Appendix E-1

Preliminary Hydrology Study for LBA Warehouse Redlands

DRC Engineering, Inc

October 4, 2021

PRELIMINARY HYDROLOGY STUDY

For:

LBA Warehouse Redlands

Project Site Location/Address:
350 Iowa Street
Redlands, CA 92373

Prepared For:
LBA realty
3347 Michelson Drive
Irvine, California 92612

Lead Agency:
City of Redlands
35 Cajon Street, Suite 15A
Redlands, CA 92373

Prepared by:
DRC Engineering, Inc.
160 S. Old Springs Road, Suite 210
Anaheim, CA 92808
(714) 685-6860
Christopher McKee, P.E.

October 4, 2021

DRC Project No. 21-996

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Proposed Hydrology Map

Section I Introduction

The following hydrology and hydraulic studies have been prepared for the development of the commercial self-warehousing property located at the northeast corner of Iowa Street and Orange Blossom Trail, San Bernardino County, California. The Project Site is shown on the Vicinity Map, included as Figure 1 in Appendix A of this report.

Section II Methodology

For both the Existing and Proposed conditions, the peak storm discharge for the drainage subareas were calculated using San Bernardino County Hydrology Manual. The Rational Method Equation (1978 April), using AES Software (Ratscx), was used to calculate the peak discharge for the 10-year and 100-year storm events. AES Software (Computational Hydraulics 1) was used to generate hydrographs using the Small Area Unit Hydrograph Method. Unit Hydrographs were input into Civil3d Hydraflow Hydrograph software to design and analyze the Proposed detention/infiltration system subsurface open-bottom chambers (Stormtech SC-740 Chambers).

Section III Project Description

Existing Site Conditions

In the Existing Condition, the Project Site is made up of approximately 9.44 acres of undeveloped land. The Project Site Hydrologic Soil-Cover is classified as currently barren, graded land. The Project Site is designated as Hydrologic Soils Group B per Figure C-16 of San Bernardino County Hydrology Manual. Based on aerial topography performed by Inland Aerial Surveys, Inc. on July 12, 2021, and Google Earth Imagery, it is apparent that the entire Project Site drains northwesterly toward an existing parkway drain which discharges offsite into the easterly curb and gutter on Iowa Street. Refer to the “Existing Hydrology Map” for an illustration of the Existing Condition drainage patterns.

The following table summarizes the data and results for the 10-year and 100-year storm event in the existing condition. All calculations can be found in Appendix C of this report.

EXISTING DRAINAGE SUMMARY			
SUBAREA	AREA (acres)	Q_{10} (cfs)	Q_{100} (cfs)
TOTAL SITE	9.44	7.45	17.07

Proposed Site Conditions

In the Proposed Condition, the Project Site proposes the construction of a warehouse facility with truck dock areas, paved parking areas, drive aisles, hardscape, landscape planters, a proposed underground storm drain system and a proposed underground detention/infiltration system. The overall drainage pattern in the Proposed Condition will follow the Existing Condition and the Project Site will be considered as one single drainage area. Stormwater flows onsite will drain into proposed grate inlet catch basins located throughout the Site and into the private underground storm drain system. The underground storm drain system conveys stormwater into the proposed underground detention/infiltration system chambers (Stormtech

SC-740 Chambers). The open bottom plastic chambers will allow adequate infiltration into the surrounding soil. In the event of a larger storm event, the system will fill up to a certain water surface elevation until overflowing into a series of outlet pipes, then into parkway drains that discharge westerly into the easterly curb and gutter of Iowa Street. The proposed storm drain system and detention/infiltration system is designed such that the Proposed Condition peak flows in the 10-year and 100-year storm does not exceed the Existing Condition peak flows.

PROPOSED UNMITIGATED FLOW (WITHOUT DETENTION)			
DRAINAGE AREA	AREA	Q_{10} (cfs)	Q_{100} (cfs)
TOTAL SITE	9.44	20.76	33.16

PROPOSED MITIGATED FLOW (WITH DETENTION)			
DRAINAGE AREA	AREA	Q_{10} (cfs)	Q_{100} (cfs)
TOTAL SITE	9.44	7.45	15.27

FEMA Flood Conditions

The Project Site is located within FEMA Special Flood Hazard Area Zone AO, subject to inundation by the 1% annual chance flood, also known as the base flood that has a 1% chance of being equaled or exceed in any given year. The sheet flow flood depth, or Base Flood Elevation equal to 2-feet above the existing grade. It is required that the proposed building finish floor elevation be constructed a minimum of 2-feet above the existing Base Flood elevation. Additionally, at the 2-foot Flood Depth Elevation on the Project Site in the Existing Condition, the total flood volume has been calculated to be approximately 822,000 cubic-feet. Using the Base Flood Elevation in the Existing Condition, the Project Site is designed to provide approximately 582,500 cubic-feet of storage above proposed surface elevations, and approximately 58,422 cubic-feet in the underground detention/infiltration system in the Proposed Condition. Therefore, a total of approximately 641,000 cubic-feet of stormwater storage is provided in the Proposed Condition. This is approximately 78% of the total Base Flood volume.

Section IV Conclusion

The difference in peak flow rate of pre-developed and post-developed conditions for 10-year and 100-year storm events are primarily due to the increase in impervious area which is approximately 90% in the developed condition. The excess runoff will be mitigated using the Stormtech detention/infiltration system.

Below is the hydrology summary table of the entire site considered as a single drainage area:

STORM EVENT	PRE-DEVELOPED DISCHARGE (cfs)	POST-DEVELOPED MITIGATED DISCHARGE (cfs)
10-YEAR	7.45	7.45
100-YEAR	17.07	15.27

In conclusion, adequate storage volume has been provided in the Proposed Condition to mitigate the 10-year and 100-year storm events. This indicates that there will be no adverse impact on the downstream end due to the development of this site.

APPENDIX A

VICINITY MAP

APPENDIX B

REFERENCES

NOAA Atlas 14, Volume 6, Version 2
Location name: Redlands, California, USA*
Latitude: 34.0569°, Longitude: -117.212°
Elevation: 1220.63 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.096 (0.080-0.116)	0.123 (0.103-0.150)	0.160 (0.133-0.195)	0.191 (0.157-0.234)	0.232 (0.185-0.296)	0.265 (0.206-0.344)	0.299 (0.227-0.398)	0.334 (0.246-0.458)	0.382 (0.270-0.547)	0.420 (0.286-0.623)
10-min	0.137 (0.114-0.167)	0.177 (0.147-0.215)	0.230 (0.190-0.280)	0.273 (0.225-0.336)	0.333 (0.265-0.424)	0.380 (0.295-0.494)	0.428 (0.325-0.571)	0.479 (0.353-0.656)	0.548 (0.387-0.784)	0.603 (0.411-0.893)
15-min	0.166 (0.138-0.202)	0.214 (0.178-0.260)	0.278 (0.230-0.338)	0.330 (0.272-0.406)	0.403 (0.320-0.512)	0.460 (0.357-0.597)	0.518 (0.393-0.690)	0.579 (0.426-0.794)	0.663 (0.468-0.948)	0.729 (0.497-1.08)
30-min	0.246 (0.204-0.298)	0.316 (0.263-0.384)	0.411 (0.340-0.500)	0.488 (0.401-0.600)	0.596 (0.473-0.757)	0.679 (0.528-0.883)	0.766 (0.581-1.02)	0.856 (0.630-1.17)	0.980 (0.692-1.40)	1.08 (0.734-1.60)
60-min	0.360 (0.299-0.436)	0.463 (0.385-0.563)	0.601 (0.498-0.732)	0.715 (0.588-0.878)	0.872 (0.693-1.11)	0.994 (0.773-1.29)	1.12 (0.850-1.49)	1.25 (0.923-1.72)	1.43 (1.01-2.05)	1.58 (1.08-2.34)
2-hr	0.512 (0.426-0.621)	0.656 (0.545-0.797)	0.846 (0.702-1.03)	1.00 (0.825-1.23)	1.22 (0.968-1.55)	1.39 (1.08-1.80)	1.56 (1.18-2.08)	1.74 (1.28-2.38)	1.98 (1.40-2.84)	2.17 (1.48-3.22)
3-hr	0.631 (0.526-0.766)	0.807 (0.671-0.981)	1.04 (0.862-1.27)	1.23 (1.01-1.51)	1.49 (1.19-1.90)	1.70 (1.32-2.21)	1.91 (1.44-2.54)	2.12 (1.56-2.91)	2.42 (1.71-3.46)	2.65 (1.80-3.92)
6-hr	0.890 (0.741-1.08)	1.14 (0.946-1.38)	1.46 (1.21-1.78)	1.73 (1.42-2.13)	2.09 (1.66-2.66)	2.38 (1.85-3.09)	2.66 (2.02-3.55)	2.96 (2.18-4.06)	3.36 (2.37-4.81)	3.68 (2.51-5.45)
12-hr	1.19 (0.988-1.44)	1.52 (1.26-1.85)	1.96 (1.62-2.39)	2.32 (1.90-2.85)	2.80 (2.22-3.56)	3.17 (2.47-4.12)	3.55 (2.69-4.73)	3.94 (2.90-5.40)	4.46 (3.15-6.38)	4.87 (3.32-7.21)
24-hr	1.58 (1.40-1.82)	2.04 (1.81-2.36)	2.64 (2.33-3.06)	3.13 (2.74-3.65)	3.78 (3.21-4.56)	4.29 (3.56-5.27)	4.79 (3.88-6.04)	5.31 (4.19-6.87)	6.01 (4.55-8.10)	6.55 (4.79-9.13)
2-day	1.96 (1.73-2.26)	2.56 (2.26-2.95)	3.35 (2.96-3.88)	4.00 (3.50-4.66)	4.88 (4.13-5.88)	5.56 (4.61-6.84)	6.25 (5.06-7.87)	6.96 (5.49-9.01)	7.93 (6.00-10.7)	8.68 (6.35-12.1)
3-day	2.11 (1.87-2.43)	2.80 (2.48-3.24)	3.73 (3.29-4.31)	4.49 (3.93-5.23)	5.54 (4.69-6.67)	6.36 (5.27-7.82)	7.20 (5.83-9.07)	8.08 (6.37-10.5)	9.29 (7.03-12.5)	10.2 (7.50-14.3)
4-day	2.27 (2.01-2.62)	3.04 (2.69-3.51)	4.07 (3.59-4.71)	4.93 (4.31-5.75)	6.12 (5.19-7.38)	7.06 (5.86-8.68)	8.03 (6.51-10.1)	9.06 (7.14-11.7)	10.5 (7.93-14.1)	11.6 (8.49-16.2)
7-day	2.64 (2.34-3.04)	3.56 (3.15-4.11)	4.79 (4.23-5.54)	5.82 (5.09-6.79)	7.25 (6.14-8.74)	8.38 (6.96-10.3)	9.56 (7.74-12.0)	10.8 (8.51-14.0)	12.5 (9.46-16.9)	13.9 (10.1-19.3)
10-day	2.86 (2.53-3.30)	3.88 (3.43-4.47)	5.24 (4.63-6.07)	6.39 (5.59-7.45)	7.98 (6.76-9.61)	9.24 (7.66-11.4)	10.5 (8.54-13.3)	11.9 (9.39-15.4)	13.8 (10.5-18.6)	15.4 (11.2-21.4)
20-day	3.54 (3.13-4.08)	4.83 (4.27-5.57)	6.58 (5.80-7.61)	8.05 (7.04-9.39)	10.1 (8.56-12.2)	11.7 (9.74-14.4)	13.4 (10.9-16.9)	15.2 (12.0-19.7)	17.8 (13.4-23.9)	19.8 (14.5-27.6)
30-day	4.16 (3.68-4.80)	5.70 (5.04-6.57)	7.78 (6.87-9.01)	9.54 (8.35-11.1)	12.0 (10.2-14.5)	14.0 (11.6-17.2)	16.0 (13.0-20.2)	18.2 (14.4-23.6)	21.3 (16.1-28.7)	23.7 (17.4-33.1)
45-day	4.98 (4.41-5.74)	6.81 (6.02-7.86)	9.30 (8.20-10.8)	11.4 (9.98-13.3)	14.4 (12.2-17.3)	16.7 (13.9-20.6)	19.2 (15.6-24.2)	21.9 (17.2-28.3)	25.6 (19.4-34.5)	28.6 (20.9-39.8)
60-day	5.82 (5.15-6.71)	7.93 (7.01-9.15)	10.8 (9.53-12.5)	13.2 (11.6-15.4)	16.7 (14.1-20.1)	19.4 (16.1-23.9)	22.3 (18.1-28.1)	25.3 (20.0-32.8)	29.7 (22.4-40.0)	33.1 (24.2-46.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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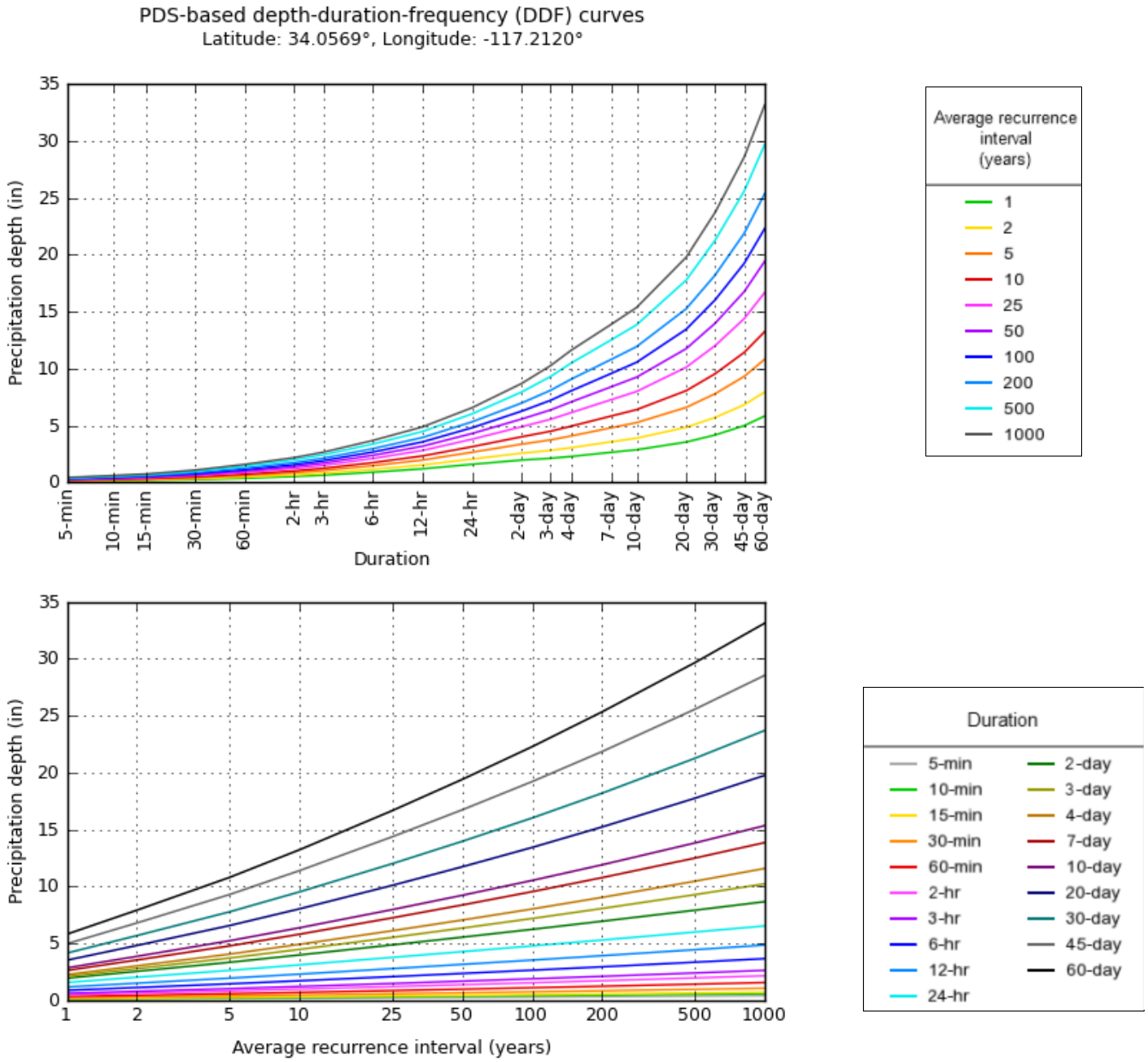
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Sep 28 18:28:16 2021

