Length (ft)	Slope	Rainfall Depth (in)	Impervious Fraction	Soil	Burn Factor	Bulk Factor
2-A	1.08	375	0.0747	9.4	0.42	7	0	0
2-B	1.73	384	0.0911	9.4	0.42	7	0	0
2-C	3.50	678	0.0457	9.4	0.47	7	0	0
Cumulative 2A, 2B, 2C	6.31	1051	0.0574	9.4	0.45	7	0	0

Table 5 – Proposed Conditions Calculations Summary – 25-Year/24-Hour Event (Non-Burn)

Name	TC (min)	Q_{25} (cfs)	V_{25} (acre-ft)
2-A	5	4.47	0.35
2-B	5	7.16	0.56
2-C	5	14.57	1.22
Cumulative 2A, 2B, 2C	7	21.79	2.14

Table 6 – Proposed Conditions Calculations Summary – 50-Year/24-Hour Event (Non-Burn)

Name	TC (min)	Q_{50} (cfs)	V_{50} (acre-ft)
2-A	5	5.18	0.41
2-B	5	8.29	0.65
2-C	5	16.85	1.41
Cumulative 2A, 2B, 2C	6	27.57	2.47

Mitigation details for the Low Impact Development (LID) calculations and mitigation are detailed in Section "G", below.

G. Low Impact Development Calculations & Mitigation

1.1 Low Impact Development Calculations

This development is a "designated project" and will be designed to retain 100 percent of the SWQDv on-site.

Low Impact Development (LID) calculations for on-site post development conditions were performed for the improvements shown on Exhibit "G", Developed Conditions On-Site Hydrology Study Map. LID Volumes were calculated using the HydroCalc Version 0.3.1 provided by the County. For tributary drainage areas larger than 40 acers the calculated volumes were summed and mitigated in one location.

Per the Los Angeles County Low Impact Development Standards Manuel (February 2014), the design storm, from which the SWQDv is calculated, is defined as the greater of:

- The 0.75-inch, 24-hour rain event; or
- The 85th percentile, 24-hour rain event as determined from the Los Angeles County 85th percentile precipitation isohyetal map.

The 85th percentile, 24-hour rain event was determined to be 1.25-inch. The 85th percentile 24-hour rain event is larger than 0.75 inches, so 1.25 inches was used for the LID Calculations below:

Table 7 – On-Site LID Calculations – 85th Percentile/24-Hour LID Event (Non-Burn)

Name	Area (acres)	Flow Length (ft)	Slope	Rainfall Depth (in)	Impervious Fraction	Soil	Burn Factor	Bulk Factor
A	2.48	678	0.0855	1.25	0.47	7	0	0
B	1.02	448	0.0513	1.25	0.47	7	0	0

Table 8 – On-Site LID Calculations Summary – 85th Percentile/24-Hour LID Event (Non-Burn)

Name	SWQDv (ft^3)
A	5313
B	2185

In accordance with County requirements, the SWQDv will be retained on site to mitigate the lid requirements for the developed condition.

Refer to Exhibit "G" for the Low Impact Development (LID) Study Map.
Refer to Attachment No. 3 for printouts of the LID calculations.

1.2 Mitigation

As a "designated project" this site is required to treat the entire 85th percentile, 24-hour rain event, volume. The treatment will be provided by infiltration, this will be done with underground infiltration chambers (or equivalent), see exhibit "G" for proposed BMP location.

Below are the preliminary BMP calculations to show 96 hour drawdown time.
Infiltration rate from approved soils report = *6.5 in/hr*
Safety factor used = *5*
Design infiltration rate = *6.5 in/hr * 5* = **1.3 in/hr**
Max water depth that can be drawn down in 96 hours = *96 hr * 1.3 in/hr = 124.8 in ÷ 12 in/ft* = **10.4 ft**

It is recommended that an effective water depth of 4 feet be used by the underground system manufacturer, to hold a minimum of the volumes listed in table 8 above.

1.3 Proposed Best Management Practices (BMPs)

The Best Management Practices (BMPs) on the following page are proposed for the project in accordance with LID requirements.

Table 9 – Overview of Project Best Management Practices (BMPs)

BMP NO.*	OBJECTIVE	BMP NAME	SUMMARY
S-1	SOURCE CONTROL	STORM DRAIN MESSAGE AND SIGNAGE	INFORMS THE PUBLIC THAT DUMPING OF WASTES INTO STORM DRAIN INLETS IS PROHIBITED AND/OR THAT THE DRAIN ULTIMATELY DISCHARGES INTO RECEIVING WATERS.
S-8	SOURCE CONTROL	LANDSCAPE IRRIGATION PRACTICES	BY EFFECTIVELY IRRIGATING, LESS RUNOFF IS PRODUCED RESULTING IN LESS POTENTIAL FOR POLLUTANTS TO ENTER THE STORM DRAIN SYSTEM.
S-9	SOURCE CONTROL	BUILDING MATERIALS SELECTION	THE USE OF ALTERNATIVE BUILDING MATERIALS CAN REDUCE POLLUTANT SOURCES IN STORMWATER RUNOFF BY ELIMINATING COMPOUNDS THAT CAN LEACH INTO STORMWATER RUNOFF.

* Per the County of Los Angeles Low Impact Development (February 2014)
- See attachment 3 for BMP information

1.4 Post-Construction BMP Operations & Maintenance (O&M)

The BMPs identified in this section will require post-construction Operations and Maintenance (O&M) to ensure their continued effectiveness throughout the life of the project. It is anticipated that all BMP O&M will commence immediately following construction of the project.

The following party shall be responsible for the implementation and funding of all BMP O&M:

- **Party Name:**
- **Primary Contact:**
- **Mailing Address:**

- **Phone:**
- **Fax:**

Note that the above information is subject to change prior to implementation of BMP O&M, when a homeowner association (HOA) takes over the maintenance responsibilities.

H. Summary & Conclusion

Per the findings of this Study, the proposed Palm Heights Site will result in a reduction of runoff from the site. This decrease in runoff is due to the potential decrease of impervious area in the proposed development as compared to the existing use of the property. As stated above the existing development is a school which is 68% impervious and the proposed residential development will result in approximately 47% imperviousness. In addition of the decrease of impervious area, the resulting flow path will be slightly longer.

In order to meet the LID requirements the site shall provide on-site infiltration chambers located at the south end of the property under the street. The chambers shall be designed to capture flow prior to flows running off site. The infiltration system shall be design to contain a minimum of 7,498 ft^3 (combined) of storm water at a max effective water depth of 4 feet. This volume may be increased, as space allows, providing additional capture volume.

Note: Refer to *Attachment 4* for a CD of this complete Study (PDF format) & all calculations.

(END)

EXHIBIT “A”

Project Watershed – Aerial Orthophoto

DRAINAGE CONCEPT/HYDROLOGY STUDY FOR TR 072939
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

PREPARED FOR:

BY	MARK	REVISION DESCRIPTION	DATE

AERIAL ORTHOPHOTO EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

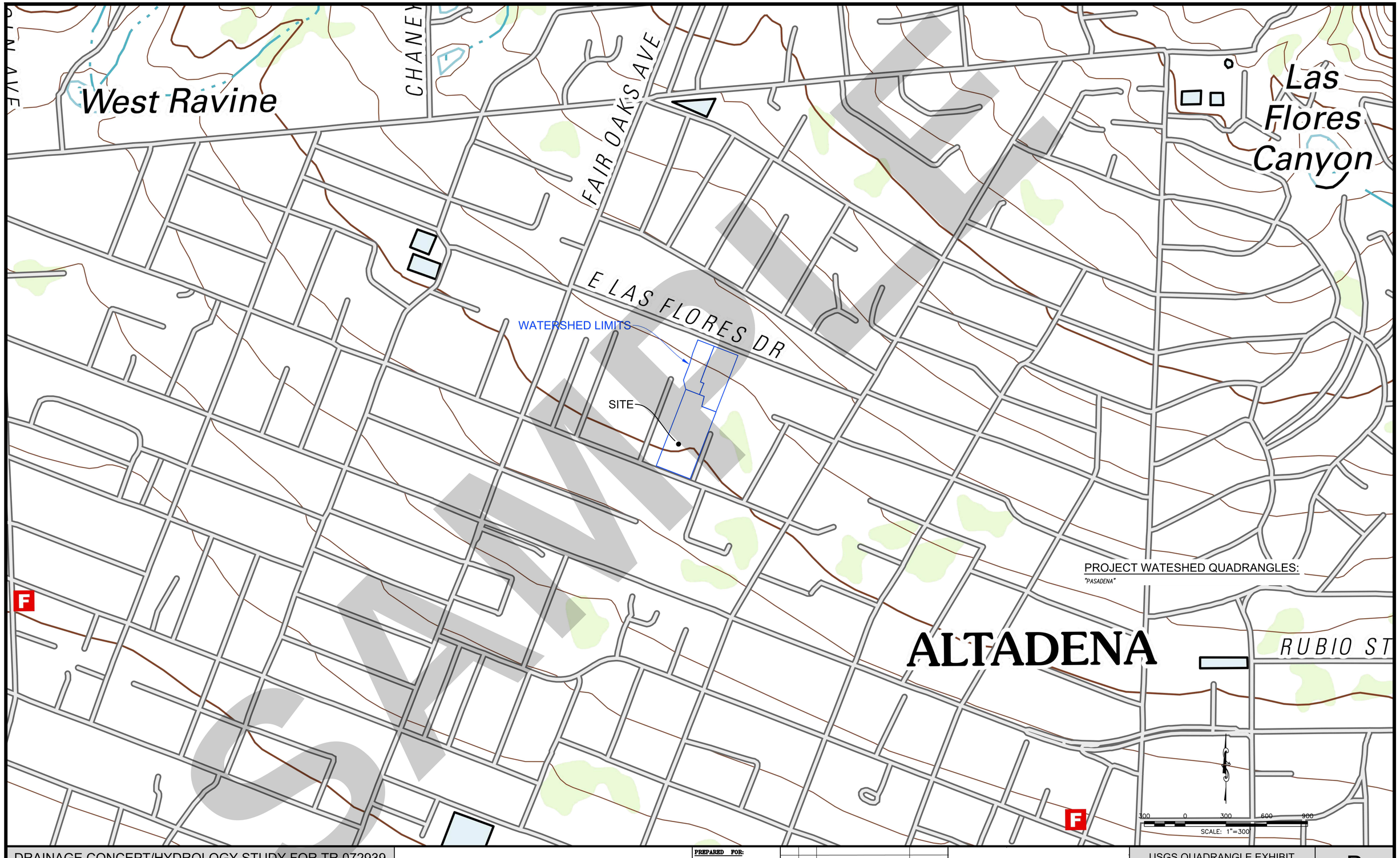
A

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 09-22-16

SHEET 1 OF 1

EXHIBIT “B”

Project Watershed – USGS Quadrangle



DRAINAGE CONCEPT/HYDROLOGY STUDY FOR TR 072939
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

PREPARED FOR:

BY	MARK	REVISION DESCRIPTION	DATE

USGS QUADRANGLE EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

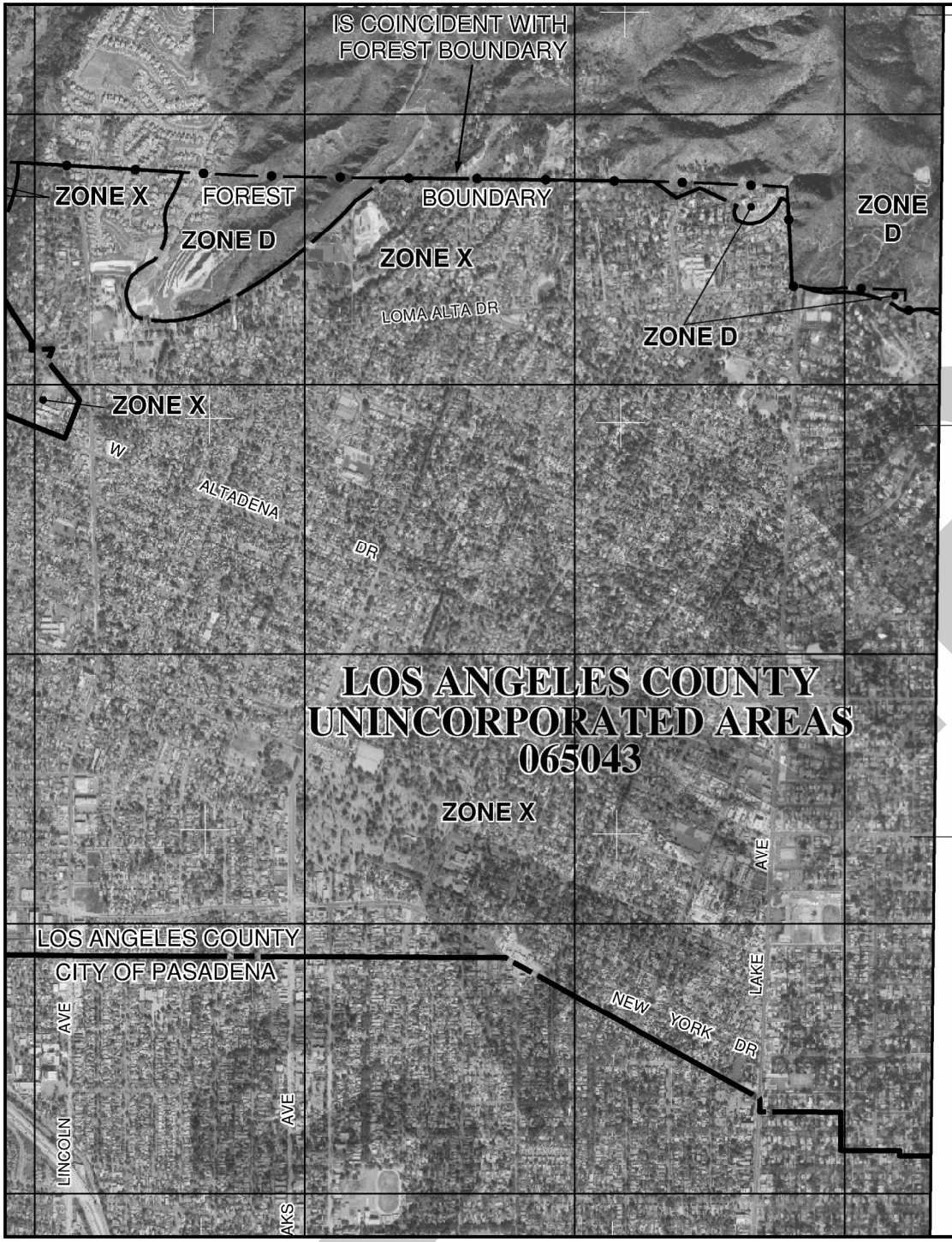
B

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 09-22-16

SHEET 1 OF 1

EXHIBIT “C”

FEMA Floodplain Maps



MAP NUMBER 06037C1375F

EFFECTIVE DATE SEPTEMBER 26, 2008

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*

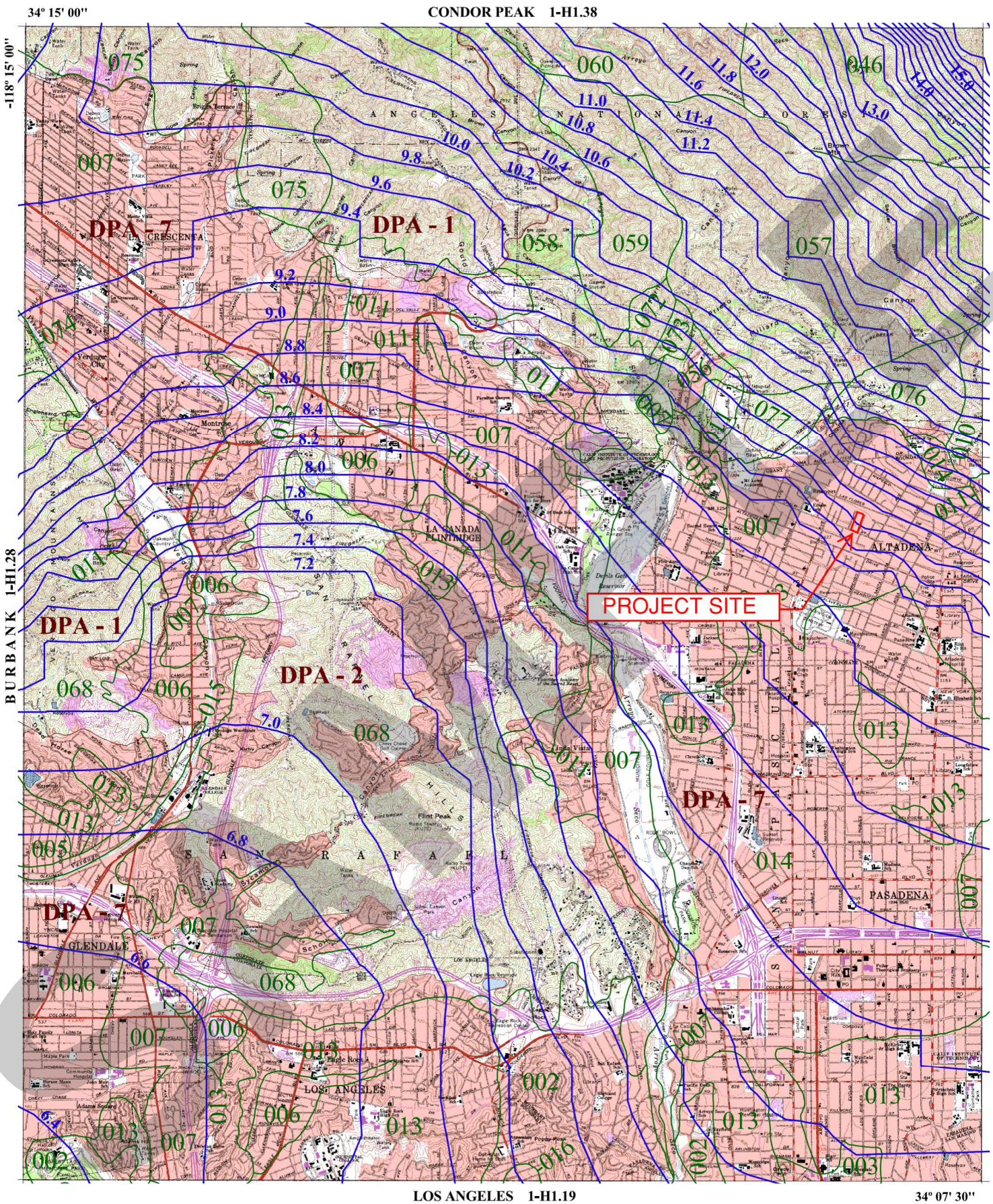
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

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)
4275 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

EXHIBIT “D”

Applicable Los Angeles County
Soil/Rainfall/DPA Zone Maps



25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

PASADENA 1-H1.29
50-YEAR 24-HOUR ISOHYET

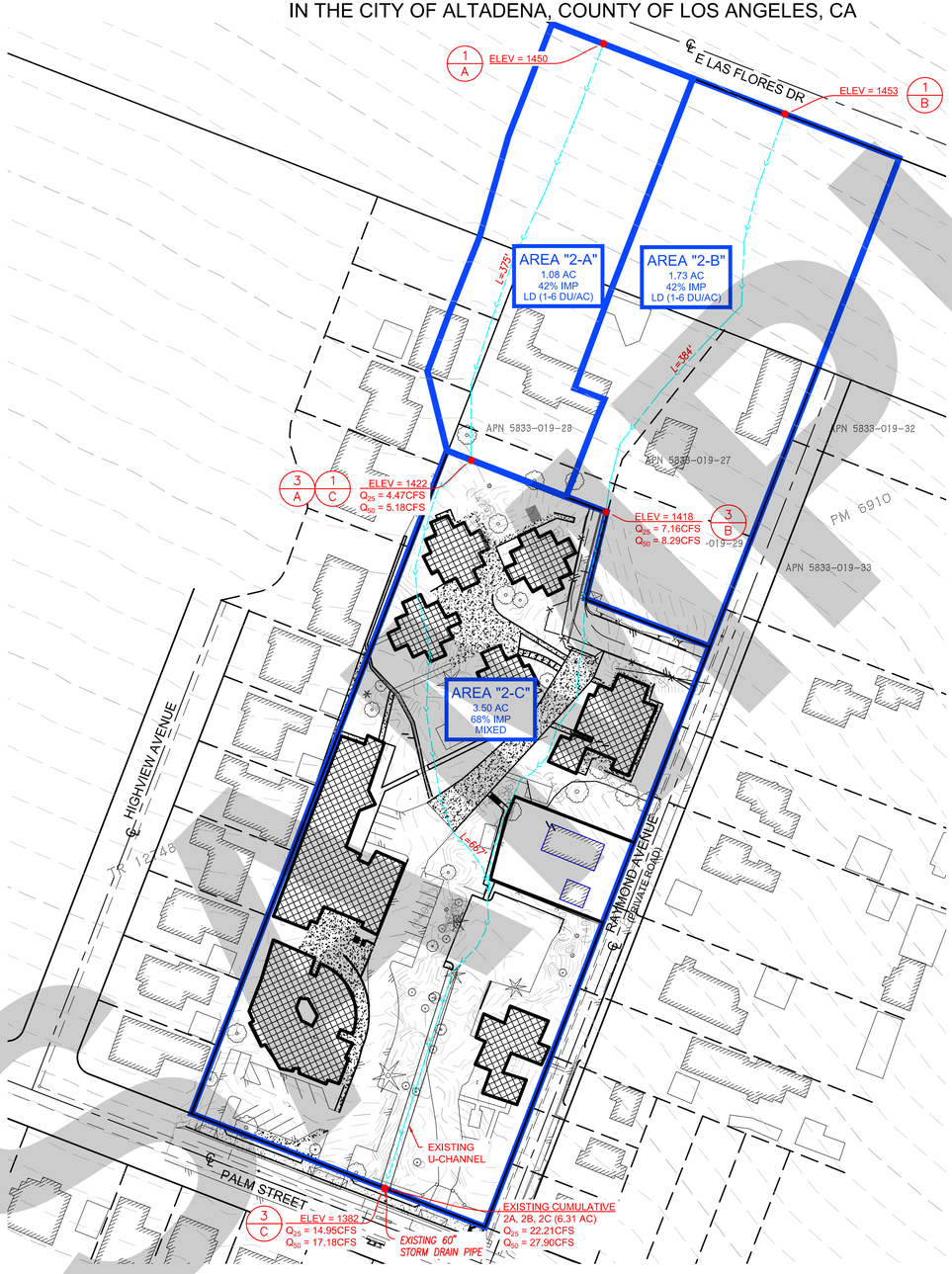
EXHIBIT “E”

Existing Hydrologic Conditions
Study Map

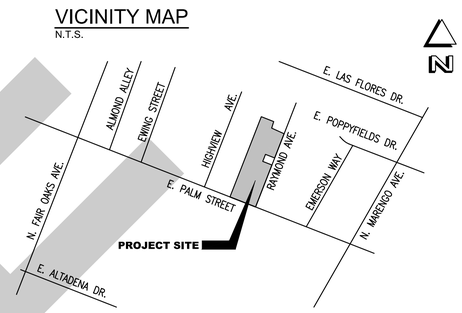
EXHIBIT "E"
EXISTING CONDITION EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

EXISTING CONDITIONS INPUT DATA

Name	Area (acres)	Flow Length (ft)	Slope	Rainfall Depth	Impervious Fraction	Soil	Burn Factor	Bulk Factor
2-A	1.08	375	0.0747	9.4	0.42	7	0	0
2-B	1.73	384	0.0911	9.4	0.42	7	0	0
2-C	3.50	667	0.0495	9.4	0.68	7	0	0
Cumulative 2A, 2B, 2C	6.31	1051	0.0580	9.4	0.56	7	0	0



VICINITY MAP
N.T.S.



MAP LEGEND

- DRAINAGE AREA LIMITS
- FLOW PATHS
- AREA "A" 1.00 AC, 20% IMP, 1 AC LOTS — DRAINAGE AREA, SIZE, % IMPERVIOUS, & CLOSEST APPROXIMATED CLASSIFICATION
- A / 1.1 — ELEV = 100.00, Q_{100} = 1.0CFS — RATIONAL METHOD NODE LOCATION, ELEVATION, & TOTAL PEAK Q_{100}

60 0 60 120 180
SCALE: 1"=60'

HYDROLOGY NOTES

- OFF-SITE TRIBUTARY FROM THE NORTH WILL BE CAPTURED AND PIPED PAST THE SITE
- NOT WITHIN COUNTY ADOPTED FLOODWAY
- NOT WITHIN FEMA FLOOD ZONE "A"
- SITE DRAINS TO EXISTING 60" STORM DRAIN

DRAINAGE CONCEPT/HYDROLOGY STUDY FOR TR 072939
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

PREPARED FOR:

BY	MARK	REVISION DESCRIPTION	DATE

EXISTING CONDITION EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

E

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 11-29-16

SHEET 1 OF 1

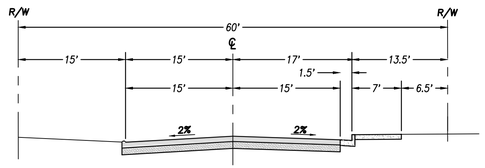
EXHIBIT “F”

Proposed Hydrologic Conditions
Study Map

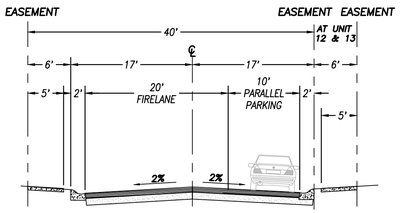
EXHIBIT "F"
PROPOSED CONDITION EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

PROPOSED CONDITIONS INPUT DATA

Name	Area (acres)	Flow Length (ft)	Slope	Rainfall Depth	Impervious Fraction	Soil	Burn Factor	Bulk Factor
2-A	1.08	375	0.0747	9.4	0.42	7	0	0
2-B	1.73	384	0.0911	9.4	0.42	7	0	0
2-C	3.50	678	0.0457	9.4	0.47	7	0	0
Cumulative 2A, 2B, 2C	6.31	1051	0.0574	9.4	0.45	7	0	0



SECTION E – PALM STREET
1"= 10'