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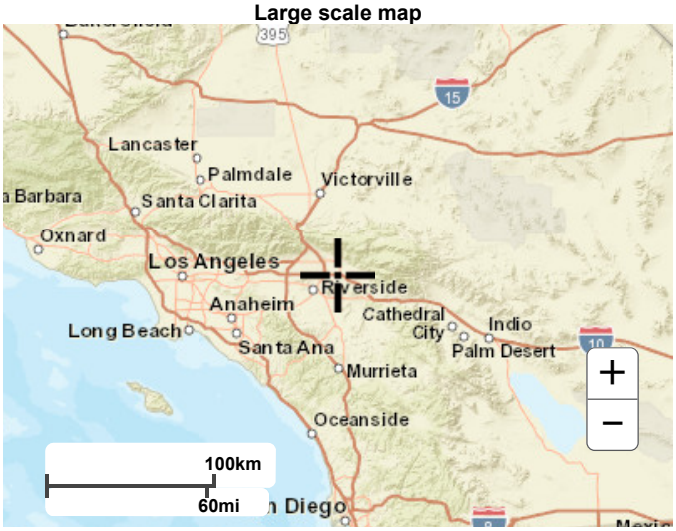
Maps & aerials

Small scale terrain

Large scale terrain

Large scale map



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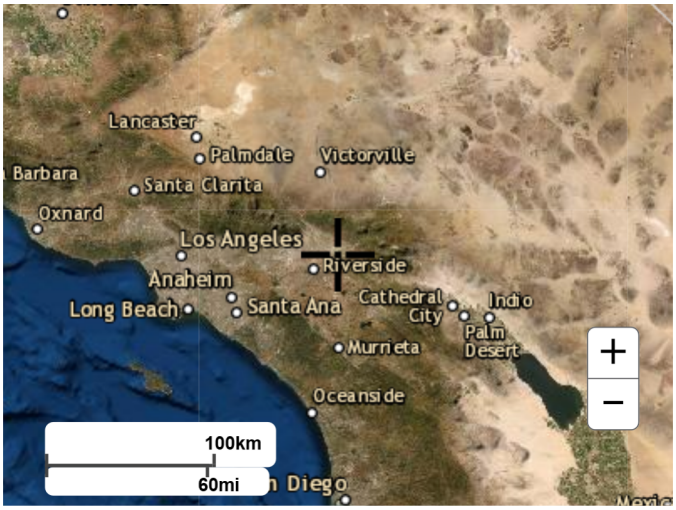

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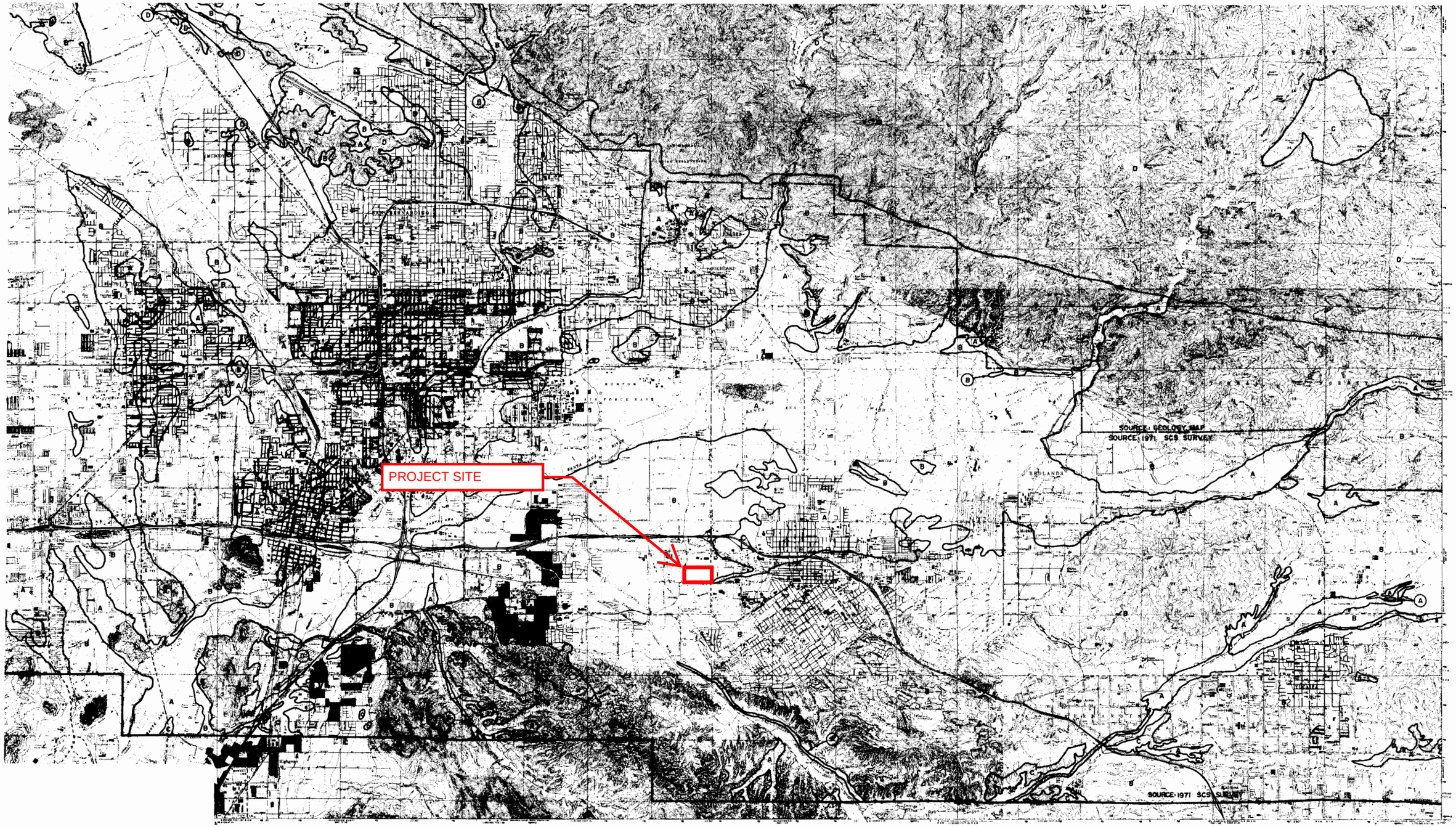
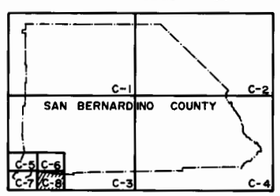
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer





INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP FOR SOUTHWEST-D AREA

 | **Issue Date: May 29, 2009** | **Effective Date: May 29, 2009** | **Case No.: 09-09-0076P** | LOMR-APP

Follows Conditional Case No.: 08-09-0057R

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	**City of Redlands San Bernardino County California**	**FILL LEVEE**	**HYDRAULIC ANALYSIS LEVEE CERTIFICATION NEW TOPOGRAPHIC DATA**
	COMMUNITY NO.: 060279		
IDENTIFIER	Nevada Business Park - Flood Wall	**APPROXIMATE LATITUDE & LONGITUDE: 34.034, -117.137 SOURCE:** USGS QUADRANGLE **DATUM:** NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 06071C8712 H DATE: August 28, 2008	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

The Zanja – from approximately 90 feet downstream of Nevada Street to approximately 1,010 feet upstream of Nevada Street

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
The Zanja	Zone AO	Zone X (shaded)	NONE	YES
	Zone AO	Zone AO	NONE	YES
	Depths*	Depths	NONE	YES

* Depths – Feet Above Ground

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

This revision involves an accredited levee system. Your community is responsible for maintaining and disseminating information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, for the levee system(s) shown as providing protection. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and flood proofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip/index.shtm.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This revision has met our criteria for removing an area from the 1-percent-annual-chance floodplain to reflect the placement of fill. However, we encourage you to require that the lowest adjacent grade and lowest floor (including basement) of any structure placed within the subject area be elevated to or above the Base (1-percent-annual-chance) Flood Elevation.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Dahlia Kasperski

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	DEPTH (FEET ABOVE GROUND)		MAP PANEL NUMBER(S)
		EFFECTIVE	REVISED	
The Zanja	At Nevada Street	2	1	06071C8712 H

Within 90 days of the second publication in the local newspaper, any interested party may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. This revision is effective as of the date of this letter. However, until the 90-day period has elapsed, the revised BFEs presented in this LOMR may be changed.

A notice of changes will be published in the *Federal Register*. A short notice also will be published in your local newspaper on or about the dates listed below. Please refer to FEMA's website at https://www.floodmaps.fema.gov/fhm/Scripts/bfe_main.asp for a more detailed description of proposed BFE changes, which will be posted within a week of the date of this letter.

LOCAL NEWSPAPER Name: Redland Daily Facts
Dates: 06/11/2009 06/18/2009

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

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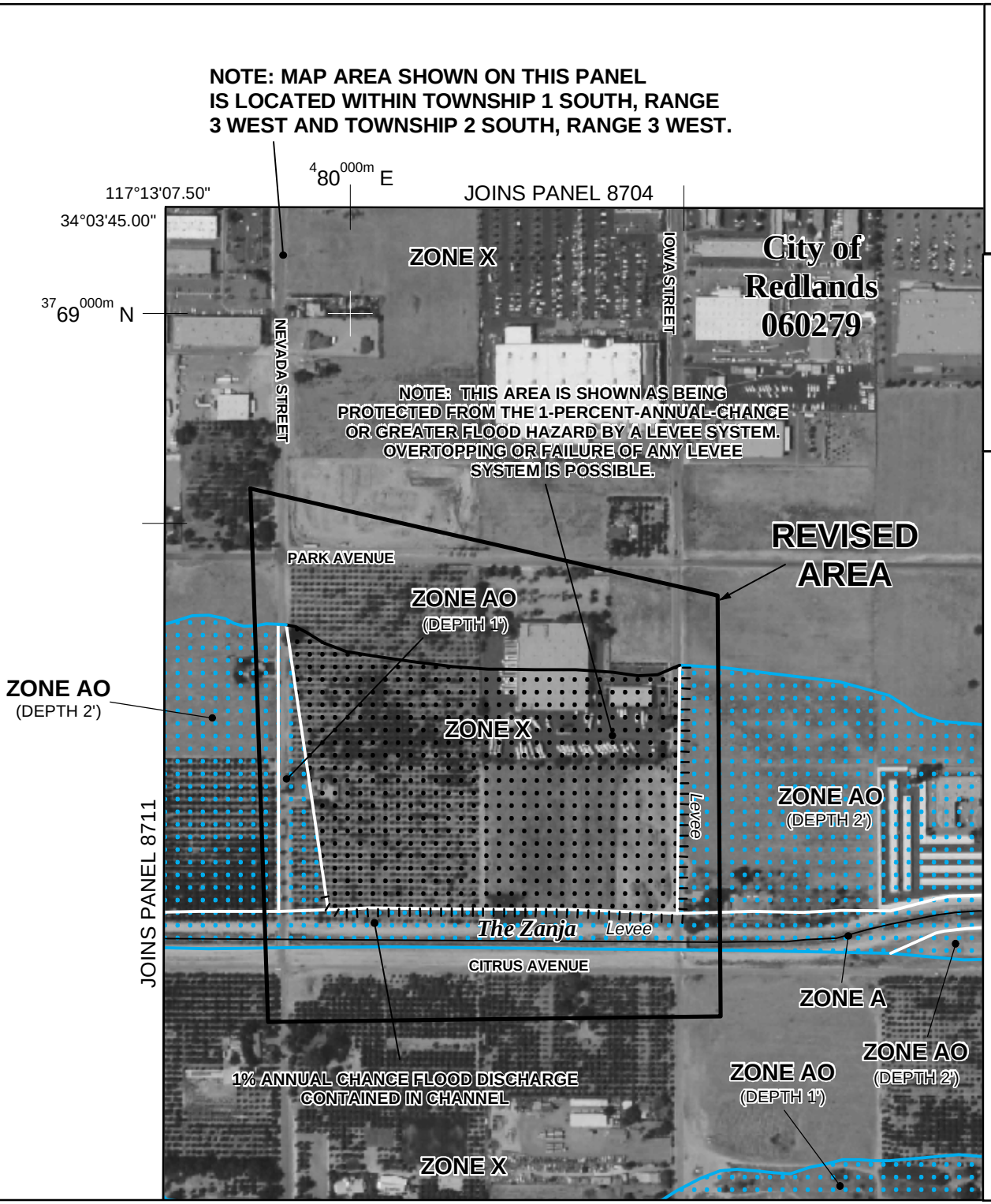
Engineering Management Branch
Mitigation Directorate



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 500'

250 0 500 FEET

150 0 150 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 8712H

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY,

CALIFORNIA

AND INCORPORATED AREAS

PANEL 8712 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN BERNARDINO COUNTY	060270	8712	H
REDLANDS, CITY OF	060279	8712	H

REVISED TO REFLECT LOMR EFFECTIVE: May 29, 2009

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
06071C8712H

MAP REVISED
AUGUST 28, 2008

Federal Emergency Management Agency

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 tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables 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 North. The **horizontal datum** was NAD 83, GRS80 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, Maryland 20910-3282
(301) 713-3242

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 digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency. This imagery was flown in 2005 and was produced with a 1-meter ground sample distance.

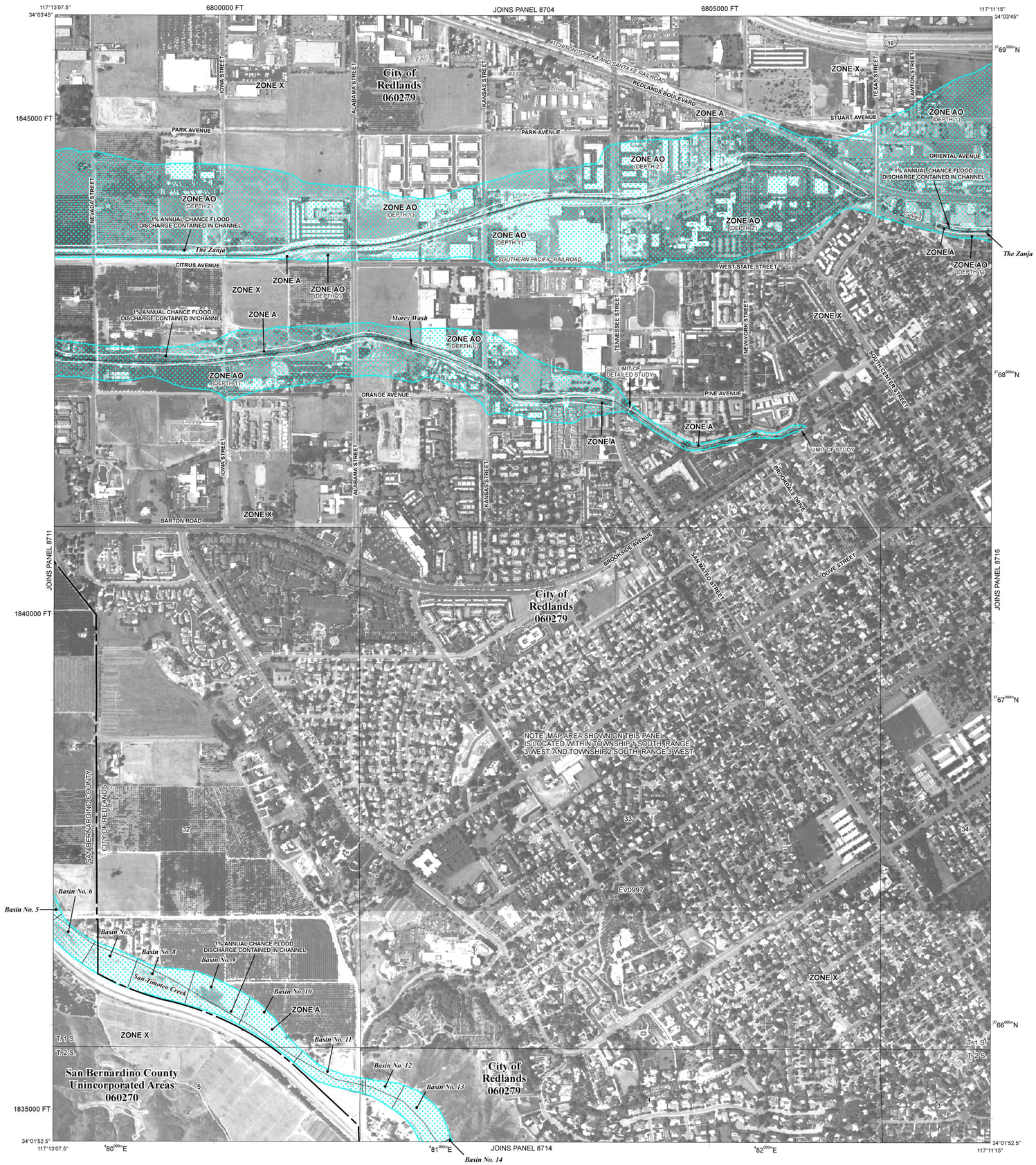
This map may reflect more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to confirm to these new stream channel configurations. As a result, 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://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 SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual 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 Area Zones and 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

- (A)–(A) — Cross section line
- (23)–(23) — Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 3776000mN — 1000-meter Universal Transverse Mercator grid values, zone 11N
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone V (FIPSZONE 0405), Lambert Conformal Conic projection
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- ●M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
March 18, 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 28, 2008 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 8712H

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 8712 OF 9400

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
REDLANDS, CITY OF	060279	8712	H
SAN BERNARDINO COUNTY	060270	8712	H

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 06071C8712H

MAP REVISED AUGUST 28, 2008

Federal Emergency Management Agency

APPENDIX C

10-YR & 100-YR AES ANALYSIS
EXISTING CONDITION
PROPOSED CONDITION

```
******************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                     160 South Old Springs Road, Suite 210
                              Anaheim, CA 92808
                                 714-685-6860

 ************************* DESCRIPTION OF STUDY *************************
* 21996                                                                 *
* Existing Condition                                                    *
* 10-year                                                               *
 ************************************************************************

  FILE NAME: 996E010.DAT
  TIME/DATE OF STUDY: 15:23 09/28/2021
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7150

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   831.00
  ELEVATION DATA: UPSTREAM(FEET) =   1223.00  DOWNSTREAM(FEET) =   1213.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   17.207
```

```
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.513
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 B        9.44      0.75      0.850    56   17.21
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      7.45
  TOTAL AREA(ACRES) =      9.44   PEAK FLOW RATE(CFS) =      7.45
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        9.4  TC(MIN.) =     17.21
  EFFECTIVE AREA(ACRES) =      9.44  AREA-AVERAGED Fm(INCH/HR)=  0.64
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =       7.45
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
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            Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

 ************************* DESCRIPTION OF STUDY *************************
* 21996                                                                 *
* Existing Condition                                                    *
* 100-year                                                              *
 ************************************************************************

  FILE NAME: 996E100.DAT
  TIME/DATE OF STUDY: 15:26 09/28/2021
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1200

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   831.00
  ELEVATION DATA: UPSTREAM(FEET) =   1223.00  DOWNSTREAM(FEET) =   1213.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   17.207
```

```
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.370
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 B        9.44      0.42      0.850    76   17.21
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =     17.07
  TOTAL AREA(ACRES) =      9.44   PEAK FLOW RATE(CFS) =     17.07
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        9.4  TC(MIN.) =     17.21
  EFFECTIVE AREA(ACRES) =      9.44  AREA-AVERAGED Fm(INCH/HR)=  0.36
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =      17.07
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                     160 South Old Springs Road, Suite 210
                              Anaheim, CA 92808
                                 714-685-6860

 ************************* DESCRIPTION OF STUDY *************************
* 21996                                                                 *
* Proposed Condition                                                    *
* 10-year                                                               *
 ************************************************************************

  FILE NAME: 996P010.DAT
  TIME/DATE OF STUDY: 08:22 09/29/2021
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.7150

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =   1221.00  DOWNSTREAM(FEET) =   1218.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.351
```

```
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.520
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
        LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        9.44      0.75      0.100    56    7.35
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     20.76
  TOTAL AREA(ACRES) =      9.44   PEAK FLOW RATE(CFS) =     20.76
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        9.4  TC(MIN.) =      7.35
  EFFECTIVE AREA(ACRES) =      9.44  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      20.76
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                           Analysis prepared by:

                           DRC Engineering, Inc.
                     160 South Old Springs Road, Suite 210
                              Anaheim, CA 92808
                                 714-685-6860

 ************************* DESCRIPTION OF STUDY *************************
* 21996                                                                 *
* Proposed Condition                                                    *
* 100-year                                                              *
 ************************************************************************

  FILE NAME: 996P100.DAT
  TIME/DATE OF STUDY: 08:22 09/29/2021
==============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.1200

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)   (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   285.00
  ELEVATION DATA: UPSTREAM(FEET) =   1221.00  DOWNSTREAM(FEET) =   1218.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.351
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.947
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        9.44      0.42      0.100    76    7.35
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     33.16
 TOTAL AREA(ACRES) =      9.44   PEAK FLOW RATE(CFS) =     33.16
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        9.4  TC(MIN.) =      7.35
 EFFECTIVE AREA(ACRES) =      9.44  AREA-AVERAGED Fm(INCH/HR)=  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =      33.16
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Existing Condition
  10-year
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     0.71 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         9.44      100.00            86.       0.272        0.105

    TOTAL AREA (Acres) =      9.44

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.272

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.895
==========================================================================
```

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******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==============================================================================
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Existing
  10-year
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    9.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.272
    LOW LOSS FRACTION = 0.895
    TIME OF CONCENTRATION(MIN.) = 17.21
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.49
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.71
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.23
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.73
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.13

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.49
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.97

******************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.22      0.0005      0.05  Q         .         .         .         .
  0.51      0.0016      0.05  Q         .         .         .         .
  0.80      0.0028      0.05  Q         .         .         .         .
  1.08      0.0041      0.05  Q         .         .         .         .
  1.37      0.0053      0.05  Q         .         .         .         .
  1.66      0.0065      0.05  Q         .         .         .         .
  1.95      0.0078      0.05  Q         .         .         .         .
  2.23      0.0090      0.05  Q         .         .         .         .
  2.52      0.0103      0.05  Q         .         .         .         .
  2.81      0.0116      0.05  Q         .         .         .         .
  3.09      0.0129      0.06  Q         .         .         .         .
  3.38      0.0142      0.06  Q         .         .         .         .
  3.67      0.0156      0.06  Q         .         .         .         .
  3.95      0.0169      0.06  Q         .         .         .         .
  4.24      0.0183      0.06  Q         .         .         .         .
  4.53      0.0197      0.06  Q         .         .         .         .
  4.81      0.0211      0.06  Q         .         .         .         .
```

5.10	0.0226	0.06	Q	.	.	.	.
5.39	0.0240	0.06	Q	.	.	.	.
5.67	0.0255	0.06	Q	.	.	.	.
5.96	0.0270	0.06	Q	.	.	.	.
6.25	0.0286	0.06	Q	.	.	.	.
6.53	0.0301	0.07	Q	.	.	.	.
6.82	0.0317	0.07	Q	.	.	.	.
7.11	0.0333	0.07	Q	.	.	.	.
7.39	0.0350	0.07	Q	.	.	.	.
7.68	0.0366	0.07	Q	.	.	.	.
7.97	0.0383	0.07	Q	.	.	.	.
8.26	0.0401	0.07	Q	.	.	.	.
8.54	0.0418	0.08	Q	.	.	.	.
8.83	0.0437	0.08	Q	.	.	.	.
9.12	0.0455	0.08	Q	.	.	.	.
9.40	0.0474	0.08	Q	.	.	.	.
9.69	0.0493	0.08	Q	.	.	.	.
9.98	0.0513	0.09	Q	.	.	.	.
10.26	0.0534	0.09	Q	.	.	.	.
10.55	0.0555	0.09	Q	.	.	.	.
10.84	0.0576	0.09	Q	.	.	.	.
11.12	0.0599	0.10	Q	.	.	.	.
11.41	0.0622	0.10	Q	.	.	.	.
11.70	0.0646	0.10	Q	.	.	.	.
11.98	0.0670	0.11	Q	.	.	.	.
12.27	0.0698	0.13	Q	.	.	.	.
12.56	0.0728	0.13	Q	.	.	.	.
12.84	0.0760	0.14	Q	.	.	.	.
13.13	0.0794	0.14	Q	.	.	.	.
13.42	0.0829	0.15	Q	.	.	.	.
13.71	0.0865	0.16	Q	.	.	.	.
13.99	0.0904	0.17	Q	.	.	.	.
14.28	0.0946	0.18	Q	.	.	.	.
14.57	0.0991	0.20	Q	.	.	.	.
14.85	0.1040	0.21	Q	.	.	.	.
15.14	0.1095	0.25	.Q	.	.	.	.
15.43	0.1164	0.33	.Q	.	.	.	.
15.71	0.1392	1.59	. Q	.	.	.	.
16.00	0.1874	2.47	. Q.	.	.	.	.
16.29	0.3173	8.49	.	.	.	. Q	.
16.57	0.4281	0.86	. Q	.	.	.	.
16.86	0.4410	0.23	Q	.	.	.	.
17.15	0.4460	0.19	Q	.	.	.	.
17.43	0.4502	0.16	Q	.	.	.	.
17.72	0.4539	0.15	Q	.	.	.	.
18.01	0.4572	0.13	Q	.	.	.	.
18.29	0.4601	0.11	Q	.	.	.	.
18.58	0.4626	0.10	Q	.	.	.	.
18.87	0.4649	0.09	Q	.	.	.	.
19.16	0.4670	0.09	Q	.	.	.	.
19.44	0.4691	0.08	Q	.	.	.	.
19.73	0.4710	0.08	Q	.	.	.	.
20.02	0.4729	0.08	Q	.	.	.	.
20.30	0.4747	0.07	Q	.	.	.	.
20.59	0.4764	0.07	Q	.	.	.	.
20.88	0.4780	0.07	Q	.	.	.	.
21.16	0.4796	0.07	Q	.	.	.	.
21.45	0.4811	0.06	Q	.	.	.	.
21.74	0.4826	0.06	Q	.	.	.	.
22.02	0.4840	0.06	Q	.	.	.	.
22.31	0.4854	0.06	Q	.	.	.	.
22.60	0.4868	0.06	Q	.	.	.	.
22.88	0.4881	0.06	Q	.	.	.	.
23.17	0.4894	0.05	Q	.	.	.	.
23.46	0.4907	0.05	Q	.	.	.	.

23.74	0.4919	0.05	Q	.	.	.	.
24.03	0.4931	0.05	Q	.	.	.	.
24.32	0.4937	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1445.6
10%	68.8
20%	34.4
30%	17.2
40%	17.2
50%	17.2
60%	17.2
70%	17.2
80%	17.2
90%	17.2

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Existing Condition
  100-year
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.12 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         9.44       100.00       86.(AMC II)     0.106       0.731

    TOTAL AREA (Acres) =      9.44

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.106

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.269
==========================================================================
```

```
******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Existing Condition
  100-Year
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    9.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.106
    LOW LOSS FRACTION = 0.269
    TIME OF CONCENTRATION(MIN.) = 17.21
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.77
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.12
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.91
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.66
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.79

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.61
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.16

******************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.22      0.0049      0.53  .Q        .         .         .         .
  0.51      0.0174      0.53  .Q        .         .         .         .
  0.80      0.0301      0.54  .Q        .         .         .         .
  1.08      0.0428      0.54  .Q        .         .         .         .
  1.37      0.0558      0.55  .Q        .         .         .         .
  1.66      0.0688      0.55  .Q        .         .         .         .
  1.95      0.0821      0.56  .Q        .         .         .         .
  2.23      0.0954      0.57  .Q        .         .         .         .
  2.52      0.1090      0.58  .Q        .         .         .         .
  2.81      0.1227      0.58  .Q        .         .         .         .
  3.09      0.1365      0.59  .Q        .         .         .         .
  3.38      0.1506      0.59  .Q        .         .         .         .
  3.67      0.1648      0.61  .Q        .         .         .         .
  3.95      0.1792      0.61  .Q        .         .         .         .
  4.24      0.1938      0.62  .Q        .         .         .         .
  4.53      0.2086      0.63  .Q        .         .         .         .
  4.81      0.2236      0.64  .Q        .         .         .         .
  5.10      0.2389      0.65  .Q        .         .         .         .
  5.39      0.2544      0.66  .Q        .         .         .         .
  5.67      0.2701      0.67  .Q        .         .         .         .
  5.96      0.2860      0.68  .Q        .         .         .         .
  6.25      0.3022      0.69  .Q        .         .         .         .
  6.53      0.3187      0.70  .Q        .         .         .         .
  6.82      0.3355      0.71  .Q        .         .         .         .
  7.11      0.3525      0.73  .Q        .         .         .         .
```