SECTION C
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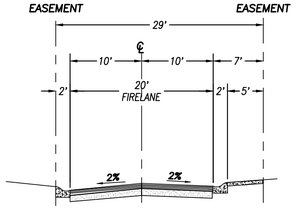
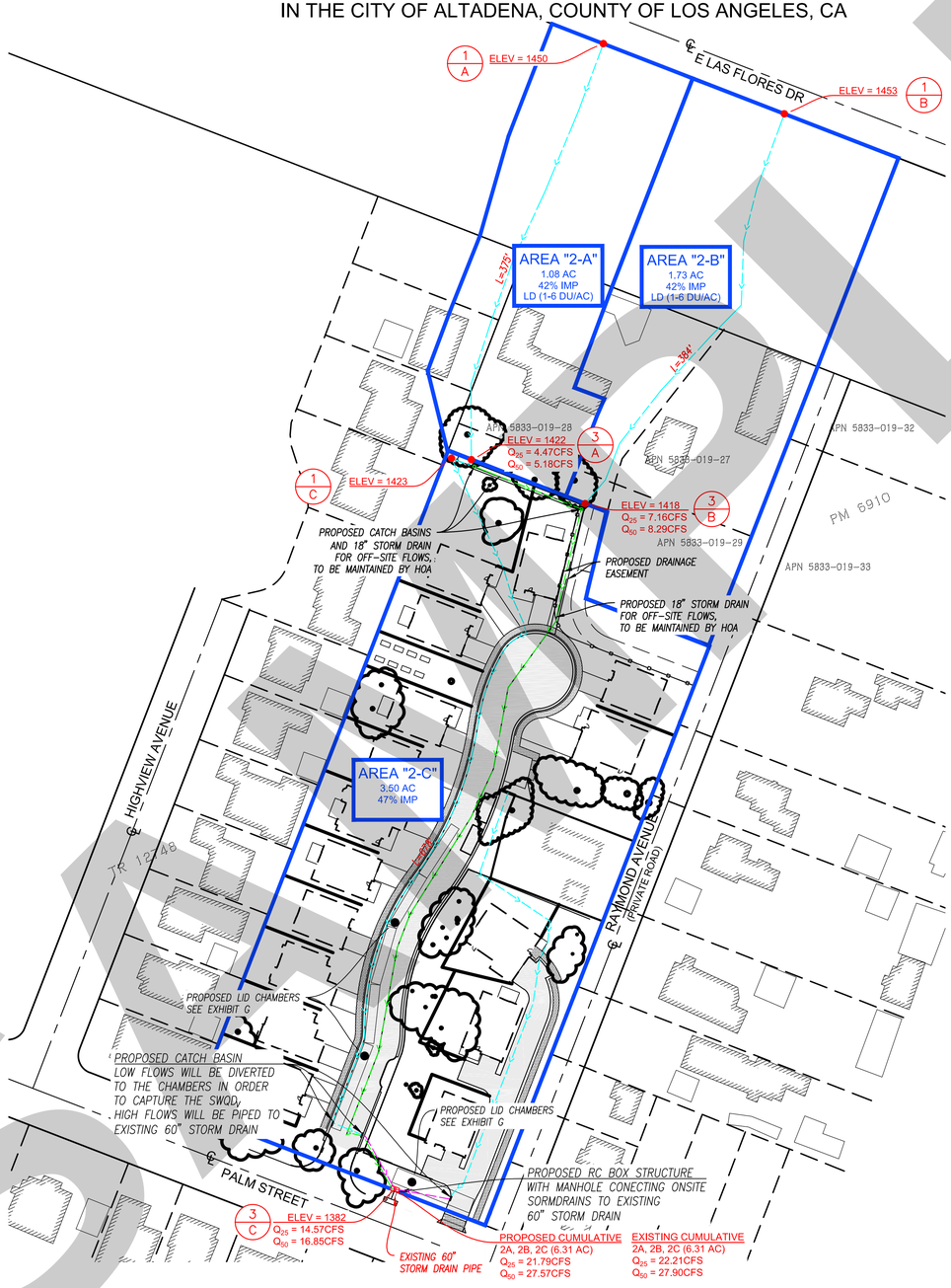
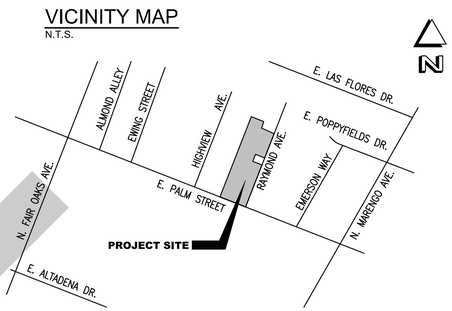
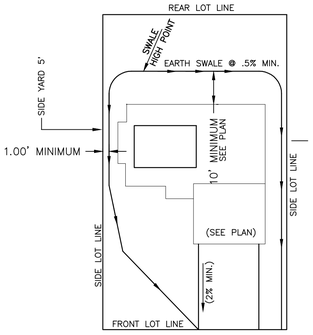


SECTION B
1"= 10'



VICINITY MAP
N.T.S.





TYPICAL LOT DRAINAGE
NO SCALE

MAP LEGEND

- DRAINAGE AREA LIMITS
- FLOW PATHS
- HIGH FLOW PATHS
- OFF-SITE FLOW PATHS

AREA "A"
1.00 AC
20% IMP
1 AC LOTS

DRAINAGE AREA, SIZE, % IMPERVIOUS, & CLOSEST APPROXIMATED CLASSIFICATION

A / 1.1
ELEV = 100.00
Q_{100} = 1.0CFS

RATIONAL METHOD NODE LOCATION, ELEVATION, & TOTAL PEAK Q_{100}

60 0 60 120 180
SCALE: 1"=60'

HYDROLOGY NOTES

- OFF-SITE TRIBUTARY FROM THE NORTH WILL BE CAPTURED AND PIPED PAST THE SITE
- NOT WITHIN COUNTY ADOPTED FLOODWAY
- NOT WITHIN FEMA FLOOD ZONE "A"
- SITE DRAINS TO EXISTING 60" STORM DRAIN
- ALL PROPOSED ON-SITE STORM DRAIN IMPROVEMENTS WILL BE MAINTAINED BY PALM HEIGHTS DEVELOPMENT, INC. UNTIL CONSTRUCTION IS COMPLETED. AFTER CONSTRUCTION IS COMPLETED A HOMEOWNER ASSOCIATION (HOA) WILL ASSUME RESPONSIBLE FOR ON-SITE STORM DRAIN MAINTENANCE.

DRAINAGE CONCEPT/HYDROLOGY STUDY FOR TR 072939
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

PREPARED FOR:

BY	MARK	REVISION DESCRIPTION	DATE

PROPOSED CONDITION EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 12-08-16

F

SHEET 1 OF 1

EXHIBIT “G”

Low Impact Development
Study Map

EXHIBIT "G"
LOW IMPACT DEVELOPMENT EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

LID CALCULATIONS INPUT – 85TH PERCENTILE/24-HOUR EVENT

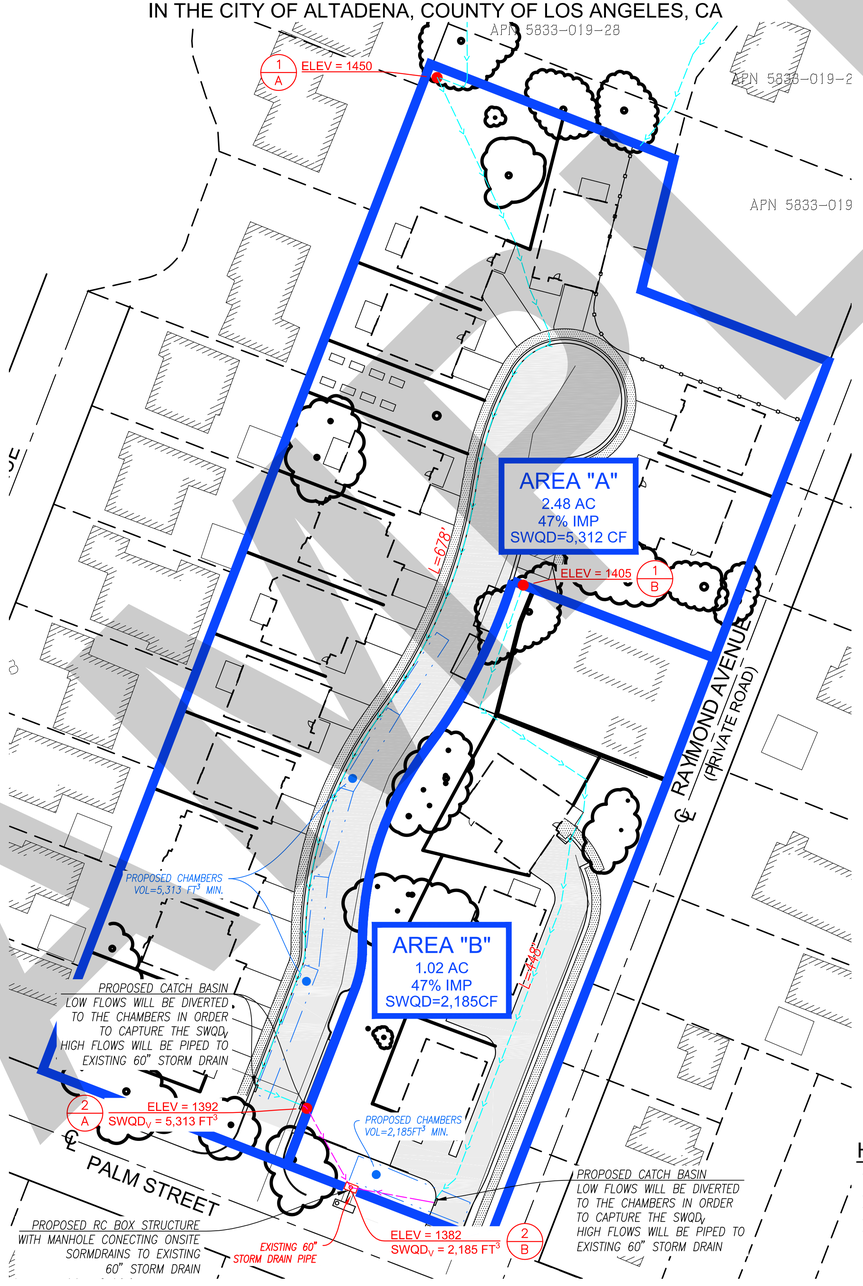
Name	Area (acres)	Flow Length (ft)	Slope	Rainfall Depth (in)	Impervious Fraction	Soil	Burn Factor	Bulk Factor
A	2.48	678	0.0855	1.25	0.47	7	0	0
B	1.02	448	0.0513	1.25	0.47	7	0	0

85TH PERCENTILE STORM DEPTH OF 1.25IN WAS USED FOR LID CALCULATIONS BECAUSE IT WAS GREATER THAN 0.75IN.

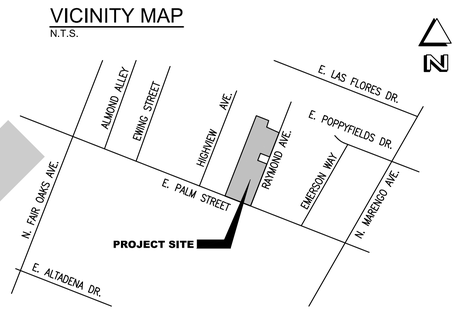
LID CALCULATIONS OUTPUT – 85TH PERCENTILE/24-HOUR EVENT

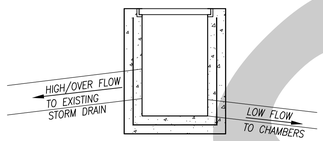
Name	$SWQD_V$ (ft^3)
A	5313
B	2185

IN ACCORDANCE WITH COUNTY REQUIREMENTS, THE SWQDV WILL BE RETAINED ON SITE TO MITIGATE THE LID REQUIREMENTS FOR THE DEVELOPED CONDITION.



VICINITY MAP
N.T.S.





DETAIL - TYPICAL CATCH BASIN
N.T.S.

MAP LEGEND

- DRAINAGE AREA LIMITS
- FLOW PATHS
- HIGH FLOW PATHS
- CHAMBERS

40 0 40 80 120
SCALE: 1"=40'

HYDROLOGY NOTES

- OFF-SITE TRIBUTARY FROM THE NORTH WILL BE CAPTURED AND PIPED PAST THE SITE
- NOT WITHIN COUNTY ADOPTED FLOODWAY
- NOT WITHIN FEMA FLOOD ZONE "A"
- SITE DRAINS TO EXISTING 60" STORM DRAIN
- ALL PROPOSED ON-SITE STORM DRAIN IMPROVEMENTS WILL BE MAINTAINED BY PALM HEIGHTS DEVELOPMENT, INC. UNTIL CONSTRUCTION IS COMPLETED. AFTER CONSTRUCTION IS COMPLETED A HOMEOWNER ASSOCIATION (HOA) WILL ASSUME RESPONSIBLE FOR ON-SITE STORM DRAIN MAINTENANCE.