7.39	0.3699	0.74	.Q . . . .
7.68	0.3876	0.76	.Q . . . .
7.97	0.4056	0.77	.Q . . . .
8.26	0.4240	0.79	.Q . . . .
8.54	0.4428	0.80	.Q . . . .
8.83	0.4620	0.82	.Q . . . .
9.12	0.4817	0.83	.Q . . . .
9.40	0.5018	0.86	.Q . . . .
9.69	0.5223	0.88	.Q . . . .
9.98	0.5435	0.91	.Q . . . .
10.26	0.5651	0.92	.Q . . . .
10.55	0.5874	0.96	.Q . . . .
10.84	0.6104	0.98	.Q . . . .
11.12	0.6340	1.02	. Q . . . .
11.41	0.6584	1.04	. Q . . . .
11.70	0.6837	1.09	. Q . . . .
11.98	0.7099	1.12	. Q . . . .
12.27	0.7388	1.32	. Q . . . .
12.56	0.7706	1.36	. Q . . . .
12.84	0.8039	1.44	. Q . . . .
13.13	0.8386	1.49	. Q . . . .
13.42	0.8752	1.59	. Q . . . .
13.71	0.9136	1.65	. Q . . . .
13.99	0.9545	1.80	. Q . . . .
14.28	0.9984	1.90	. Q . . . .
14.57	1.0462	2.14	. Q . . . .
14.85	1.0986	2.28	. Q . . . .
15.14	1.1583	2.76	. Q . . . .
15.43	1.2284	3.16	. Q . . . .
15.71	1.3273	5.18	. Q . . . .
16.00	1.4671	6.61	. . Q . . .
16.29	1.7356	16.04	. . . . Q .
16.57	1.9732	4.01	. Q . . . .
16.86	2.0499	2.46	. Q . . . .
17.15	2.1029	2.02	. Q . . . .
17.43	2.1473	1.72	. Q . . . .
17.72	2.1859	1.54	. Q . . . .
18.01	2.2207	1.40	. Q . . . .
18.29	2.2510	1.15	. Q . . . .
18.58	2.2772	1.07	. Q . . . .
18.87	2.3017	1.00	.Q . . . .
19.16	2.3247	0.94	.Q . . . .
19.44	2.3464	0.89	.Q . . . .
19.73	2.3670	0.85	.Q . . . .
20.02	2.3866	0.81	.Q . . . .
20.30	2.4054	0.78	.Q . . . .
20.59	2.4234	0.75	.Q . . . .
20.88	2.4408	0.72	.Q . . . .
21.16	2.4576	0.70	.Q . . . .
21.45	2.4738	0.67	.Q . . . .
21.74	2.4895	0.65	.Q . . . .
22.02	2.5048	0.63	.Q . . . .
22.31	2.5196	0.62	.Q . . . .
22.60	2.5340	0.60	.Q . . . .
22.88	2.5480	0.58	.Q . . . .
23.17	2.5617	0.57	.Q . . . .
23.46	2.5751	0.56	.Q . . . .
23.74	2.5882	0.55	.Q . . . .
24.03	2.6010	0.53	.Q . . . .
24.32	2.6073	0.00	Q . . . .

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1445.6
10%	240.9
20%	68.8
30%	51.6

40%	34.4
50%	17.2
60%	17.2
70%	17.2
80%	17.2
90%	17.2

```
*****************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
=============================================================================
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                          Analysis prepared by:

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                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

*****************************************************************************
-----------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Proposed Condition
  10-year
=============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     0.71 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         9.44       10.00            56.       0.748        0.651

    TOTAL AREA (Acres) =      9.44

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.075

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.349
=============================================================================
```

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******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Proposed Condition
  10-year
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    9.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.075
    LOW LOSS FRACTION = 0.349
    TIME OF CONCENTRATION(MIN.) =  7.35
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.49
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.71
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.23
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.73
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.13

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.57
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.89

******************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
------------------------------------------------------------------------------
  0.08      0.0000      0.00  Q         .         .         .         .
  0.20      0.0016      0.31  Q         .         .         .         .
  0.32      0.0047      0.31  Q         .         .         .         .
  0.44      0.0079      0.31  Q         .         .         .         .
  0.57      0.0110      0.31  Q         .         .         .         .
  0.69      0.0142      0.32  Q         .         .         .         .
  0.81      0.0174      0.32  Q         .         .         .         .
  0.93      0.0206      0.32  Q         .         .         .         .
  1.06      0.0238      0.32  Q         .         .         .         .
  1.18      0.0271      0.32  Q         .         .         .         .
  1.30      0.0303      0.32  Q         .         .         .         .
  1.42      0.0336      0.32  Q         .         .         .         .
  1.55      0.0369      0.33  Q         .         .         .         .
  1.67      0.0402      0.33  Q         .         .         .         .
  1.79      0.0435      0.33  Q         .         .         .         .
  1.91      0.0469      0.33  Q         .         .         .         .
  2.04      0.0502      0.33  Q         .         .         .         .
```

2.16	0.0536	0.33	Q	.	.	.	.
2.28	0.0570	0.33	Q	.	.	.	.
2.40	0.0604	0.34	Q	.	.	.	.
2.53	0.0638	0.34	Q	.	.	.	.
2.65	0.0672	0.34	Q	.	.	.	.
2.77	0.0707	0.34	Q	.	.	.	.
2.89	0.0742	0.34	Q	.	.	.	.
3.02	0.0776	0.35	Q	.	.	.	.
3.14	0.0812	0.35	Q	.	.	.	.
3.26	0.0847	0.35	Q	.	.	.	.
3.38	0.0882	0.35	Q	.	.	.	.
3.51	0.0918	0.35	Q	.	.	.	.
3.63	0.0954	0.36	Q	.	.	.	.
3.75	0.0990	0.36	Q	.	.	.	.
3.87	0.1026	0.36	Q	.	.	.	.
4.00	0.1063	0.36	Q	.	.	.	.
4.12	0.1100	0.36	Q	.	.	.	.
4.24	0.1137	0.37	Q	.	.	.	.
4.36	0.1174	0.37	Q	.	.	.	.
4.49	0.1211	0.37	Q	.	.	.	.
4.61	0.1249	0.37	Q	.	.	.	.
4.73	0.1287	0.37	Q	.	.	.	.
4.85	0.1325	0.38	Q	.	.	.	.
4.97	0.1363	0.38	Q	.	.	.	.
5.10	0.1401	0.38	Q	.	.	.	.
5.22	0.1440	0.38	Q	.	.	.	.
5.34	0.1479	0.39	Q	.	.	.	.
5.46	0.1519	0.39	Q	.	.	.	.
5.59	0.1558	0.39	Q	.	.	.	.
5.71	0.1598	0.39	Q	.	.	.	.
5.83	0.1638	0.40	Q	.	.	.	.
5.96	0.1678	0.40	Q	.	.	.	.
6.08	0.1719	0.40	Q	.	.	.	.
6.20	0.1760	0.41	Q	.	.	.	.
6.32	0.1801	0.41	Q	.	.	.	.
6.45	0.1843	0.41	Q	.	.	.	.
6.57	0.1885	0.42	Q	.	.	.	.
6.69	0.1927	0.42	Q	.	.	.	.
6.81	0.1969	0.42	Q	.	.	.	.
6.93	0.2012	0.42	Q	.	.	.	.
7.06	0.2055	0.43	Q	.	.	.	.
7.18	0.2099	0.43	Q	.	.	.	.
7.30	0.2142	0.43	Q	.	.	.	.
7.43	0.2186	0.44	Q	.	.	.	.
7.55	0.2231	0.44	Q	.	.	.	.
7.67	0.2276	0.44	Q	.	.	.	.
7.79	0.2321	0.45	Q	.	.	.	.
7.91	0.2367	0.45	Q	.	.	.	.
8.04	0.2413	0.46	Q	.	.	.	.
8.16	0.2459	0.46	Q	.	.	.	.
8.28	0.2506	0.47	Q	.	.	.	.
8.41	0.2553	0.47	Q	.	.	.	.
8.53	0.2601	0.47	Q	.	.	.	.
8.65	0.2649	0.48	Q	.	.	.	.
8.77	0.2697	0.48	Q	.	.	.	.
8.90	0.2747	0.49	Q	.	.	.	.
9.02	0.2796	0.49	Q	.	.	.	.
9.14	0.2846	0.50	Q	.	.	.	.
9.26	0.2897	0.50	.Q	.	.	.	.
9.38	0.2948	0.51	.Q	.	.	.	.
9.51	0.2999	0.51	.Q	.	.	.	.
9.63	0.3051	0.52	.Q	.	.	.	.
9.75	0.3104	0.52	.Q	.	.	.	.
9.88	0.3157	0.53	.Q	.	.	.	.
10.00	0.3211	0.54	.Q	.	.	.	.

10.12	0.3266	0.54	.Q . . . .
10.24	0.3321	0.55	.Q . . . .
10.37	0.3377	0.55	.Q . . . .
10.49	0.3433	0.56	.Q . . . .
10.61	0.3490	0.57	.Q . . . .
10.73	0.3548	0.58	.Q . . . .
10.85	0.3607	0.58	.Q . . . .
10.98	0.3666	0.59	.Q . . . .
11.10	0.3727	0.60	.Q . . . .
11.22	0.3788	0.61	.Q . . . .
11.35	0.3850	0.62	.Q . . . .
11.47	0.3913	0.63	.Q . . . .
11.59	0.3977	0.63	.Q . . . .
11.71	0.4042	0.65	.Q . . . .
11.84	0.4108	0.66	.Q . . . .
11.96	0.4175	0.67	.Q . . . .
12.08	0.4243	0.68	.Q . . . .
12.20	0.4318	0.80	.Q . . . .
12.32	0.4399	0.81	.Q . . . .
12.45	0.4481	0.82	.Q . . . .
12.57	0.4565	0.83	.Q . . . .
12.69	0.4650	0.85	.Q . . . .
12.82	0.4737	0.86	.Q . . . .
12.94	0.4826	0.89	.Q . . . .
13.06	0.4916	0.90	.Q . . . .
13.18	0.5009	0.92	.Q . . . .
13.30	0.5103	0.94	.Q . . . .
13.43	0.5199	0.97	.Q . . . .
13.55	0.5298	0.98	.Q . . . .
13.67	0.5399	1.01	. Q . . . .
13.80	0.5502	1.03	. Q . . . .
13.92	0.5609	1.07	. Q . . . .
14.04	0.5718	1.09	. Q . . . .
14.16	0.5832	1.14	. Q . . . .
14.28	0.5949	1.17	. Q . . . .
14.41	0.6071	1.24	. Q . . . .
14.53	0.6199	1.29	. Q . . . .
14.65	0.6335	1.40	. Q . . . .
14.77	0.6480	1.46	. Q . . . .
14.90	0.6636	1.60	. Q . . . .
15.02	0.6802	1.69	. Q . . . .
15.14	0.6983	1.88	. Q . . . .
15.27	0.7180	2.00	. Q . . . .
15.39	0.7401	2.36	. Q . . . .
15.51	0.7664	2.84	. Q . . . .
15.63	0.7978	3.36	. Q . . . .
15.76	0.8336	3.72	. Q . . . .
15.88	0.8771	4.87	. Q. . . .
16.00	0.9344	6.45	. . Q . . .
16.12	1.0459	15.56	. . .Q .
16.25	1.1451	4.04	. Q . . . .
16.37	1.1811	3.07	. Q . . . .
16.49	1.2075	2.14	. Q . . . .
16.61	1.2273	1.78	. Q . . . .
16.73	1.2441	1.53	. Q . . . .
16.86	1.2586	1.34	. Q . . . .
16.98	1.2715	1.20	. Q . . . .
17.10	1.2833	1.12	. Q . . . .
17.23	1.2942	1.05	. Q . . . .
17.35	1.3046	1.00	.Q . . . .
17.47	1.3145	0.95	.Q . . . .
17.59	1.3239	0.91	.Q . . . .
17.72	1.3329	0.87	.Q . . . .
17.84	1.3416	0.84	.Q . . . .
17.96	1.3500	0.81	.Q . . . .

18.08	1.3581	0.79	.Q	.	.	.	.
18.20	1.3655	0.66	.Q	.	.	.	.
18.33	1.3721	0.64	.Q	.	.	.	.
18.45	1.3785	0.62	.Q	.	.	.	.
18.57	1.3847	0.60	.Q	.	.	.	.
18.69	1.3907	0.59	.Q	.	.	.	.
18.82	1.3966	0.57	.Q	.	.	.	.
18.94	1.4023	0.56	.Q	.	.	.	.
19.06	1.4079	0.54	.Q	.	.	.	.
19.18	1.4133	0.53	.Q	.	.	.	.
19.31	1.4186	0.52	.Q	.	.	.	.
19.43	1.4239	0.51	.Q	.	.	.	.
19.55	1.4290	0.50	Q	.	.	.	.
19.67	1.4340	0.49	Q	.	.	.	.
19.80	1.4389	0.48	Q	.	.	.	.
19.92	1.4437	0.47	Q	.	.	.	.
20.04	1.4484	0.46	Q	.	.	.	.
20.17	1.4530	0.45	Q	.	.	.	.
20.29	1.4576	0.45	Q	.	.	.	.
20.41	1.4621	0.44	Q	.	.	.	.
20.53	1.4665	0.43	Q	.	.	.	.
20.66	1.4708	0.43	Q	.	.	.	.
20.78	1.4751	0.42	Q	.	.	.	.
20.90	1.4793	0.41	Q	.	.	.	.
21.02	1.4835	0.41	Q	.	.	.	.
21.14	1.4876	0.40	Q	.	.	.	.
21.27	1.4916	0.40	Q	.	.	.	.
21.39	1.4956	0.39	Q	.	.	.	.
21.51	1.4995	0.39	Q	.	.	.	.
21.64	1.5034	0.38	Q	.	.	.	.
21.76	1.5072	0.38	Q	.	.	.	.
21.88	1.5110	0.37	Q	.	.	.	.
22.00	1.5148	0.37	Q	.	.	.	.
22.12	1.5185	0.36	Q	.	.	.	.
22.25	1.5221	0.36	Q	.	.	.	.
22.37	1.5257	0.35	Q	.	.	.	.
22.49	1.5293	0.35	Q	.	.	.	.
22.61	1.5328	0.35	Q	.	.	.	.
22.74	1.5363	0.34	Q	.	.	.	.
22.86	1.5398	0.34	Q	.	.	.	.
22.98	1.5432	0.34	Q	.	.	.	.
23.11	1.5466	0.33	Q	.	.	.	.
23.23	1.5499	0.33	Q	.	.	.	.
23.35	1.5533	0.33	Q	.	.	.	.
23.47	1.5565	0.32	Q	.	.	.	.
23.59	1.5598	0.32	Q	.	.	.	.
23.72	1.5630	0.32	Q	.	.	.	.
23.84	1.5662	0.31	Q	.	.	.	.
23.96	1.5694	0.31	Q	.	.	.	.
24.08	1.5725	0.31	Q	.	.	.	.
24.21	1.5741	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1440.6
10%	110.2
20%	44.1
30%	22.0
40%	14.7

50%	7.3
60%	7.3
70%	7.3
80%	7.3
90%	7.3

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Proposed Condition
  100-year
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.12 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1         9.44       10.00       56.(AMC II)     0.423       0.735

    TOTAL AREA (Acres) =      9.44

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.042

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.265
==========================================================================
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******************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==============================================================================
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             Ver. 22.0  Release Date: 07/01/2015  License ID 1510

                          Analysis prepared by:

                          DRC Engineering, Inc.
                    160 South Old Springs Road, Suite 210
                             Anaheim, CA 92808
                                714-685-6860

******************************************************************************
------------------------------------------------------------------------------

 Problem Descriptions:
  21996
  Proposed Condition
  100-year
------------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    9.44
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.042
    LOW LOSS FRACTION = 0.265
    TIME OF CONCENTRATION(MIN.) =  7.35
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.77
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.12
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.91
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.66
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.79

------------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.79
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.97

******************************************************************************
  TIME      VOLUME       Q    0.        7.5      15.0      22.5      30.0
 (HOURS)     (AF)      (CFS)
------------------------------------------------------------------------------
  0.08      0.0000      0.00  Q         .         .         .         .
  0.20      0.0027      0.53  Q         .         .         .         .
  0.32      0.0081      0.53  Q         .         .         .         .
  0.44      0.0135      0.54  Q         .         .         .         .
  0.57      0.0189      0.54  Q         .         .         .         .
  0.69      0.0244      0.54  Q         .         .         .         .
  0.81      0.0298      0.54  Q         .         .         .         .
  0.93      0.0353      0.55  Q         .         .         .         .
  1.06      0.0409      0.55  Q         .         .         .         .
  1.18      0.0464      0.55  Q         .         .         .         .
  1.30      0.0520      0.55  Q         .         .         .         .
  1.42      0.0576      0.56  Q         .         .         .         .
  1.55      0.0633      0.56  Q         .         .         .         .
  1.67      0.0689      0.56  Q         .         .         .         .
  1.79      0.0746      0.56  Q         .         .         .         .
  1.91      0.0803      0.57  Q         .         .         .         .
  2.04      0.0861      0.57  Q         .         .         .         .
```