DRAINAGE CONCEPT/HYDROLOGY STUDY FOR TR 072939
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

PREPARED FOR:

BY	MARK	REVISION DESCRIPTION	DATE

LOW IMPACT DEVELOPMENT EXHIBIT
PALM HEIGHTS
IN THE CITY OF ALTADENA, COUNTY OF LOS ANGELES, CA

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 12-08-16

G

SHEET 1 OF 1

ATTACHMENT 1

Existing Conditions
HydroCalc Calculations

Peak Flow Hydrologic Analysis

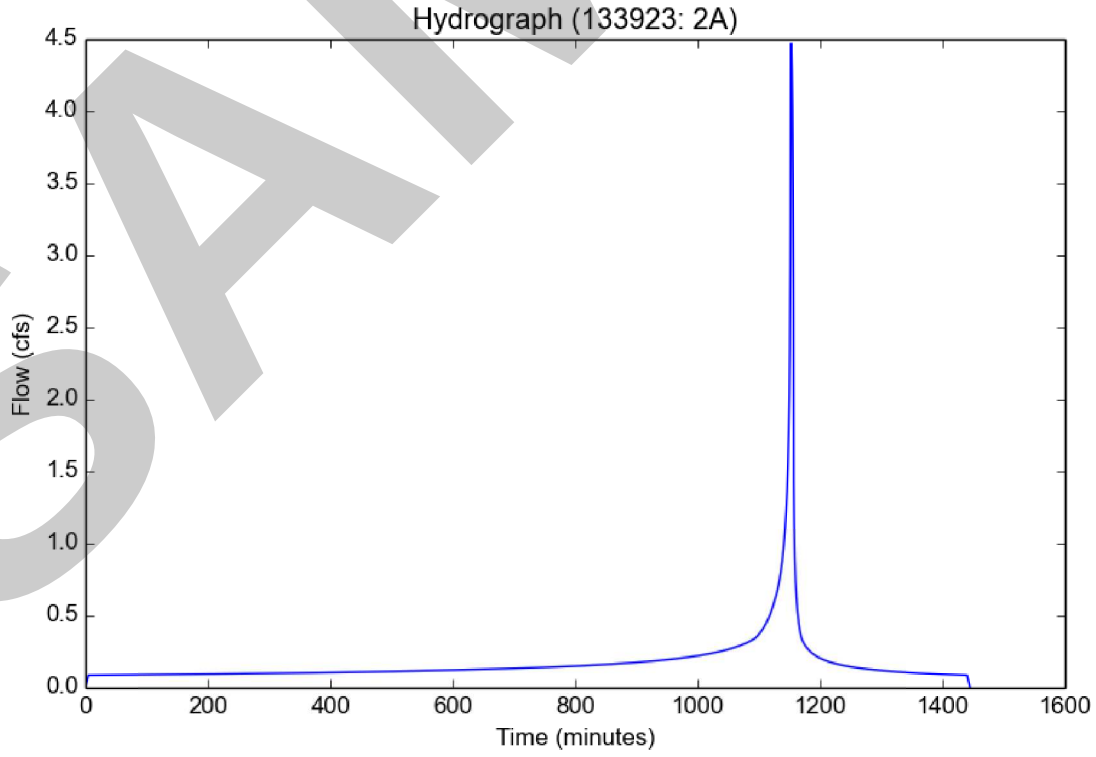
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A
Area (ac)	1.08
Flow Path Length (ft)	375.0
Flow Path Slope (vft/hft)	0.0747
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.9241
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8406
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.4701
Burned Peak Flow Rate (cfs)	4.4701
24-Hr Clear Runoff Volume (ac-ft)	0.3509
24-Hr Clear Runoff Volume (cu-ft)	15286.1499



Peak Flow Hydrologic Analysis

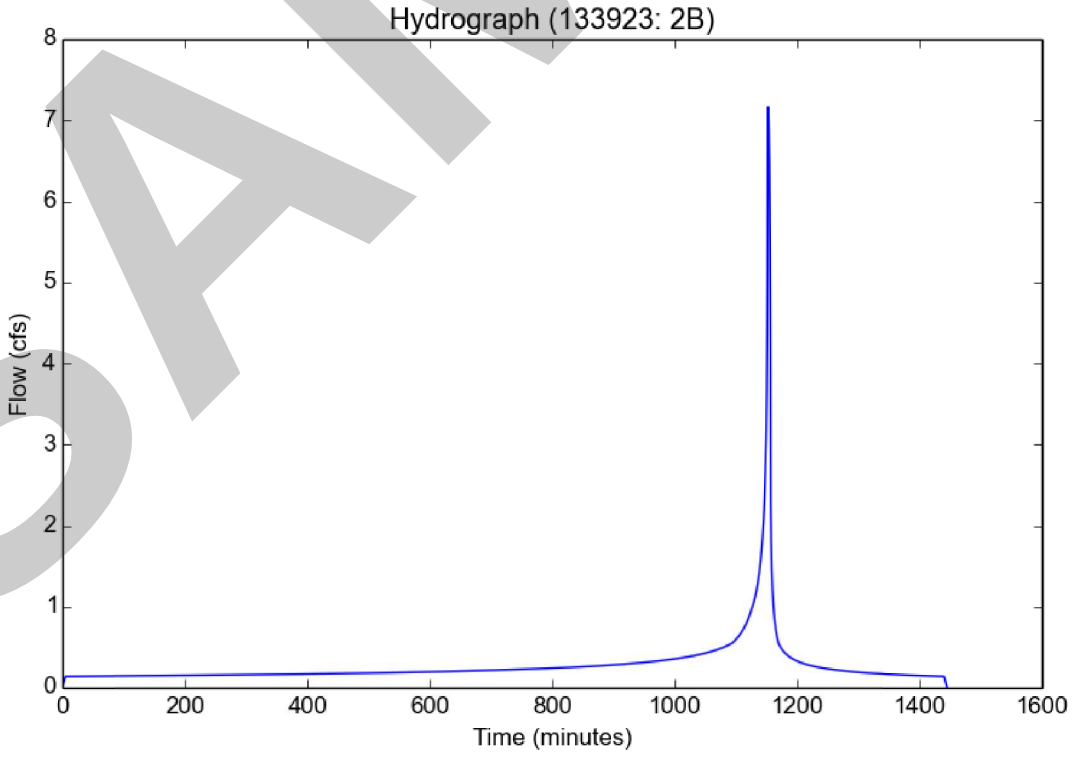
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2B
Area (ac)	1.73
Flow Path Length (ft)	384.0
Flow Path Slope (vft/hft)	0.0911
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.9241
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8406
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	7.1605
Burned Peak Flow Rate (cfs)	7.1605
24-Hr Clear Runoff Volume (ac-ft)	0.5621
24-Hr Clear Runoff Volume (cu-ft)	24486.1476



Peak Flow Hydrologic Analysis

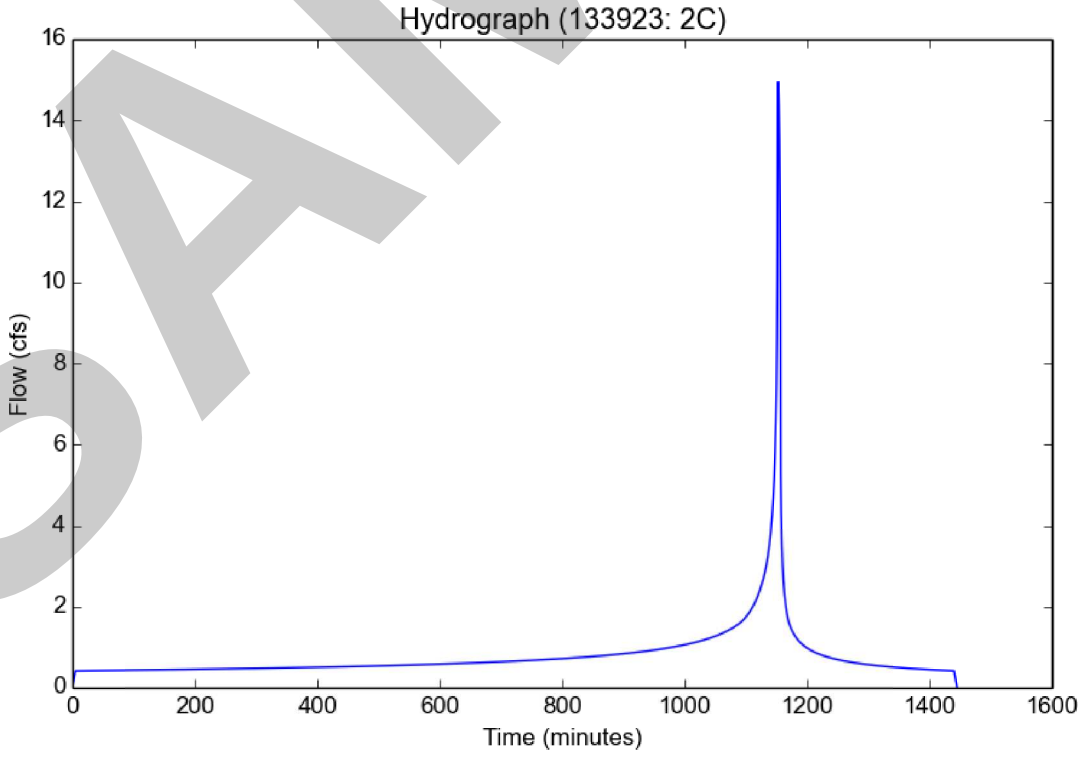
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2C
Area (ac)	3.5
Flow Path Length (ft)	667.0
Flow Path Slope (vft/hft)	0.0495
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.68
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.9241
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8672
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	14.9457
Burned Peak Flow Rate (cfs)	14.9457
24-Hr Clear Runoff Volume (ac-ft)	1.5906
24-Hr Clear Runoff Volume (cu-ft)	69286.2865



Peak Flow Hydrologic Analysis

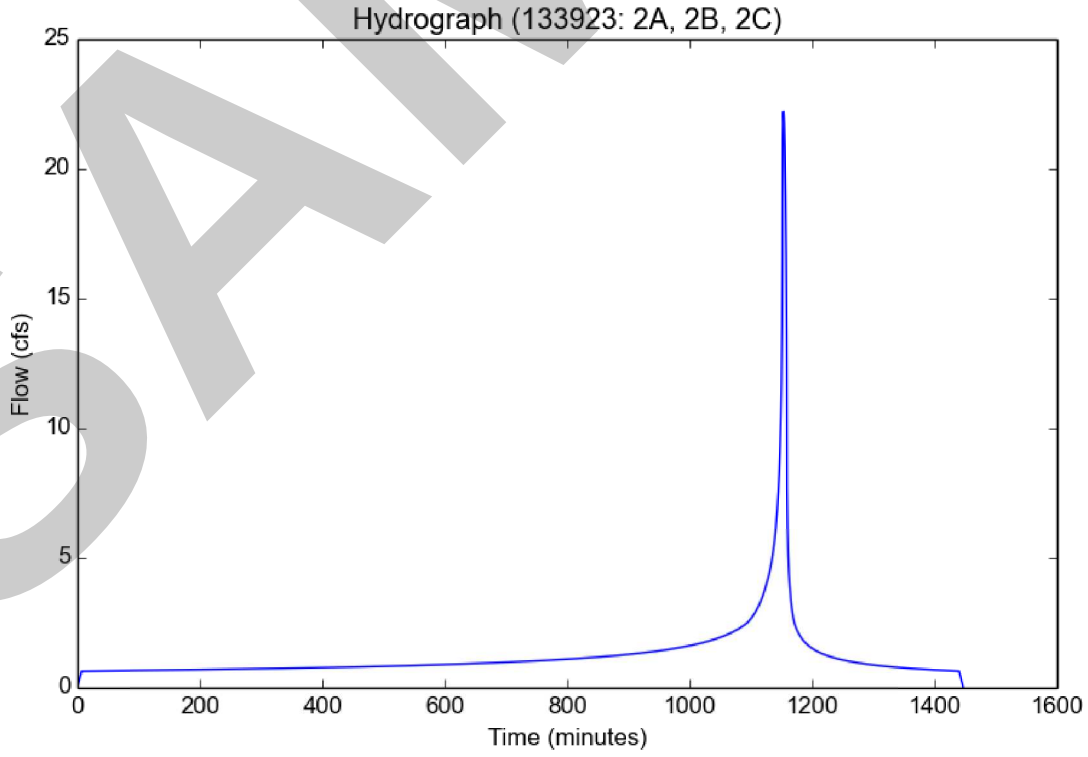
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A, 2B, 2C
Area (ac)	6.31
Flow Path Length (ft)	1051.0
Flow Path Slope (vft/hft)	0.0609
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.56
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.2038
Undeveloped Runoff Coefficient (Cu)	0.7573
Developed Runoff Coefficient (Cd)	0.8372
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	22.2076
Burned Peak Flow Rate (cfs)	22.2076
24-Hr Clear Runoff Volume (ac-ft)	2.4893
24-Hr Clear Runoff Volume (cu-ft)	108431.7438



Peak Flow Hydrologic Analysis

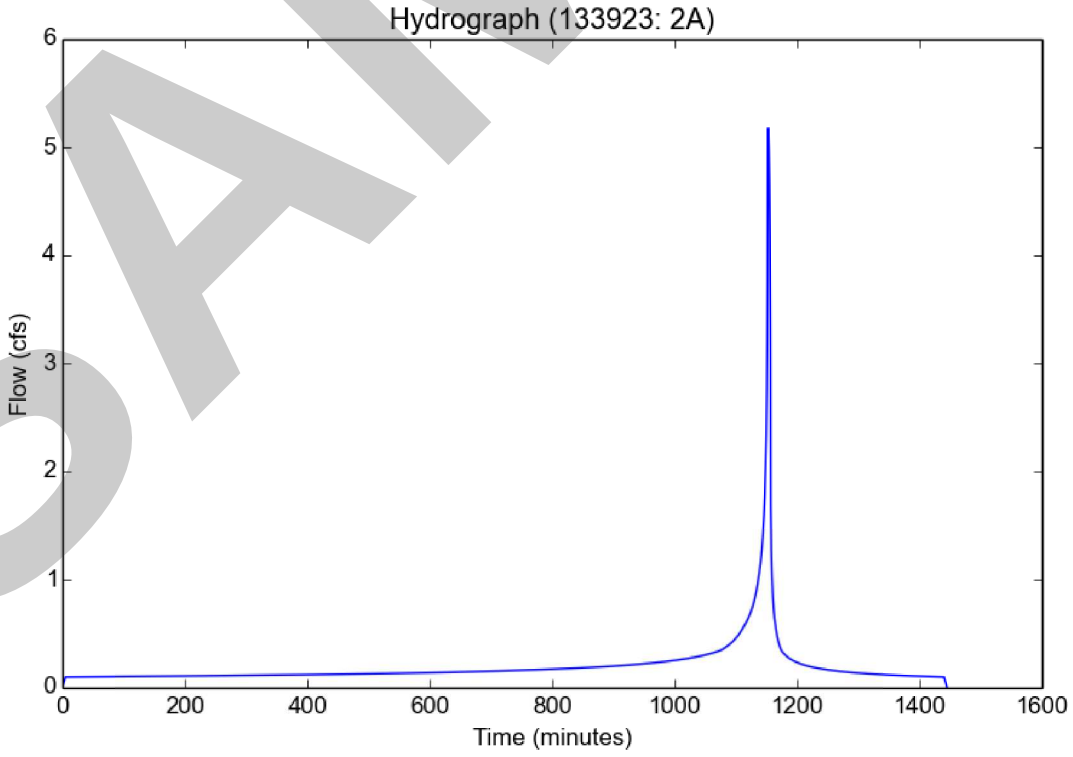
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A
Area (ac)	1.08
Flow Path Length (ft)	375.0
Flow Path Slope (vft/hft)	0.0747
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.6083
Undeveloped Runoff Coefficient (Cu)	0.8219
Developed Runoff Coefficient (Cd)	0.8547
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.1768
Burned Peak Flow Rate (cfs)	5.1768
24-Hr Clear Runoff Volume (ac-ft)	0.4052
24-Hr Clear Runoff Volume (cu-ft)	17650.3471



Peak Flow Hydrologic Analysis

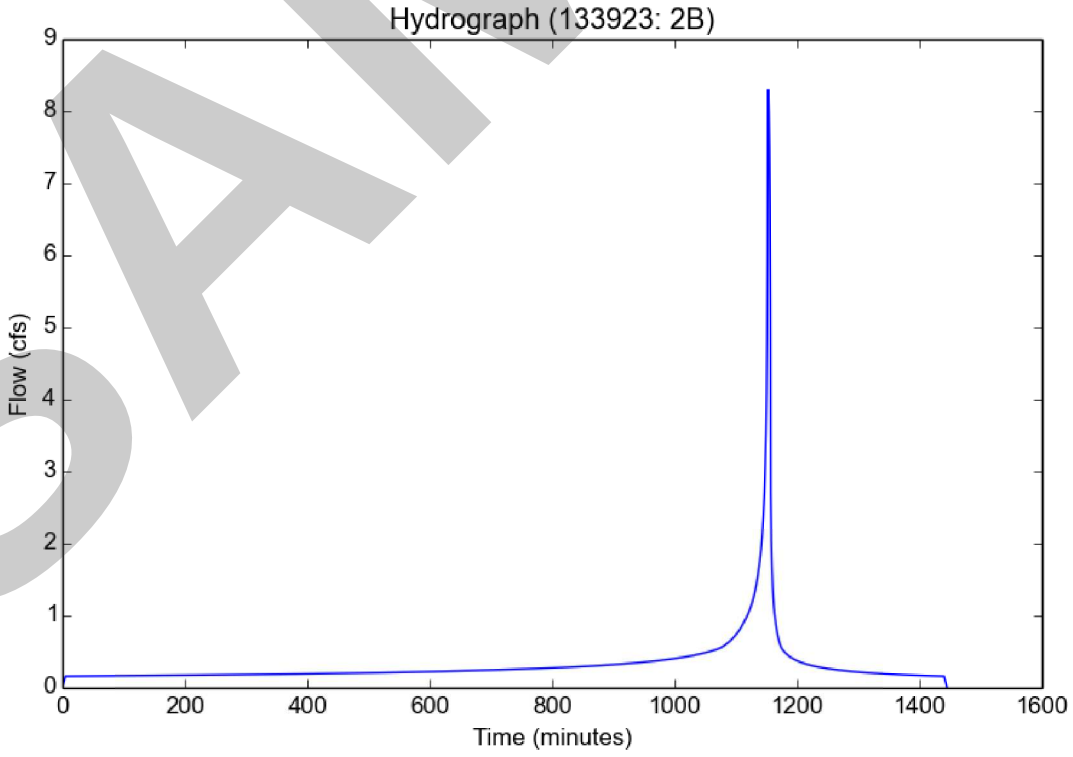
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2B
Area (ac)	1.73
Flow Path Length (ft)	384.0
Flow Path Slope (vft/hft)	0.0911
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.6083
Undeveloped Runoff Coefficient (Cu)	0.8219
Developed Runoff Coefficient (Cd)	0.8547
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	8.2924
Burned Peak Flow Rate (cfs)	8.2924
24-Hr Clear Runoff Volume (ac-ft)	0.6491
24-Hr Clear Runoff Volume (cu-ft)	28273.2412



Peak Flow Hydrologic Analysis

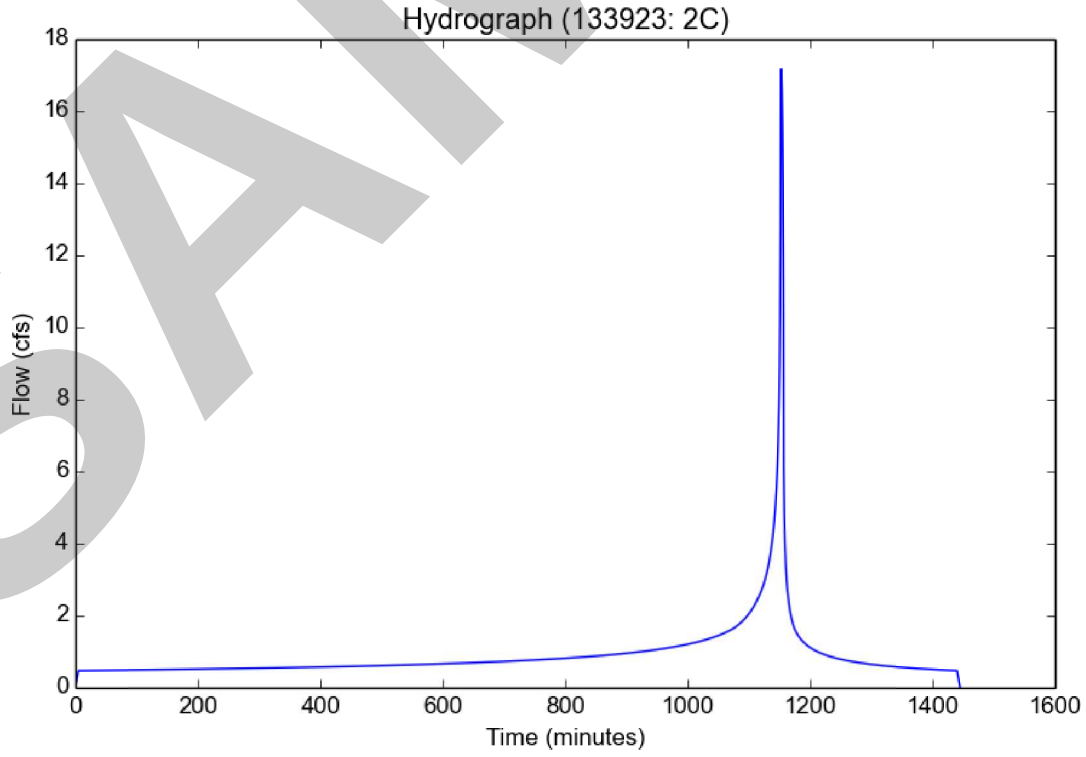
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2C
Area (ac)	3.5
Flow Path Length (ft)	667.0
Flow Path Slope (vft/hft)	0.0495
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.68
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.6083
Undeveloped Runoff Coefficient (Cu)	0.8219
Developed Runoff Coefficient (Cd)	0.875
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	17.1753
Burned Peak Flow Rate (cfs)	17.1753
24-Hr Clear Runoff Volume (ac-ft)	1.8215
24-Hr Clear Runoff Volume (cu-ft)	79343.1592



Peak Flow Hydrologic Analysis

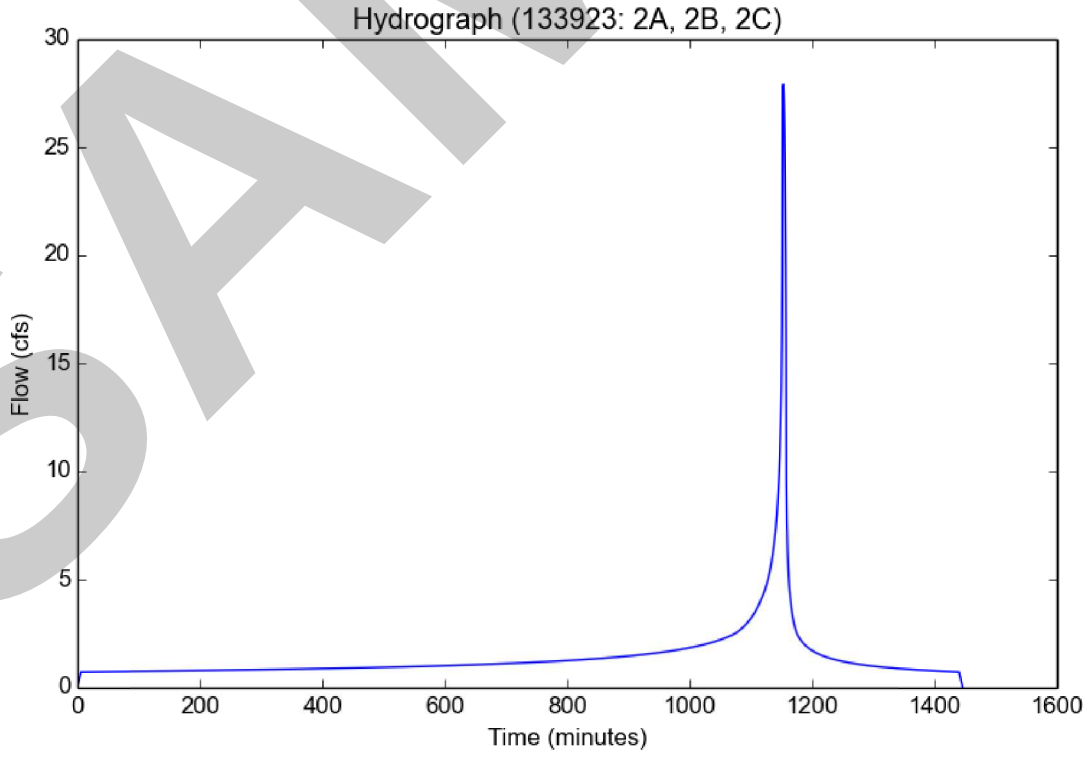
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report EX.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A, 2B, 2C
Area (ac)	6.31
Flow Path Length (ft)	1051.0
Flow Path Slope (vft/hft)	0.0609
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.56
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.1477
Undeveloped Runoff Coefficient (Cu)	0.8066
Developed Runoff Coefficient (Cd)	0.8589
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	27.8997
Burned Peak Flow Rate (cfs)	27.8997
24-Hr Clear Runoff Volume (ac-ft)	2.8605
24-Hr Clear Runoff Volume (cu-ft)	124603.9315