2.16	0.0919	0.57	Q	.	.	.	.
2.28	0.0977	0.57	Q	.	.	.	.
2.40	0.1035	0.58	Q	.	.	.	.
2.53	0.1094	0.58	Q	.	.	.	.
2.65	0.1153	0.58	Q	.	.	.	.
2.77	0.1212	0.59	Q	.	.	.	.
2.89	0.1271	0.59	Q	.	.	.	.
3.02	0.1331	0.59	Q	.	.	.	.
3.14	0.1392	0.60	Q	.	.	.	.
3.26	0.1452	0.60	Q	.	.	.	.
3.38	0.1513	0.60	Q	.	.	.	.
3.51	0.1574	0.61	Q	.	.	.	.
3.63	0.1636	0.61	Q	.	.	.	.
3.75	0.1698	0.61	Q	.	.	.	.
3.87	0.1760	0.62	Q	.	.	.	.
4.00	0.1823	0.62	Q	.	.	.	.
4.12	0.1886	0.62	Q	.	.	.	.
4.24	0.1949	0.63	Q	.	.	.	.
4.36	0.2013	0.63	Q	.	.	.	.
4.49	0.2077	0.63	Q	.	.	.	.
4.61	0.2142	0.64	Q	.	.	.	.
4.73	0.2207	0.64	Q	.	.	.	.
4.85	0.2272	0.65	Q	.	.	.	.
4.97	0.2338	0.65	Q	.	.	.	.
5.10	0.2404	0.66	Q	.	.	.	.
5.22	0.2470	0.66	Q	.	.	.	.
5.34	0.2537	0.66	Q	.	.	.	.
5.46	0.2605	0.67	Q	.	.	.	.
5.59	0.2673	0.67	Q	.	.	.	.
5.71	0.2741	0.68	Q	.	.	.	.
5.83	0.2810	0.68	Q	.	.	.	.
5.96	0.2879	0.69	Q	.	.	.	.
6.08	0.2949	0.69	Q	.	.	.	.
6.20	0.3019	0.70	Q	.	.	.	.
6.32	0.3090	0.70	Q	.	.	.	.
6.45	0.3161	0.71	Q	.	.	.	.
6.57	0.3233	0.71	Q	.	.	.	.
6.69	0.3306	0.72	Q	.	.	.	.
6.81	0.3378	0.72	Q	.	.	.	.
6.93	0.3452	0.73	Q	.	.	.	.
7.06	0.3526	0.73	Q	.	.	.	.
7.18	0.3601	0.74	Q	.	.	.	.
7.30	0.3676	0.75	Q	.	.	.	.
7.43	0.3752	0.75	.Q	.	.	.	.
7.55	0.3828	0.76	.Q	.	.	.	.
7.67	0.3905	0.76	.Q	.	.	.	.
7.79	0.3983	0.77	.Q	.	.	.	.
7.91	0.4061	0.78	.Q	.	.	.	.
8.04	0.4140	0.79	.Q	.	.	.	.
8.16	0.4220	0.79	.Q	.	.	.	.
8.28	0.4300	0.80	.Q	.	.	.	.
8.41	0.4381	0.80	.Q	.	.	.	.
8.53	0.4463	0.81	.Q	.	.	.	.
8.65	0.4546	0.82	.Q	.	.	.	.
8.77	0.4630	0.83	.Q	.	.	.	.
8.90	0.4714	0.84	.Q	.	.	.	.
9.02	0.4799	0.85	.Q	.	.	.	.
9.14	0.4885	0.85	.Q	.	.	.	.
9.26	0.4972	0.86	.Q	.	.	.	.
9.38	0.5059	0.87	.Q	.	.	.	.
9.51	0.5148	0.88	.Q	.	.	.	.
9.63	0.5238	0.89	.Q	.	.	.	.
9.75	0.5328	0.90	.Q	.	.	.	.
9.88	0.5420	0.91	.Q	.	.	.	.
10.00	0.5513	0.92	.Q	.	.	.	.

10.12	0.5606	0.93	.Q . . . .
10.24	0.5701	0.94	.Q . . . .
10.37	0.5797	0.95	.Q . . . .
10.49	0.5894	0.97	.Q . . . .
10.61	0.5993	0.98	.Q . . . .
10.73	0.6092	0.99	.Q . . . .
10.85	0.6194	1.01	.Q . . . .
10.98	0.6297	1.03	.Q . . . .
11.10	0.6402	1.04	.Q . . . .
11.22	0.6509	1.07	.Q . . . .
11.35	0.6618	1.09	.Q . . . .
11.47	0.6730	1.11	.Q . . . .
11.59	0.6843	1.13	.Q . . . .
11.71	0.6959	1.16	.Q . . . .
11.84	0.7078	1.18	.Q . . . .
11.96	0.7199	1.21	.Q . . . .
12.08	0.7322	1.23	.Q . . . .
12.20	0.7459	1.47	.Q . . . .
12.32	0.7609	1.49	.Q . . . .
12.45	0.7762	1.53	. Q . . . .
12.57	0.7919	1.56	. Q . . . .
12.69	0.8079	1.60	. Q . . . .
12.82	0.8243	1.63	. Q . . . .
12.94	0.8410	1.68	. Q . . . .
13.06	0.8582	1.71	. Q . . . .
13.18	0.8759	1.77	. Q . . . .
13.30	0.8940	1.80	. Q . . . .
13.43	0.9126	1.87	. Q . . . .
13.55	0.9317	1.91	. Q . . . .
13.67	0.9514	1.99	. Q . . . .
13.80	0.9718	2.03	. Q . . . .
13.92	0.9928	2.12	. Q . . . .
14.04	1.0145	2.17	. Q . . . .
14.16	1.0373	2.33	. Q . . . .
14.28	1.0612	2.39	. Q . . . .
14.41	1.0860	2.52	. Q . . . .
14.53	1.1119	2.60	. Q . . . .
14.65	1.1391	2.77	. Q . . . .
14.77	1.1676	2.86	. Q . . . .
14.90	1.1976	3.08	. Q . . . .
15.02	1.2295	3.21	. Q . . . .
15.14	1.2636	3.52	. Q . . . .
15.27	1.3001	3.70	. Q . . . .
15.39	1.3405	4.27	. Q . . . .
15.51	1.3877	5.06	. Q . . . .
15.63	1.4431	5.88	. Q . . . .
15.76	1.5055	6.45	. Q . . . .
15.88	1.5802	8.31	. Q . . . .
16.00	1.6768	10.78	. Q . . . .
16.12	1.8580	25.02	. Q . . . .
16.25	2.0202	7.01	. Q . . . .
16.37	2.0831	5.42	. Q . . . .
16.49	2.1304	3.92	. Q . . . .
16.61	2.1672	3.36	. Q . . . .
16.73	2.1992	2.97	. Q . . . .
16.86	2.2278	2.68	. Q . . . .
16.98	2.2538	2.45	. Q . . . .
17.10	2.2776	2.25	. Q . . . .
17.23	2.2994	2.08	. Q . . . .
17.35	2.3198	1.95	. Q . . . .
17.47	2.3389	1.84	. Q . . . .
17.59	2.3571	1.74	. Q . . . .
17.72	2.3743	1.66	. Q . . . .
17.84	2.3906	1.58	. Q . . . .
17.96	2.4063	1.51	. Q . . . .

18.08	2.4213	1.45	.Q	.	.	.	.
18.20	2.4347	1.20	.Q	.	.	.	.
18.33	2.4465	1.15	.Q	.	.	.	.
18.45	2.4579	1.10	.Q	.	.	.	.
18.57	2.4688	1.06	.Q	.	.	.	.
18.69	2.4793	1.02	.Q	.	.	.	.
18.82	2.4895	0.98	.Q	.	.	.	.
18.94	2.4993	0.96	.Q	.	.	.	.
19.06	2.5089	0.94	.Q	.	.	.	.
19.18	2.5183	0.92	.Q	.	.	.	.
19.31	2.5274	0.89	.Q	.	.	.	.
19.43	2.5364	0.88	.Q	.	.	.	.
19.55	2.5452	0.86	.Q	.	.	.	.
19.67	2.5538	0.84	.Q	.	.	.	.
19.80	2.5622	0.82	.Q	.	.	.	.
19.92	2.5705	0.81	.Q	.	.	.	.
20.04	2.5786	0.79	.Q	.	.	.	.
20.17	2.5866	0.78	.Q	.	.	.	.
20.29	2.5944	0.77	.Q	.	.	.	.
20.41	2.6021	0.75	.Q	.	.	.	.
20.53	2.6097	0.74	Q	.	.	.	.
20.66	2.6171	0.73	Q	.	.	.	.
20.78	2.6245	0.72	Q	.	.	.	.
20.90	2.6317	0.71	Q	.	.	.	.
21.02	2.6388	0.70	Q	.	.	.	.
21.14	2.6459	0.69	Q	.	.	.	.
21.27	2.6528	0.68	Q	.	.	.	.
21.39	2.6596	0.67	Q	.	.	.	.
21.51	2.6664	0.66	Q	.	.	.	.
21.64	2.6731	0.65	Q	.	.	.	.
21.76	2.6796	0.65	Q	.	.	.	.
21.88	2.6861	0.64	Q	.	.	.	.
22.00	2.6925	0.63	Q	.	.	.	.
22.12	2.6989	0.62	Q	.	.	.	.
22.25	2.7051	0.62	Q	.	.	.	.
22.37	2.7113	0.61	Q	.	.	.	.
22.49	2.7175	0.60	Q	.	.	.	.
22.61	2.7235	0.59	Q	.	.	.	.
22.74	2.7295	0.59	Q	.	.	.	.
22.86	2.7354	0.58	Q	.	.	.	.
22.98	2.7413	0.58	Q	.	.	.	.
23.11	2.7471	0.57	Q	.	.	.	.
23.23	2.7528	0.56	Q	.	.	.	.
23.35	2.7585	0.56	Q	.	.	.	.
23.47	2.7642	0.55	Q	.	.	.	.
23.59	2.7698	0.55	Q	.	.	.	.
23.72	2.7753	0.54	Q	.	.	.	.
23.84	2.7808	0.54	Q	.	.	.	.
23.96	2.7862	0.53	Q	.	.	.	.
24.08	2.7916	0.53	Q	.	.	.	.
24.21	2.7943	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1440.6
10%	154.3
20%	58.8
30%	22.0
40%	14.7