ATTACHMENT 2

Proposed Conditions
HydroCalc Calculations

Peak Flow Hydrologic Analysis

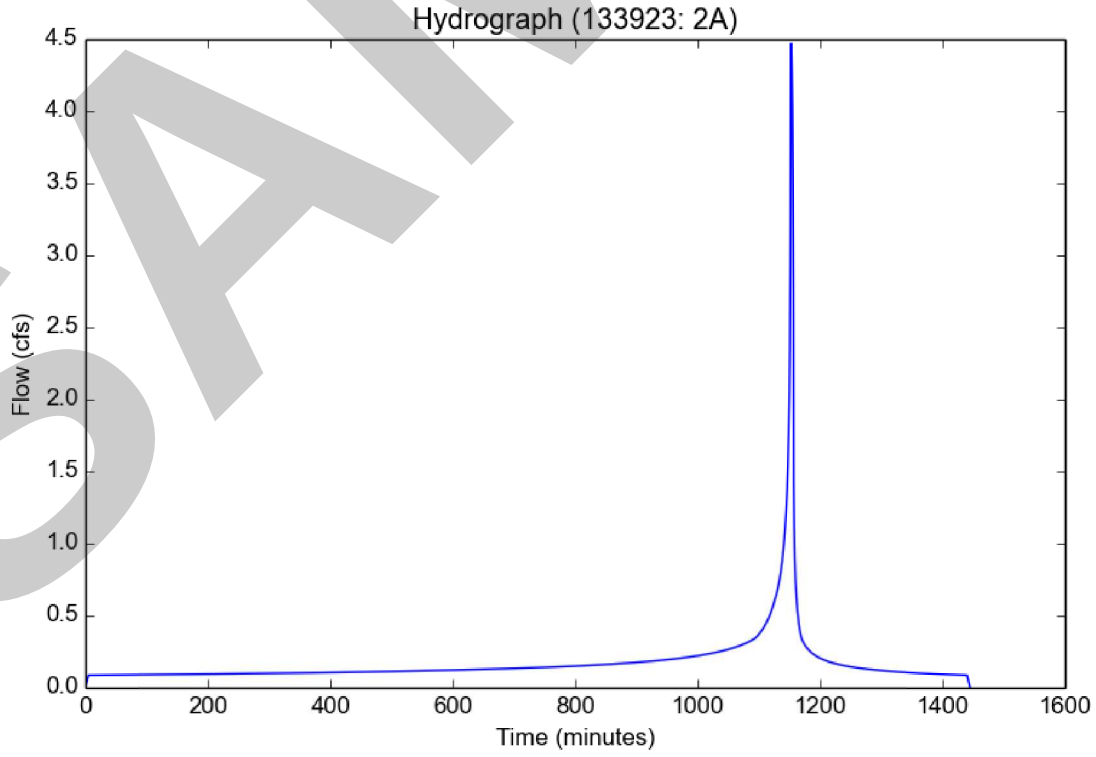
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A
Area (ac)	1.08
Flow Path Length (ft)	375.0
Flow Path Slope (vft/hft)	0.0747
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.9241
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8406
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.4701
Burned Peak Flow Rate (cfs)	4.4701
24-Hr Clear Runoff Volume (ac-ft)	0.3509
24-Hr Clear Runoff Volume (cu-ft)	15286.1499



Peak Flow Hydrologic Analysis

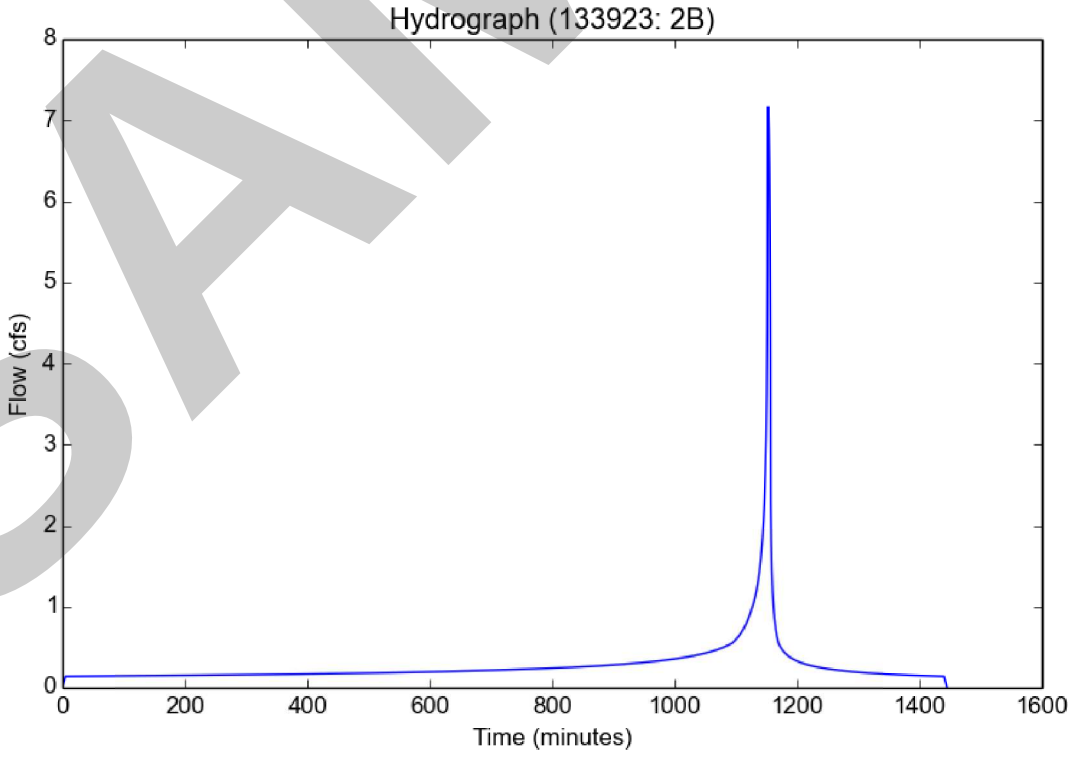
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2B
Area (ac)	1.73
Flow Path Length (ft)	384.0
Flow Path Slope (vft/hft)	0.0911
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.9241
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8406
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	7.1605
Burned Peak Flow Rate (cfs)	7.1605
24-Hr Clear Runoff Volume (ac-ft)	0.5621
24-Hr Clear Runoff Volume (cu-ft)	24486.1476



Peak Flow Hydrologic Analysis

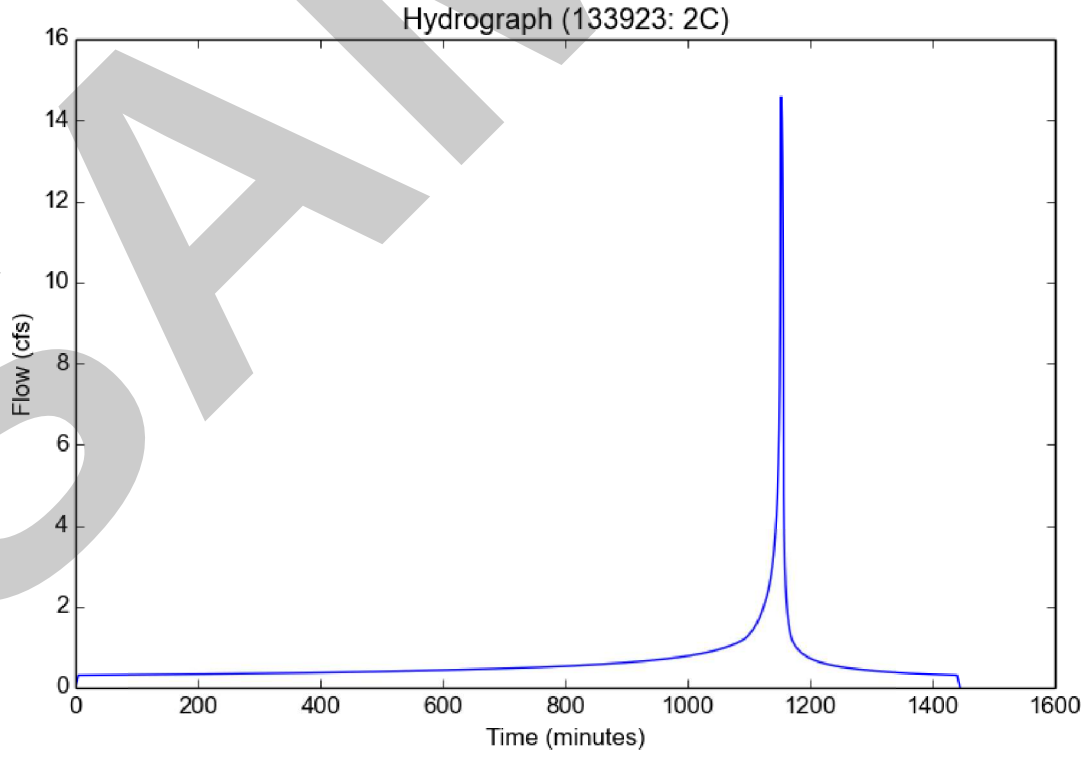
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2C
Area (ac)	3.5
Flow Path Length (ft)	678.0
Flow Path Slope (vft/hft)	0.0457
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.47
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.9241
Undeveloped Runoff Coefficient (Cu)	0.7975
Developed Runoff Coefficient (Cd)	0.8457
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	14.5748
Burned Peak Flow Rate (cfs)	14.5748
24-Hr Clear Runoff Volume (ac-ft)	1.2244
24-Hr Clear Runoff Volume (cu-ft)	53336.1099



Peak Flow Hydrologic Analysis

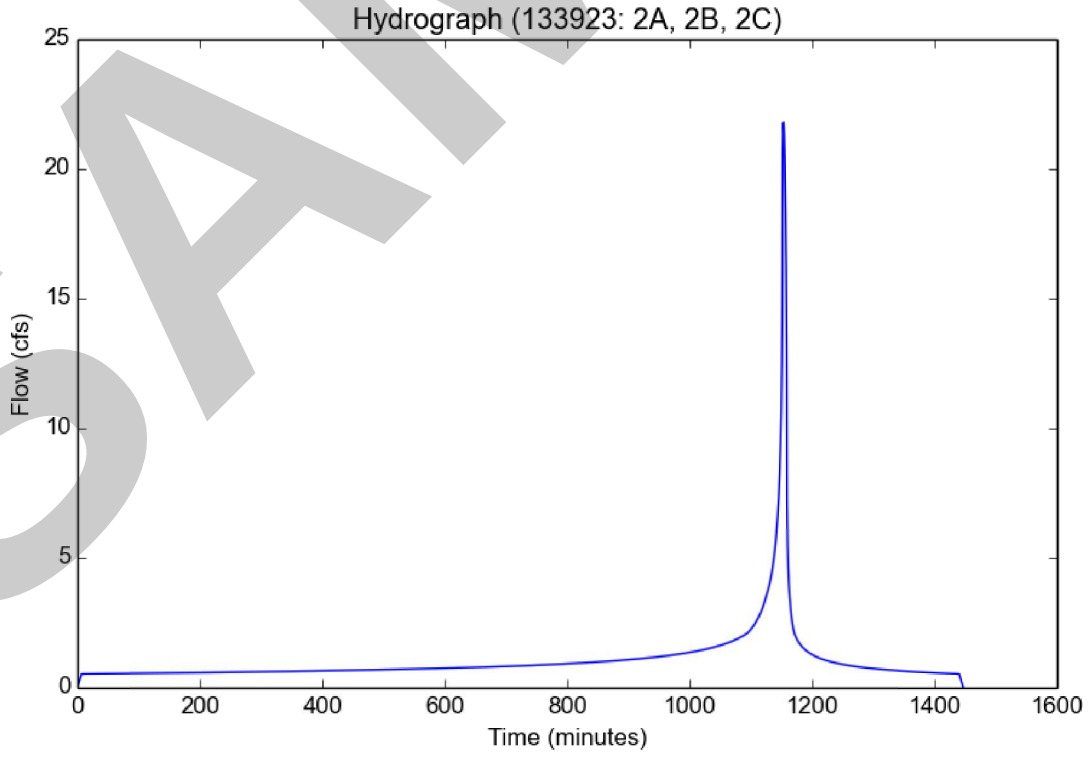
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A, 2B, 2C
Area (ac)	6.31
Flow Path Length (ft)	1062.0
Flow Path Slope (vft/hft)	0.057
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.45
Soil Type	7
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	8.2532
Peak Intensity (in/hr)	4.2038
Undeveloped Runoff Coefficient (Cu)	0.7573
Developed Runoff Coefficient (Cd)	0.8215
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	21.791
Burned Peak Flow Rate (cfs)	21.791
24-Hr Clear Runoff Volume (ac-ft)	2.1432
24-Hr Clear Runoff Volume (cu-ft)	93356.7233



Peak Flow Hydrologic Analysis

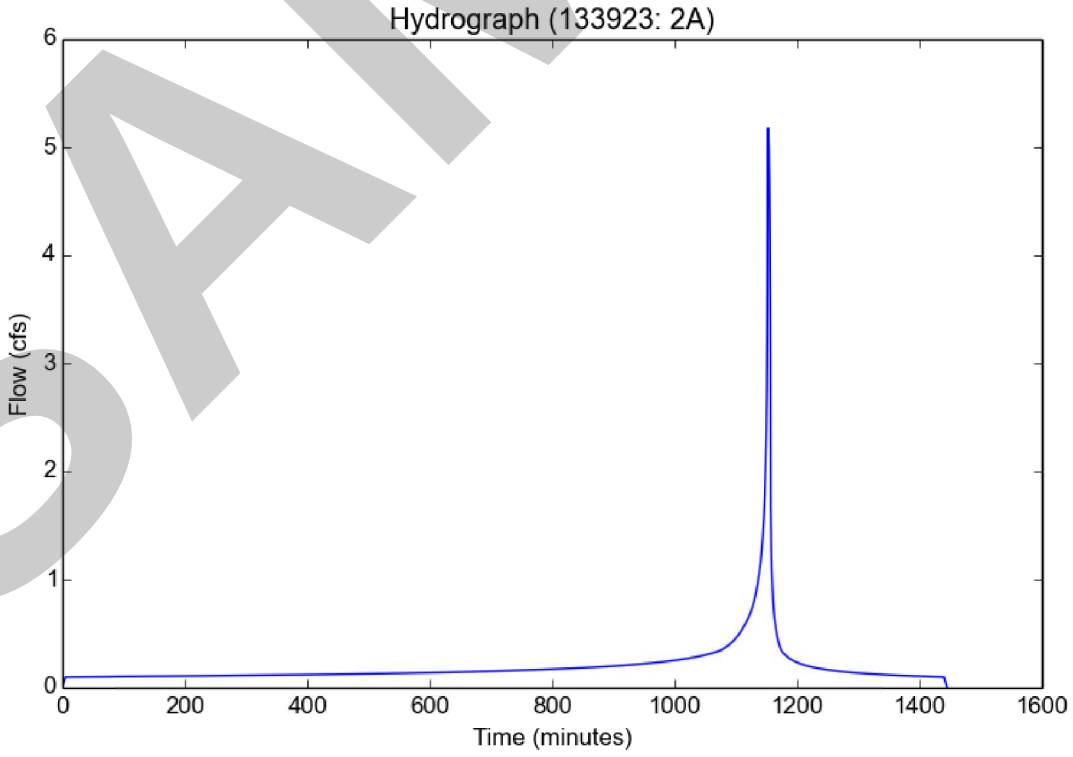
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A
Area (ac)	1.08
Flow Path Length (ft)	375.0
Flow Path Slope (vft/hft)	0.0747
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.6083
Undeveloped Runoff Coefficient (Cu)	0.8219
Developed Runoff Coefficient (Cd)	0.8547
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.1768
Burned Peak Flow Rate (cfs)	5.1768
24-Hr Clear Runoff Volume (ac-ft)	0.4052
24-Hr Clear Runoff Volume (cu-ft)	17650.3471



Peak Flow Hydrologic Analysis

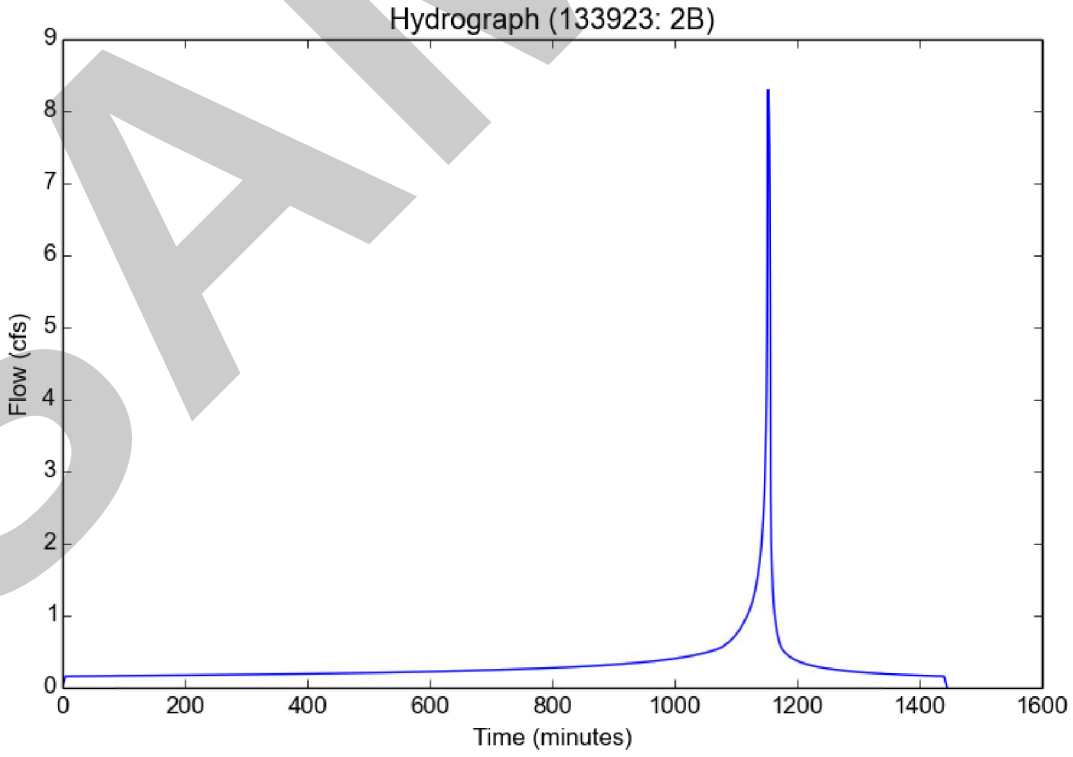
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2B
Area (ac)	1.73
Flow Path Length (ft)	384.0
Flow Path Slope (vft/hft)	0.0911
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.42
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.6083
Undeveloped Runoff Coefficient (Cu)	0.8219
Developed Runoff Coefficient (Cd)	0.8547
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	8.2924
Burned Peak Flow Rate (cfs)	8.2924
24-Hr Clear Runoff Volume (ac-ft)	0.6491
24-Hr Clear Runoff Volume (cu-ft)	28273.2412



Peak Flow Hydrologic Analysis

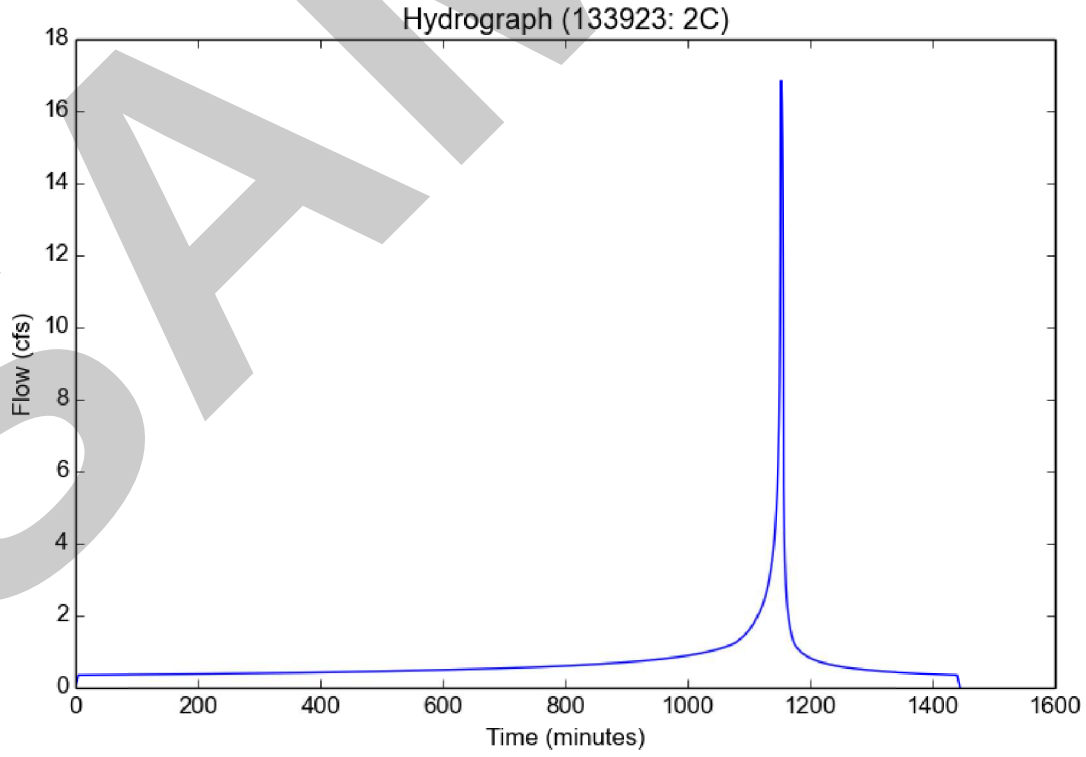
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2C
Area (ac)	3.5
Flow Path Length (ft)	678.0
Flow Path Slope (vft/hft)	0.0457
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.47
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.6083
Undeveloped Runoff Coefficient (Cu)	0.8219
Developed Runoff Coefficient (Cd)	0.8586
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	16.8532
Burned Peak Flow Rate (cfs)	16.8532
24-Hr Clear Runoff Volume (ac-ft)	1.4109
24-Hr Clear Runoff Volume (cu-ft)	61458.4605



Peak Flow Hydrologic Analysis

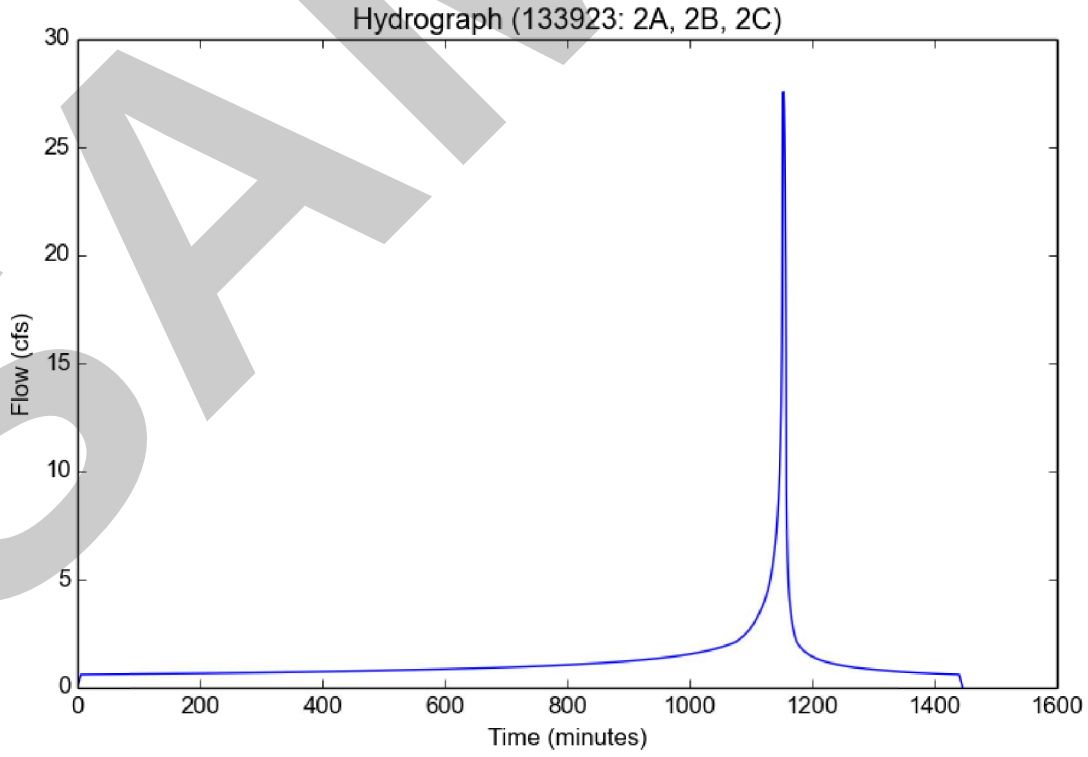
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/133923 Report PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	2A, 2B, 2C
Area (ac)	6.31
Flow Path Length (ft)	1062.0
Flow Path Slope (vft/hft)	0.057
50-yr Rainfall Depth (in)	9.4
Percent Impervious	0.45
Soil Type	7
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	9.4
Peak Intensity (in/hr)	5.1477
Undeveloped Runoff Coefficient (Cu)	0.8066
Developed Runoff Coefficient (Cd)	0.8487
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	27.5662
Burned Peak Flow Rate (cfs)	27.5662
24-Hr Clear Runoff Volume (ac-ft)	2.4727
24-Hr Clear Runoff Volume (cu-ft)	107710.5527



ATTACHMENT 3

Low Impact Development Calculations/
BMP Information

Peak Flow Hydrologic Analysis

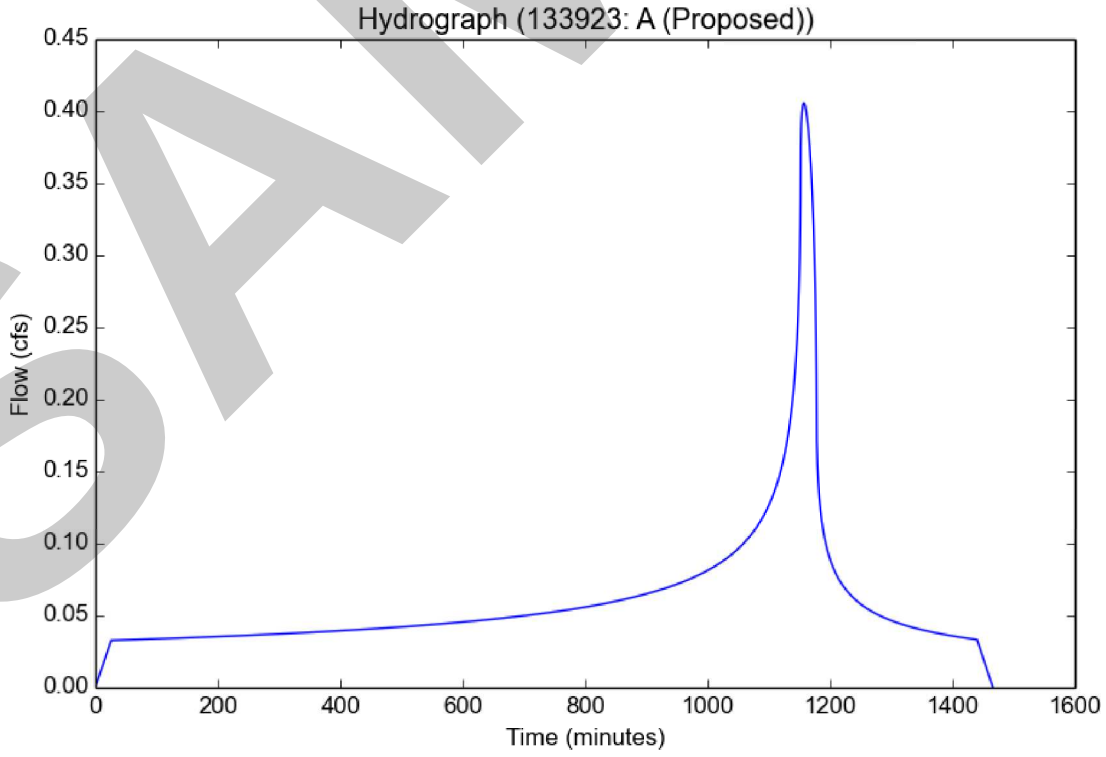
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/SUSMP/133923 Report SUSMP PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	A (Proposed)
Area (ac)	2.48
Flow Path Length (ft)	678.0
Flow Path Slope (vft/hft)	0.085545723
85th Percentile Rainfall Depth (in)	1.25
Percent Impervious	0.47
Soil Type	7
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.25
Peak Intensity (in/hr)	0.3436
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.476
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	0.4056
Burned Peak Flow Rate (cfs)	0.4056
24-Hr Clear Runoff Volume (ac-ft)	0.122
24-Hr Clear Runoff Volume (cu-ft)	5312.2057