50%	7.3
60%	7.3
70%	7.3
80%	7.3
90%	7.3

APPENDIX D

HYDRAFLOW HYDROGRAPHS ANALYSIS

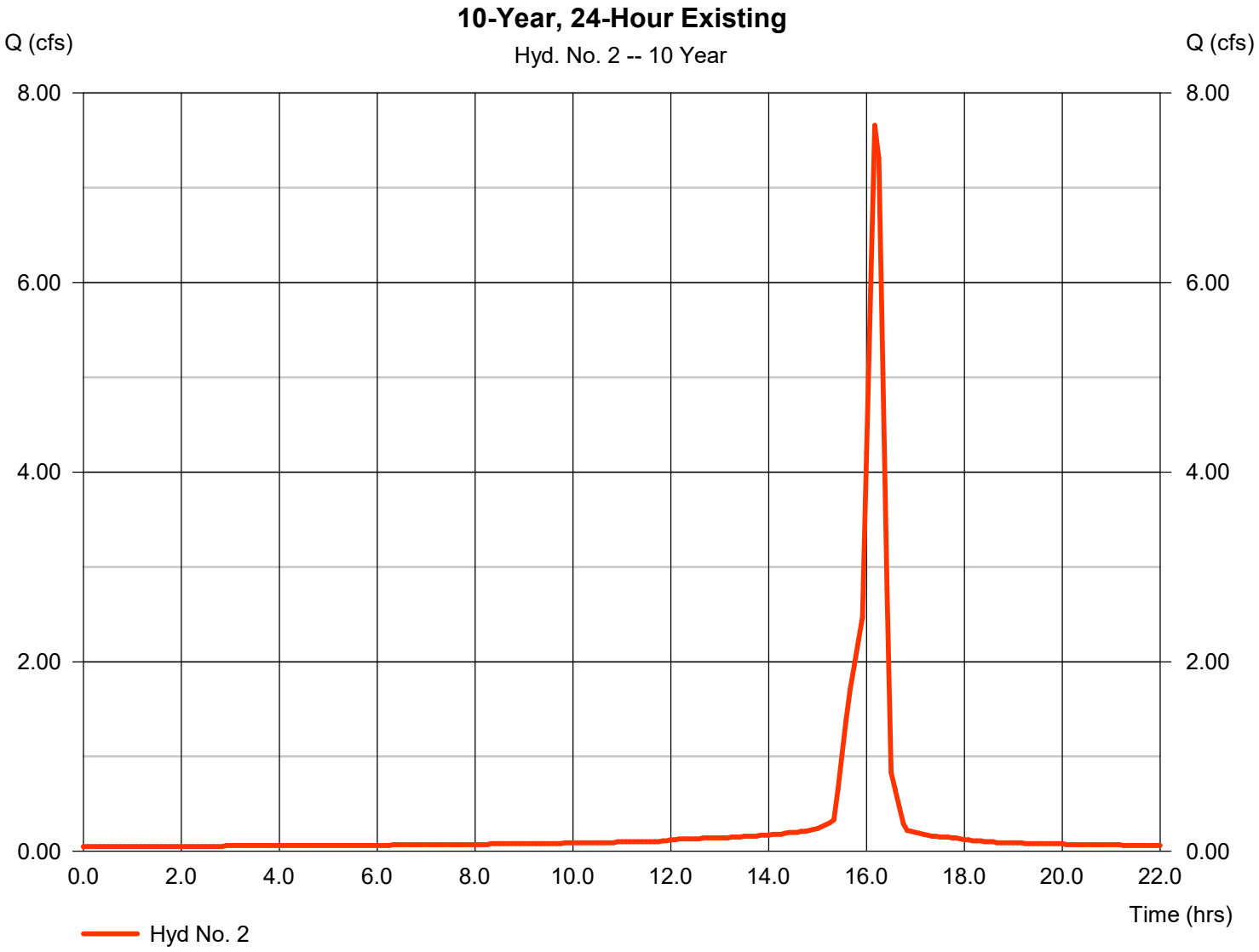
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Monday, 10 / 4 / 2021

Hyd. No. 2

10-Year, 24-Hour Existing

Hydrograph type	= Manual	Peak discharge	= 7.660 cfs
Storm frequency	= 10 yrs	Time to peak	= 16.17 hrs
Time interval	= 5 min	Hyd. volume	= 21,351 cuft

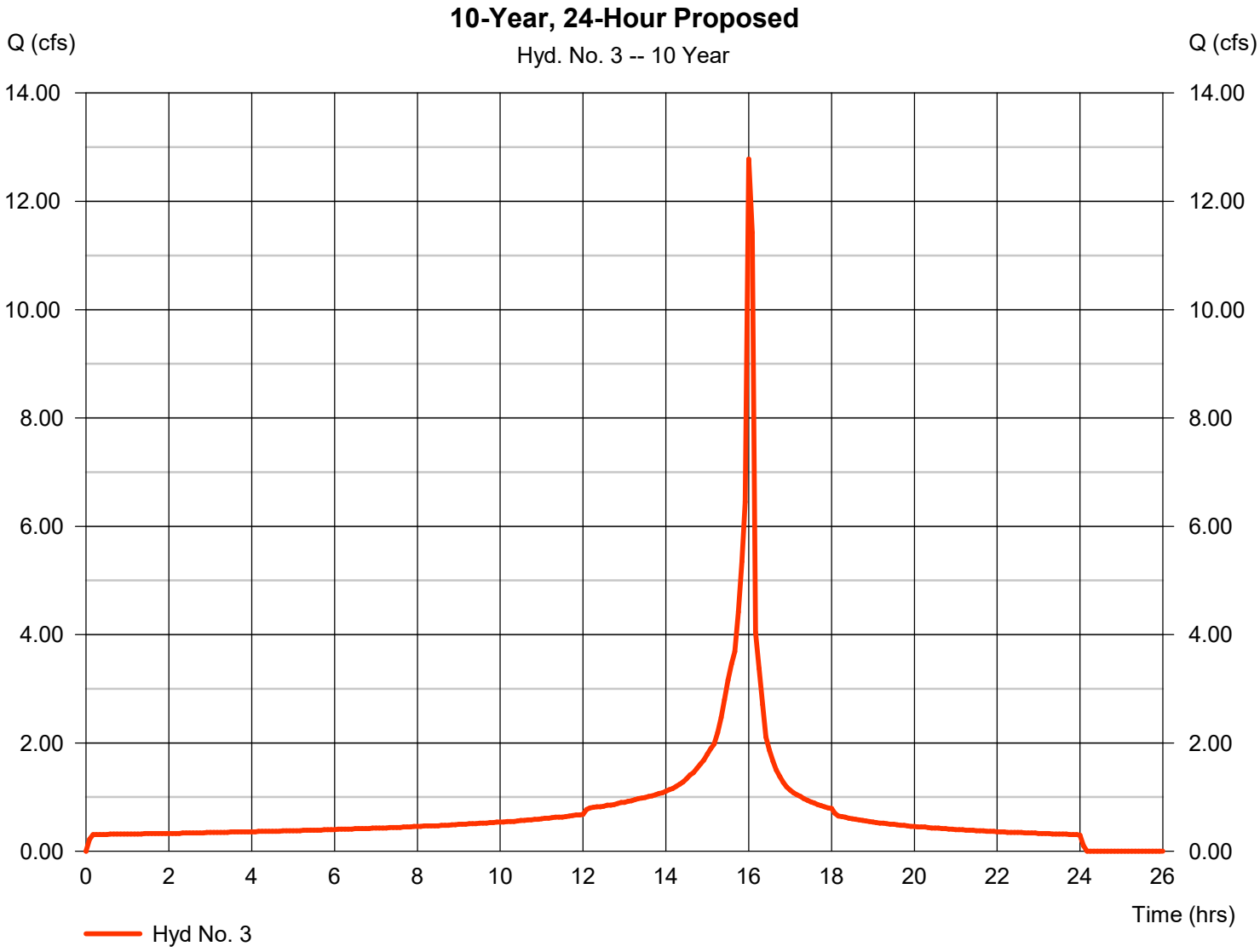


Hydrograph Report

Hyd. No. 3

10-Year, 24-Hour Proposed

Hydrograph type	= Manual	Peak discharge	= 12.78 cfs
Storm frequency	= 10 yrs	Time to peak	= 16.00 hrs
Time interval	= 5 min	Hyd. volume	= 68,133 cuft



Hydrograph Report

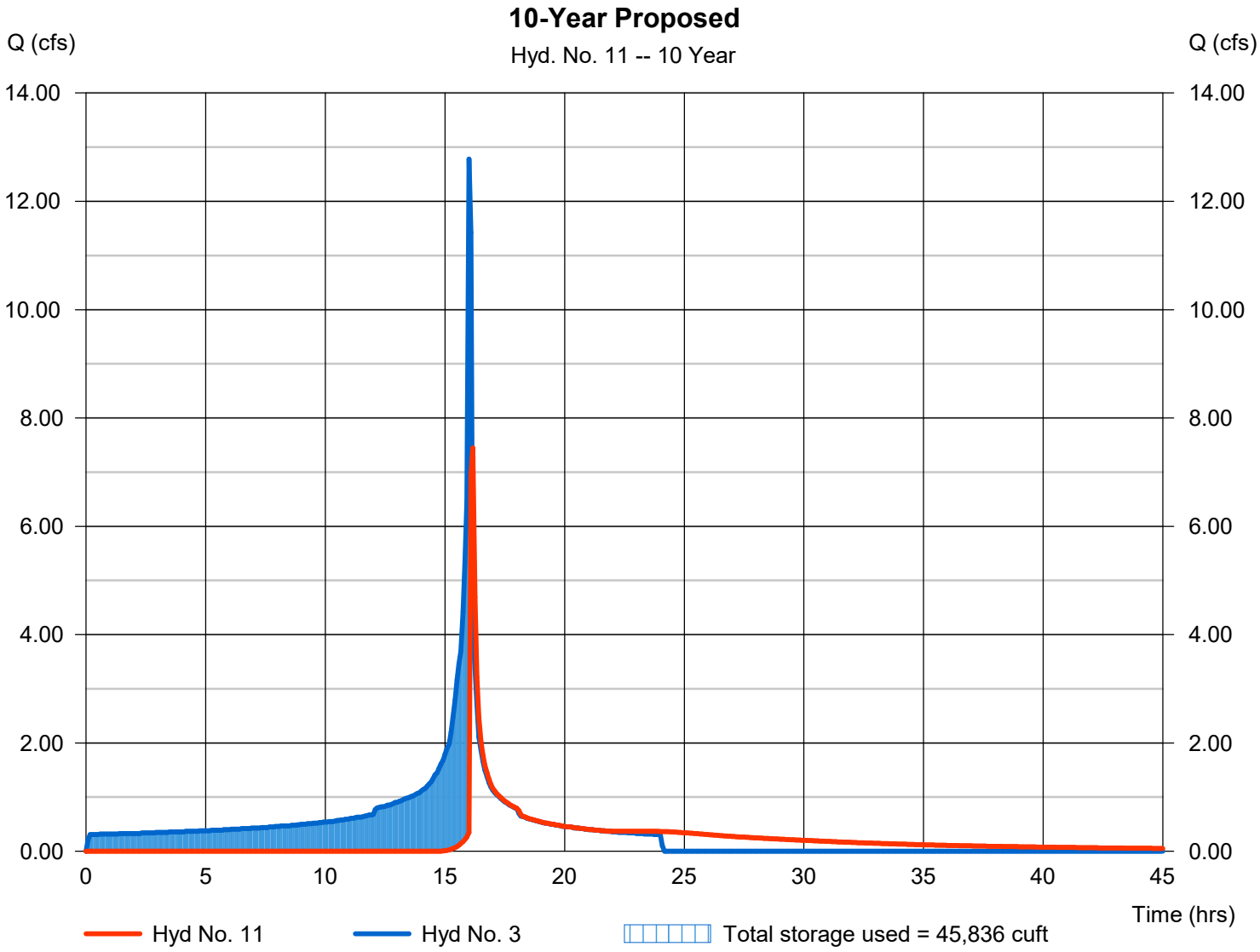
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Monday, 10 / 4 / 2021

Hyd. No. 11

10-Year Proposed

Hydrograph type	=	Reservoir	Peak discharge	=	7.446 cfs
Storm frequency	=	10 yrs	Time to peak	=	16.17 hrs
Time interval	=	5 min	Hyd. volume	=	39,335 cuft
Inflow hyd. No.	=	3 - 10-Year, 24-Hour Proposed	Max. Elevation	=	1214.50 ft
Reservoir name	=	SC-740 Chambers	Max. Storage	=	45,836 cuft

Storage Indication method used.



Pond Report

Pond No. 7 - SC-740 Chambers

Pond Data

UG Chambers -Invert elev. = 1212.15 ft, Rise x Span = 2.05 x 2.05 ft, Barrel Len = 71.20 ft, No. Barrels = 87, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 1211.65 ft, Width = 4.75 ft, Height = 3.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1211.65	n/a	0	0
0.35	1212.00	n/a	4,120	4,120
0.70	1212.35	n/a	4,736	8,857
1.05	1212.70	n/a	6,153	15,010
1.40	1213.05	n/a	6,659	21,668
1.75	1213.40	n/a	6,770	28,439
2.10	1213.75	n/a	6,557	34,996
2.45	1214.10	n/a	5,894	40,890
2.80	1214.45	n/a	4,341	45,231
3.15	1214.80	n/a	4,120	49,351
3.50	1215.15	n/a	4,120	53,471

Culvert / Orifice Structures

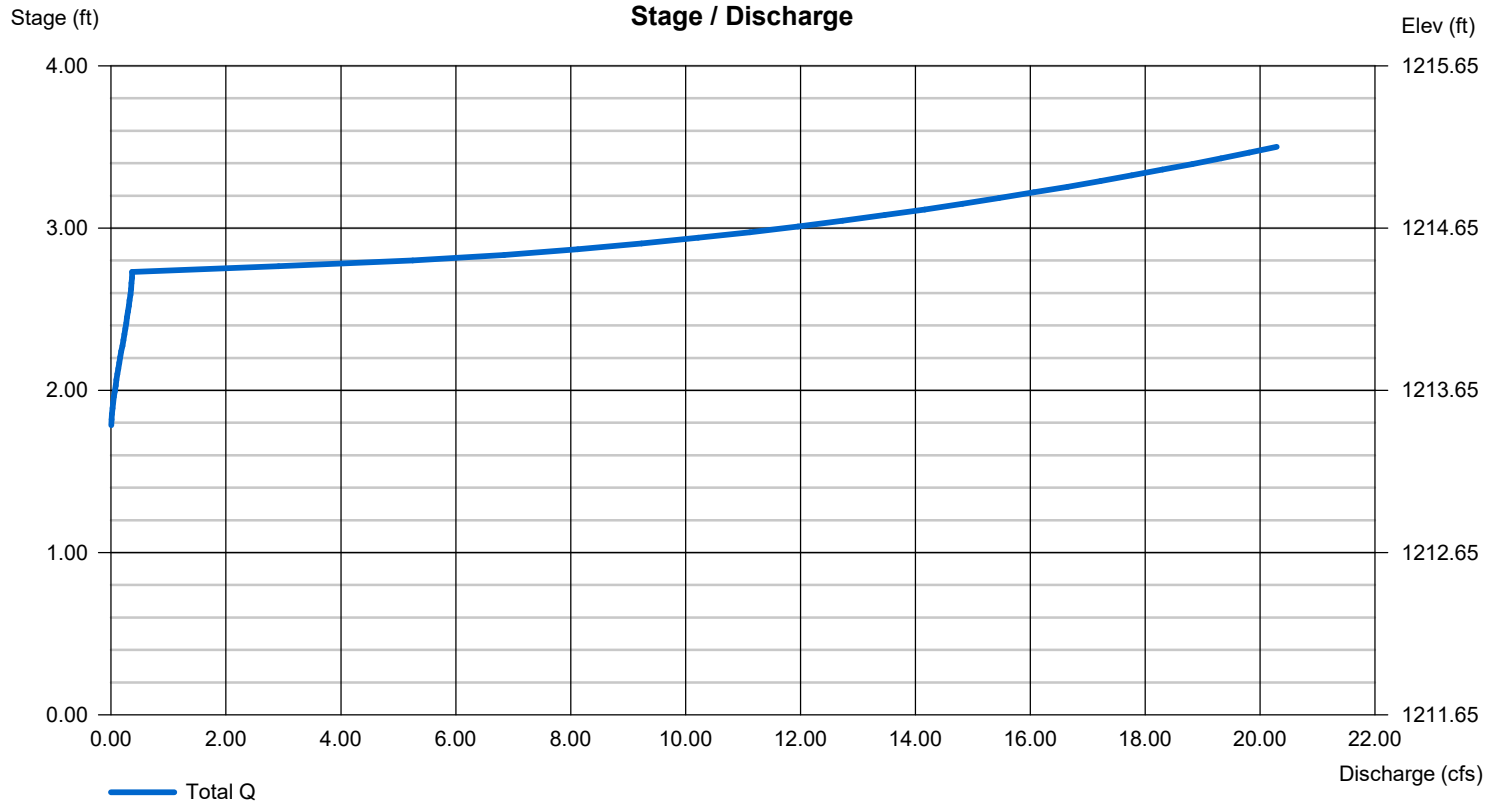
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 5	0	0	0
Invert El. (ft)	= 1213.40	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

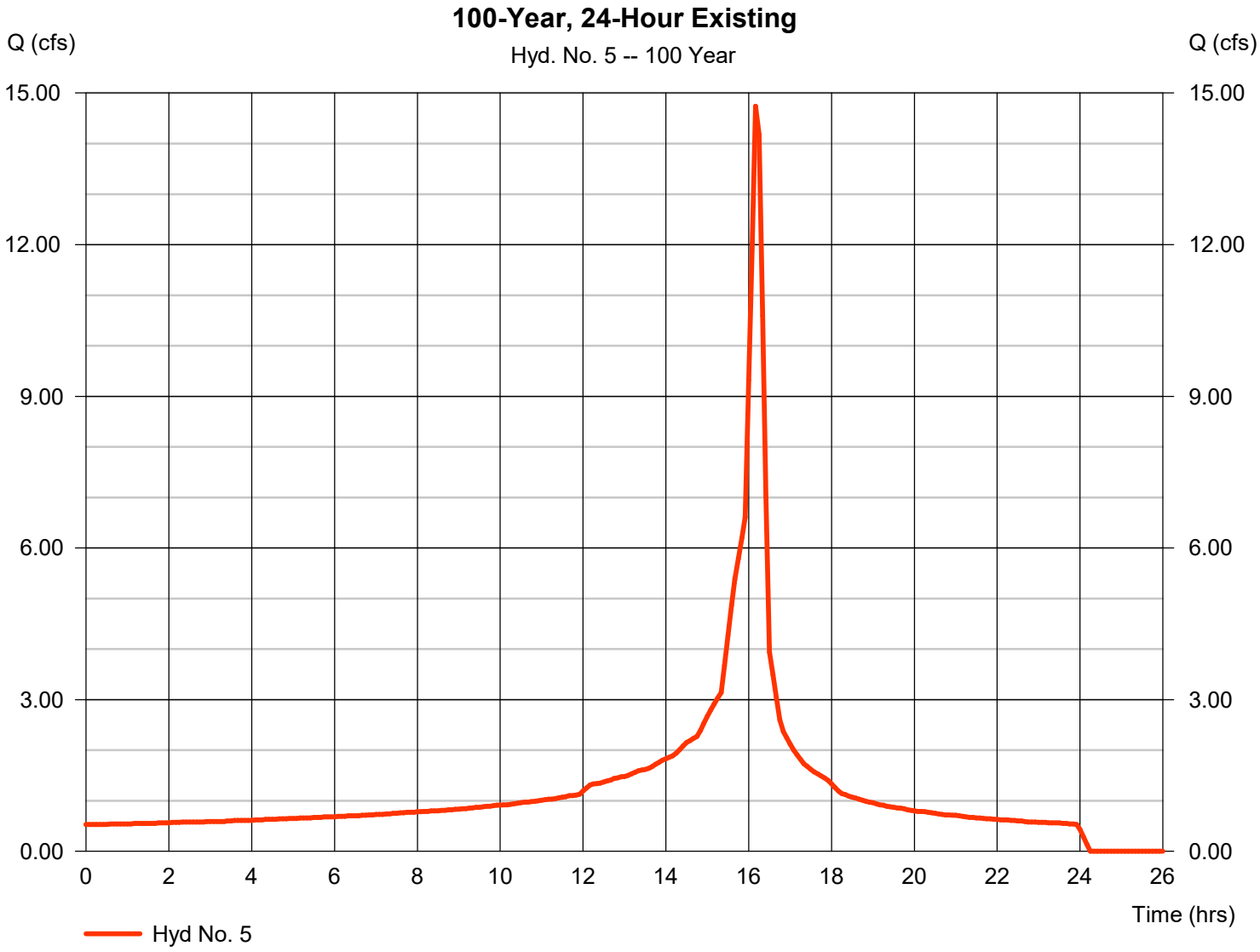


Hydrograph Report

Hyd. No. 5

100-Year, 24-Hour Existing

Hydrograph type	= Manual	Peak discharge	= 14.74 cfs
Storm frequency	= 100 yrs	Time to peak	= 16.17 hrs
Time interval	= 5 min	Hyd. volume	= 113,514 cuft

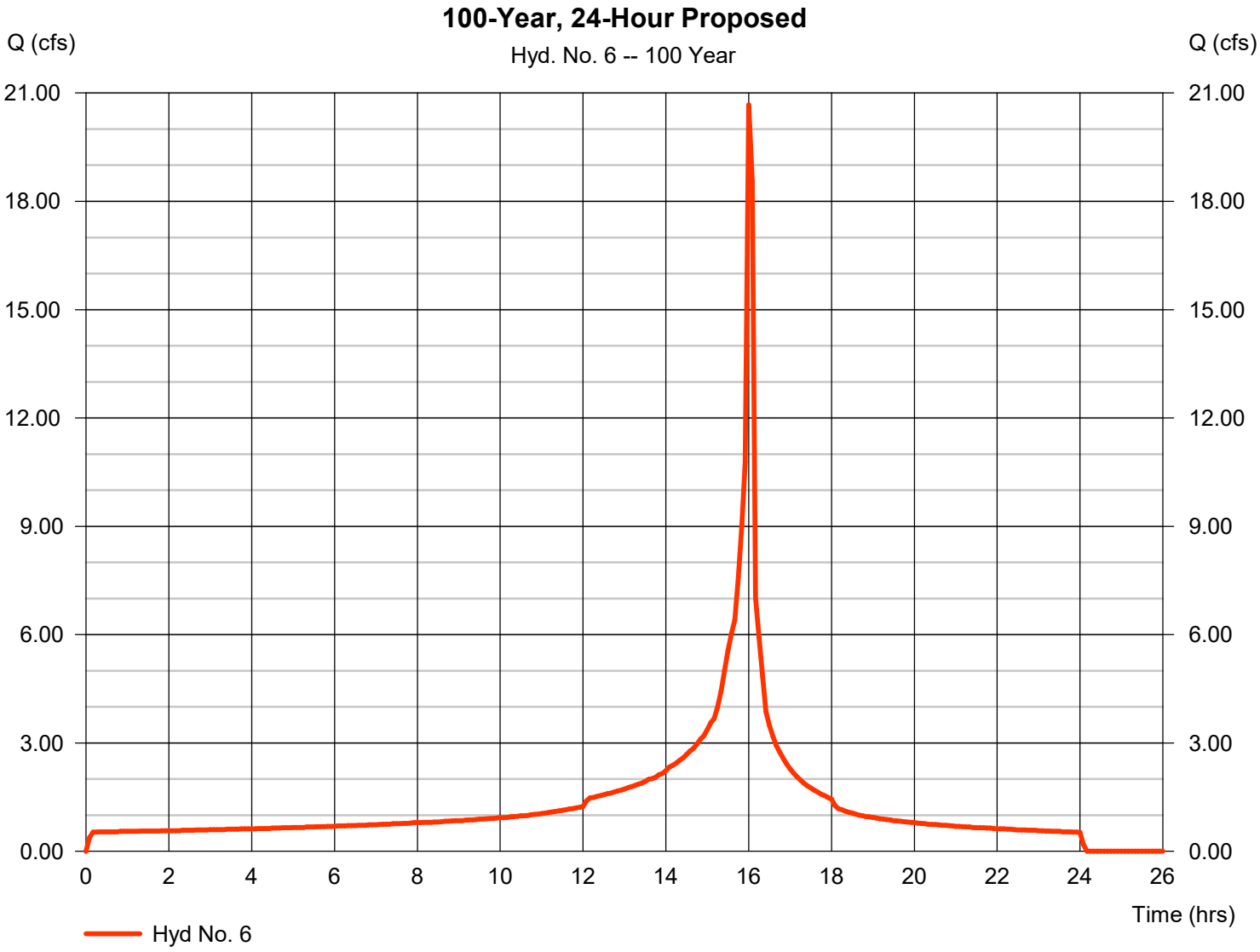


Hydrograph Report

Hyd. No. 6

100-Year, 24-Hour Proposed

Hydrograph type	= Manual	Peak discharge	= 20.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 16.00 hrs
Time interval	= 5 min	Hyd. volume	= 121,089 cuft



Hydrograph Report

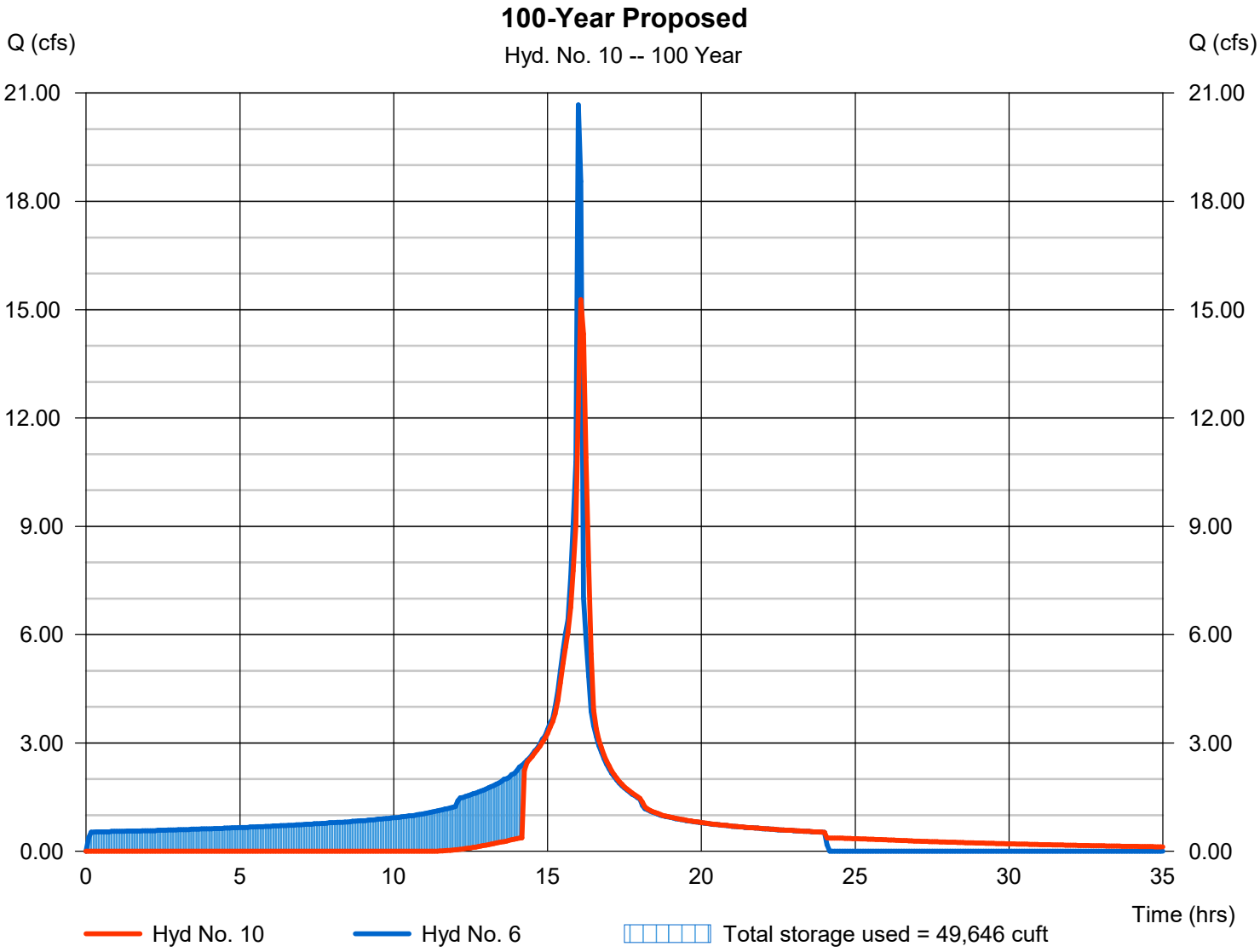
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Monday, 10 / 4 / 2021

Hyd. No. 10

100-Year Proposed

Hydrograph type	=	Reservoir	Peak discharge	=	15.27 cfs
Storm frequency	=	100 yrs	Time to peak	=	16.08 hrs
Time interval	=	5 min	Hyd. volume	=	92,291 cuft
Inflow hyd. No.	=	6 - 100-Year, 24-Hour Proposed	Max. Elevation	=	1214.83 ft
Reservoir name	=	SC-740 Chambers	Max. Storage	=	49,646 cuft

Storage Indication method used.