Peak Flow Hydrologic Analysis

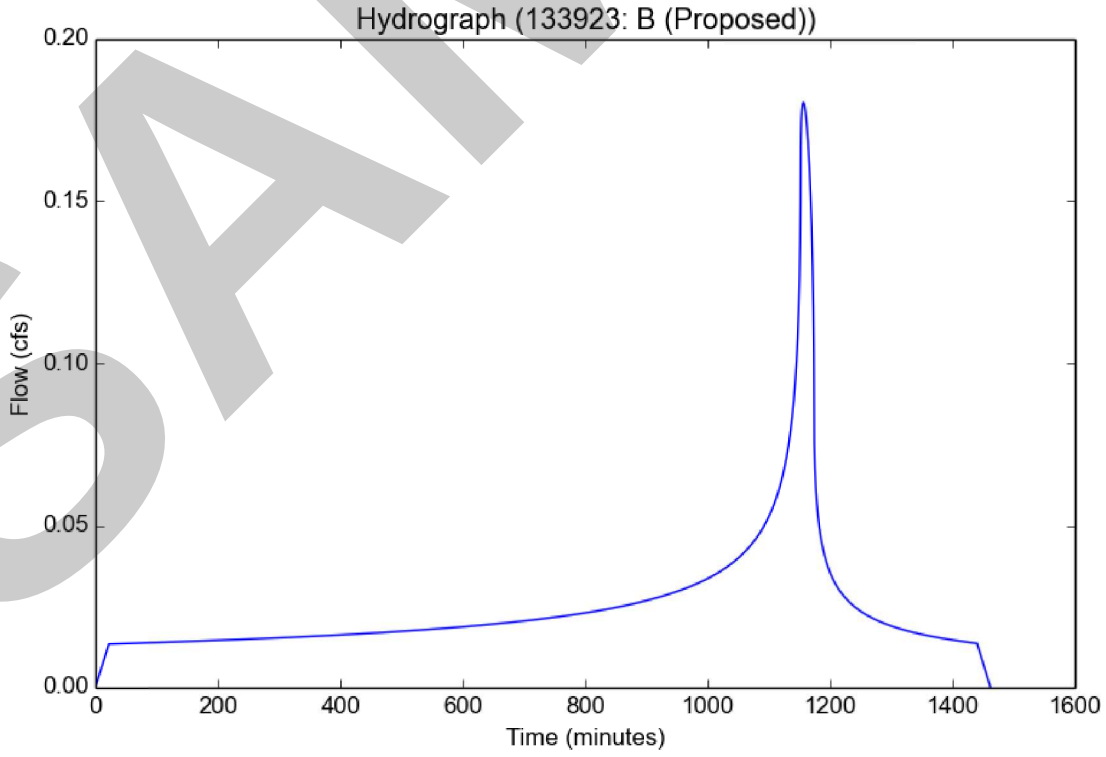
File location: I:/2013 Jobs/133923 - Altadena/Hydrology/Calcs/SUSMP/133923 Report SUSMP PROP.pdf
Version: HydroCalc 0.3.1

Input Parameters

Project Name	133923
Subarea ID	B (Proposed)
Area (ac)	1.02
Flow Path Length (ft)	448.0
Flow Path Slope (vft/hft)	0.051339286
85th Percentile Rainfall Depth (in)	1.25
Percent Impervious	0.47
Soil Type	7
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.25
Peak Intensity (in/hr)	0.3717
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.476
Time of Concentration (min)	22.0
Clear Peak Flow Rate (cfs)	0.1805
Burned Peak Flow Rate (cfs)	0.1805
24-Hr Clear Runoff Volume (ac-ft)	0.0502
24-Hr Clear Runoff Volume (cu-ft)	2184.8534



S-1: Storm Drain Message and Signage

Purpose

Waste material dumped into storm drain inlets can adversely impact surface and ground waters. In fact, any material discharged into the storm drain system has the potential to significantly impact downstream receiving waters. Storm drain messages have become a popular method of alerting and reminding the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet or catch basin. The message simply informs the public that dumping of wastes into storm drain inlets is prohibited and/or that the drain ultimately discharges into receiving waters.

General Guidance

- The signs must be placed so they are easily visible to the public.
- Be aware that signs placed on sidewalk will be worn by foot traffic.

Design Specifications

- Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.
- Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., "No Dumping – Drains to the Ocean") are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.

Maintenance Requirements

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaced as necessary). If required by LACDPW, the owner/operator or homeowner's association shall enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards and signs.

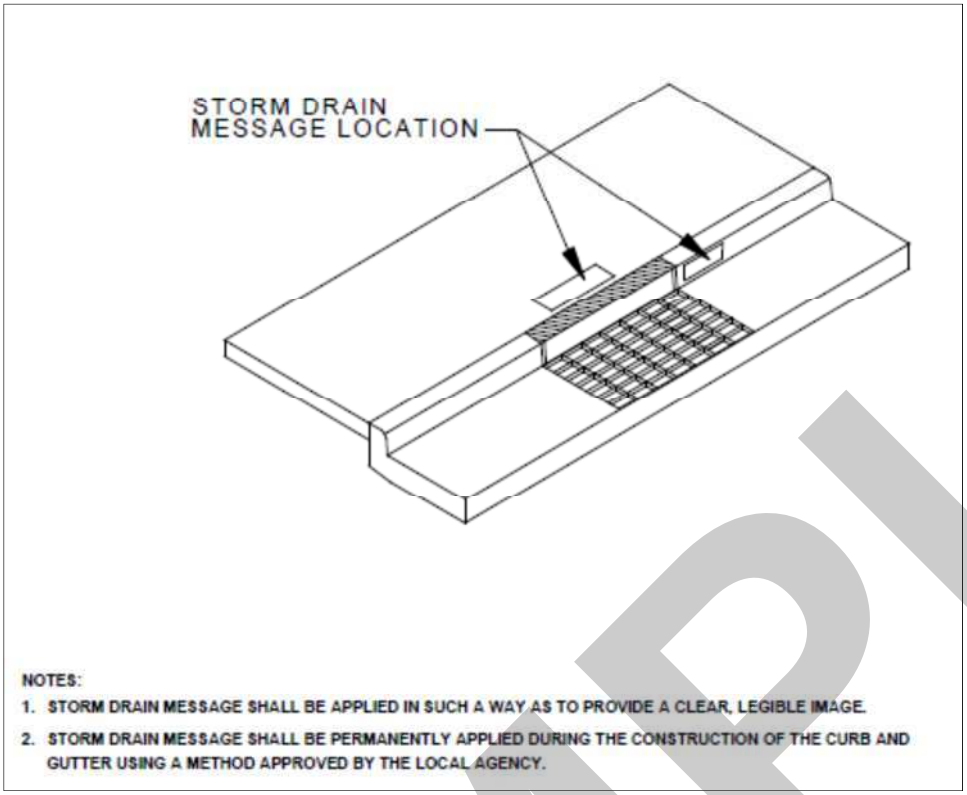


Figure D-1. Storm Drain Message Location – Curb Type Inlet

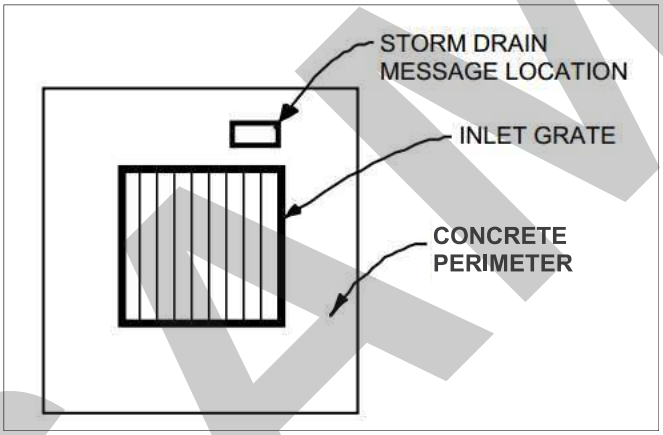


Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet

S-8: Landscape Irrigation Practices

Purpose

Irrigation runoff provides a pathway for pollutants (i.e., nutrients, bacteria, organics, sediment) to enter the storm drain system. By effectively irrigating, less runoff is produced resulting in less potential for pollutants to enter the storm drain system.

General Guidance

- Do not allow irrigation runoff from the landscaped area to drain directly to storm drain system.
- Minimize use of fertilizer, pesticides, and herbicides on landscaped areas.
- Plan sites with sufficient landscaped area and dispersal capacity (e.g., ability to receive irrigation water without generating runoff).
- Consult a landscape professional regarding appropriate plants, fertilizer, mulching applications, and irrigation requirements (if any) to ensure healthy vegetation growth.

Design Specifications

- Choose plants that minimize the need for fertilizer and pesticides.
- Group plants with similar water requirements and water accordingly.
- Use mulch to minimize evaporation and erosion.
- Include a vegetative boundary around project site to act as a filter.
- Design the irrigation system to only water areas that need it.
- Install an approved subsurface drip, pop-up, or other irrigation system.[1] The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.
- Install rain sensors to shut off the irrigation system during and after storm events.
- Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.
- If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).

[1] If alternative distribution systems (e.g., spray irrigation) are approved, the County will establish guidelines to implement these new systems.

- For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.[2]
- Implement Integrated Pest Management practices.

For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.

Maintenance Requirements

Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

[2] As determined by the City of Los Angeles, Building and Safety Division

S-9: Building Materials Selection

Purpose

Building materials can potentially contribute pollutants of concern to stormwater runoff through leaching. For example, metal buildings, roofing, and fencing materials may be significant sources of metals in stormwater runoff, especially due to acidic precipitation. The use of alternative building materials can reduce pollutant sources in stormwater runoff by eliminating compounds that can leach into stormwater runoff. Alternative building materials may also reduce the need to perform maintenance activities (i.e., painting) that involve pollutants of concern, and may reduce the volume of stormwater runoff. Alternative materials are available to replace lumber and paving.

Design Specifications

Lumber

Decks and other house components constructed using pressure-treated wood that is typically treated using arsenate, copper, and chromium compounds are hazardous to the environment. Pressure-treated wood may be replaced with cement-fiber or vinyl.

Roofs, Fencing, and Metals

Minimizing the use of copper and galvanized (zinc-coated) metals on buildings and fencing can reduce leaching of these pollutants into stormwater runoff. The following building materials are conventionally made of galvanized metals:

- Metal roofs;
- Chain-link fencing and siding; and
- Metal downspouts, vents, flashing, and trim on roofs.

Architectural use of copper for roofs and gutters should be avoided. As an alternative to copper and galvanized materials, coated metal products are available for both roofing and gutter application. Vinyl-coated fencing is an alternative to traditional galvanized chain-link fences. These products eliminate contact of bare metal with precipitation or stormwater runoff, and reduce the potential for stormwater runoff contamination. Roofing materials are also made of recycled rubber and plastic.

Green roofs may be an option. Green roofs use vegetation such as grasses and other plants as an exterior surface. The plants reduce the velocity of stormwater runoff and absorb water to reduce the volume of stormwater runoff. One potential problem with using green roofs in the Los Angeles County area is the long, hot and dry summers, which may kill the plants if they are not watered. See the Green Roof Fact Sheet (RET-7) in Appendix E.

Pesticides

The use of pesticides around foundations can be reduced through the use of alternative barriers. Sand barriers can be applied around foundations to deter termites, as they cannot tunnel through sand. Metal shields also block termites from tunneling. Additionally, diatomaceous earth can be used to repel or kill a wide variety of other pests.

Maintenance Requirements

The integrity of structural elements that are subject to damage (e.g., signs) must be maintained by the owner/operator as required by local codes and ordinances. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.