Pond Report

Pond No. 7 - SC-740 Chambers

Pond Data

UG Chambers -Invert elev. = 1212.15 ft, Rise x Span = 2.05 x 2.05 ft, Barrel Len = 71.20 ft, No. Barrels = 87, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 1211.65 ft, Width = 4.75 ft, Height = 3.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1211.65	n/a	0	0
0.35	1212.00	n/a	4,120	4,120
0.70	1212.35	n/a	4,736	8,857
1.05	1212.70	n/a	6,153	15,010
1.40	1213.05	n/a	6,659	21,668
1.75	1213.40	n/a	6,770	28,439
2.10	1213.75	n/a	6,557	34,996
2.45	1214.10	n/a	5,894	40,890
2.80	1214.45	n/a	4,341	45,231
3.15	1214.80	n/a	4,120	49,351
3.50	1215.15	n/a	4,120	53,471

Culvert / Orifice Structures

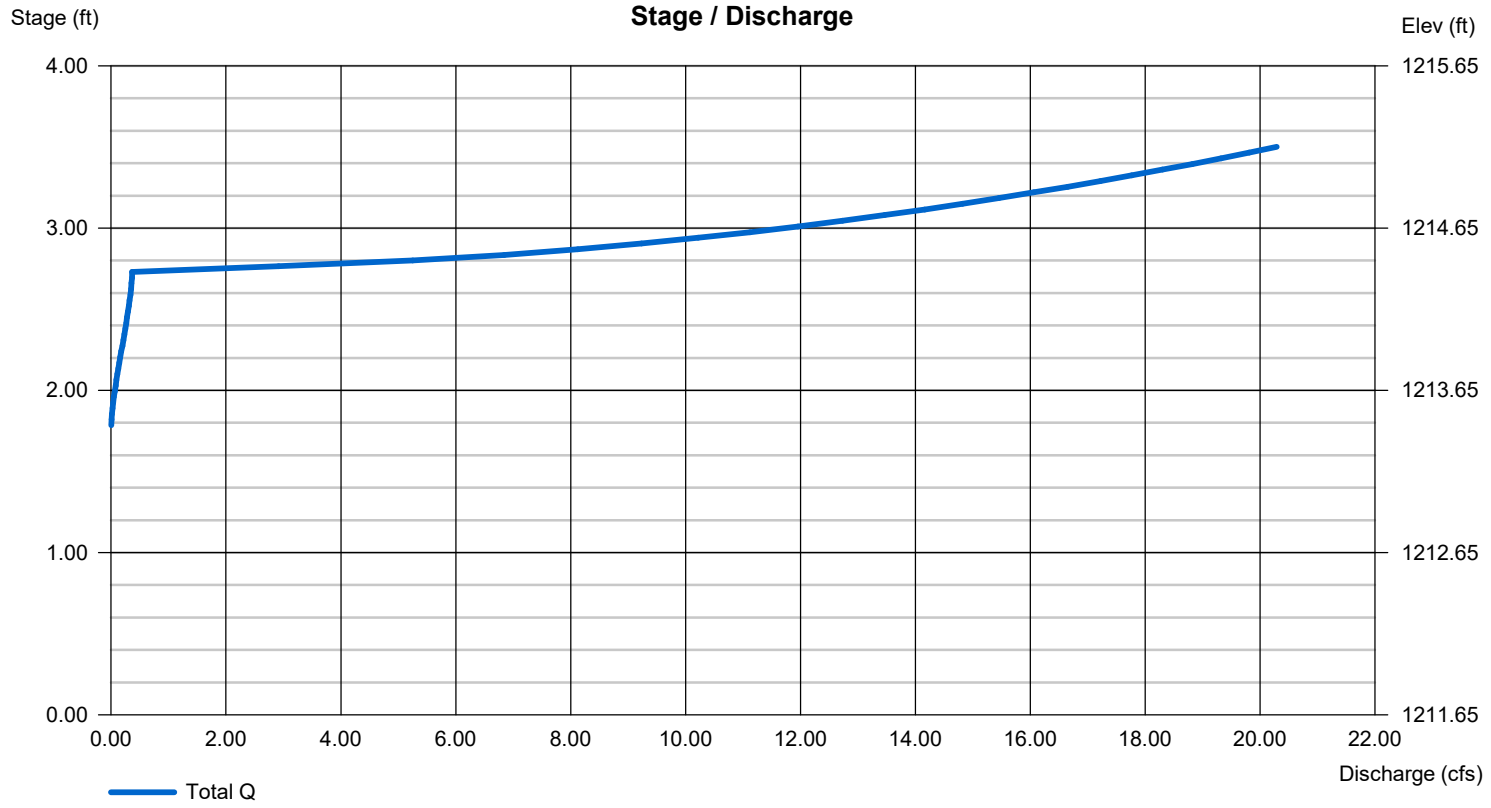
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 5	0	0	0
Invert El. (ft)	= 1213.40	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

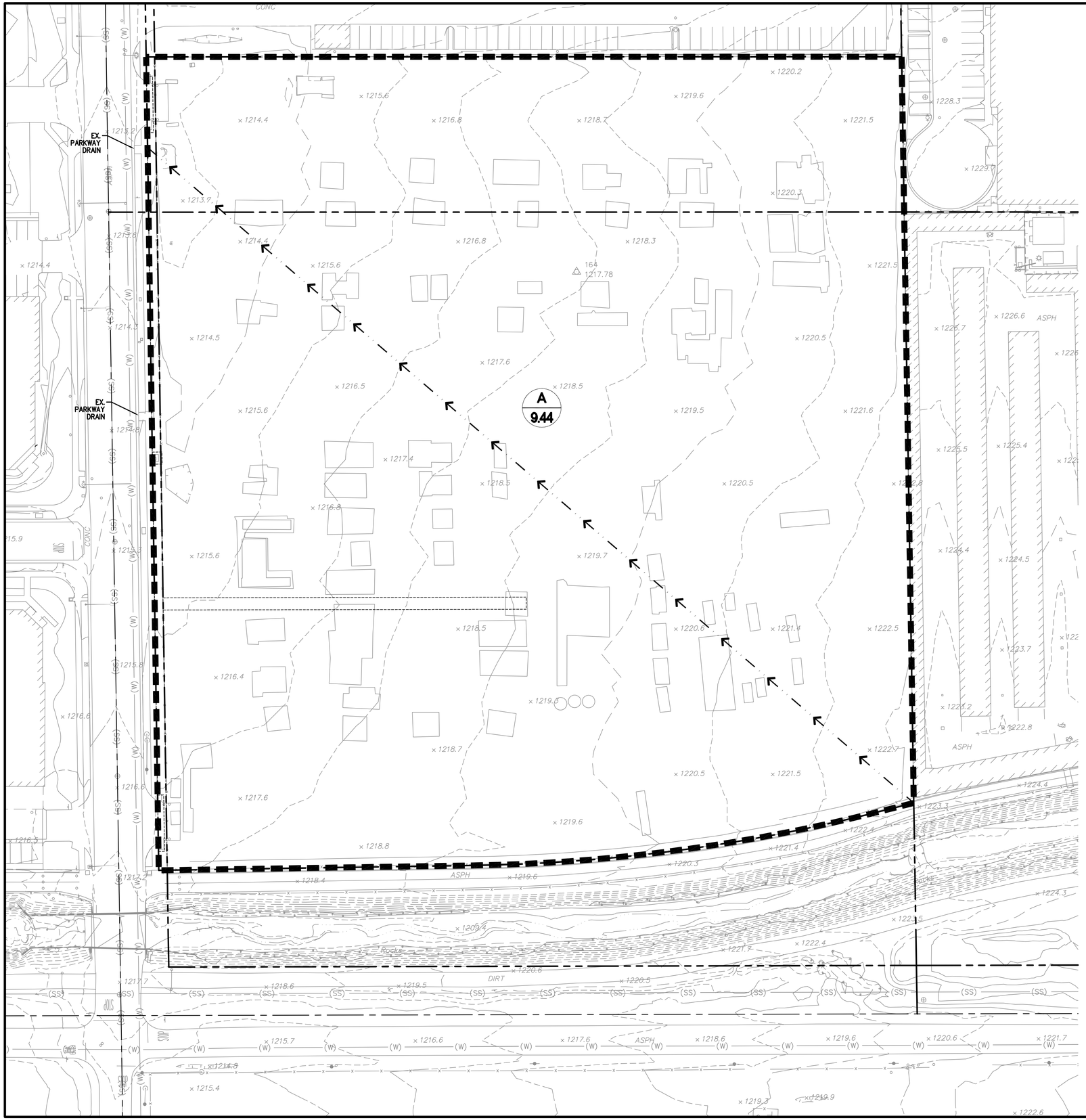
Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



APPENDIX E

EXISTING HYDROLOGY MAP
PROPOSED HYDROLOGY MAP



LEGEND

FLOW PATH

WATERSHED AREA

A — DRAINAGE AREA NAME

9.44 — DRAINAGE AREA ACREAGE

DA-A

DMA DRAINAGE AREA	= 410,992 SF = 9.44 ACRES
EXISTING SITE IMPERVIOUS AREA	= 0 SF = 0 ACRES
ANTECEDENT MOISTURE CONDITION	• AMC II (10-YEAR) • AMC III (100-YEAR)
HYDROLOGIC SOIL GROUP	• B
LONGEST FLOWPATH LENGTH	= 831 FT
Δ ELEVATION	= 10 FT
LONGEST FLOWPATH SLOPE	= 0.0120 FT/FT
LAND COVER TYPE	• BARREN (GRADED LAND)
CURVE NUMBER [AMC-II]	= 86

N

40' 0' 40' 80' 120'

GRAPHIC SCALE: 1"=40'

NOT FOR CONSTRUCTION

160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

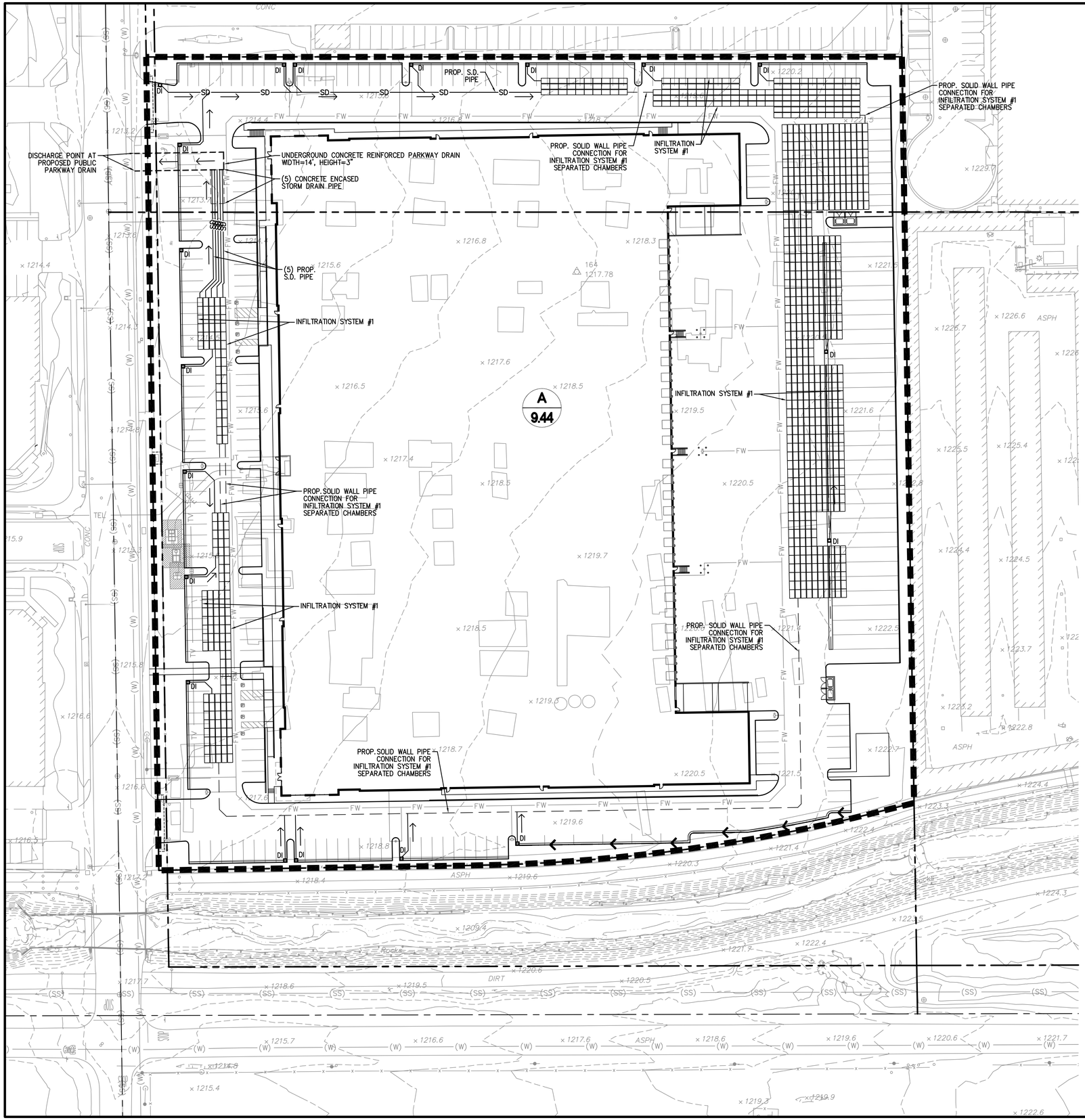
NO: REVISION: DATE:

PROJECT: **PROPOSED WAREHOUSE BUILDING**
350 IOWA STREET
REDLANDS, CALIFORNIA 92373

DRAWING NAME: **EXISTING HYDROLOGY MAP**

ISSUE:	CONCEPT
DATE:	10/5/2021
CHECKED: CM	DRAWN: LI
DRAWING FILE:	21996PRHM
PROJECT NO.:	21996
SHEET NUMBER:	1
OF	1 SHEETS
SCALE:	AS SHOWN

FILENAME: M:\2021\21-996 LBA Redlands Iowa St\HM\21996 HM_EX.dwg, LAST SAVED ON: Oct 05 2021 7:27am PLOTTED BY: LEO, ON: Oct 05 2021 7:27am, CFG:



LEGEND

- FLOW PATH
- WATERSHED AREA
- A — DRAINAGE AREA NAME
- 9.44 — DRAINAGE AREA ACREAGE
- DI — DRAINAGE INLET
- SD — STORM DRAIN PIPE AND FLOW DIRECTION

DA-A

DMA DRAINAGE AREA	= 410,992 SF = 9.44 ACRES
EXISTING SITE IMPERVIOUS AREA	= 368,677 SF = 8.46 ACRES (90%)
ANTECEDENT MOISTURE CONDITION	• AMC II (10-YEAR) • AMC III (100-YEAR)
HYDROLOGIC SOIL GROUP	• B
LONGEST FLOWPATH LENGTH	= 285 FT
Δ ELEVATION	= 2.8 FT
LONGEST FLOWPATH SLOPE	= 0.0098 FT/FT
LAND COVER TYPE(S)	• 10% COMMERCIAL LANDSCAPING • 90% IMPERVIOUS AREAS
CURVE NUMBER(S) [AMC-II]	= 56 (LANDSCAPE) = 98 (IMPERVIOUS)

INFILTRATION SYSTEM #1

MODEL NO.	• STORMTECH SC-740 CHAMBER
# OF UNITS	= 780
TOTAL STORAGE PROVIDED	= 58,422 CU-FT

N

40' 0' 40' 80' 120'

GRAPHIC SCALE: 1"=40'

160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860

DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

NOT FOR CONSTRUCTION

NO:	REVISION:	DATE:

PROJECT: **PROPOSED WAREHOUSE BUILDING**
350 IOWA STREET
REDLANDS, CALIFORNIA 92373

DRAWING NAME: **PROPOSED HYDROLOGY MAP**

ISSUE:	CONCEPT
DATE:	10/5/2021
CHECKED: CM	DRAWN: LI
DRAWING FILE: 21996PRHM	
PROJECT NO.: ~~21996~~	
SHEET NUMBER: 1	
OF 1 SHEETS	
SCALE: AS SHOWN	

FILENAME: M:\2021\21-996 LEA Redlands Iowa St\HM\21996 HM_PR.dwg, LAST SAVED ON: Oct 05 2021 7:26am PLOTTED BY: LEO, ON: Oct 05 2021 7:26am, CFG: