Appendix H

Hydrology and Water Resources

Appendix H.1

Preliminary Hydrology Study

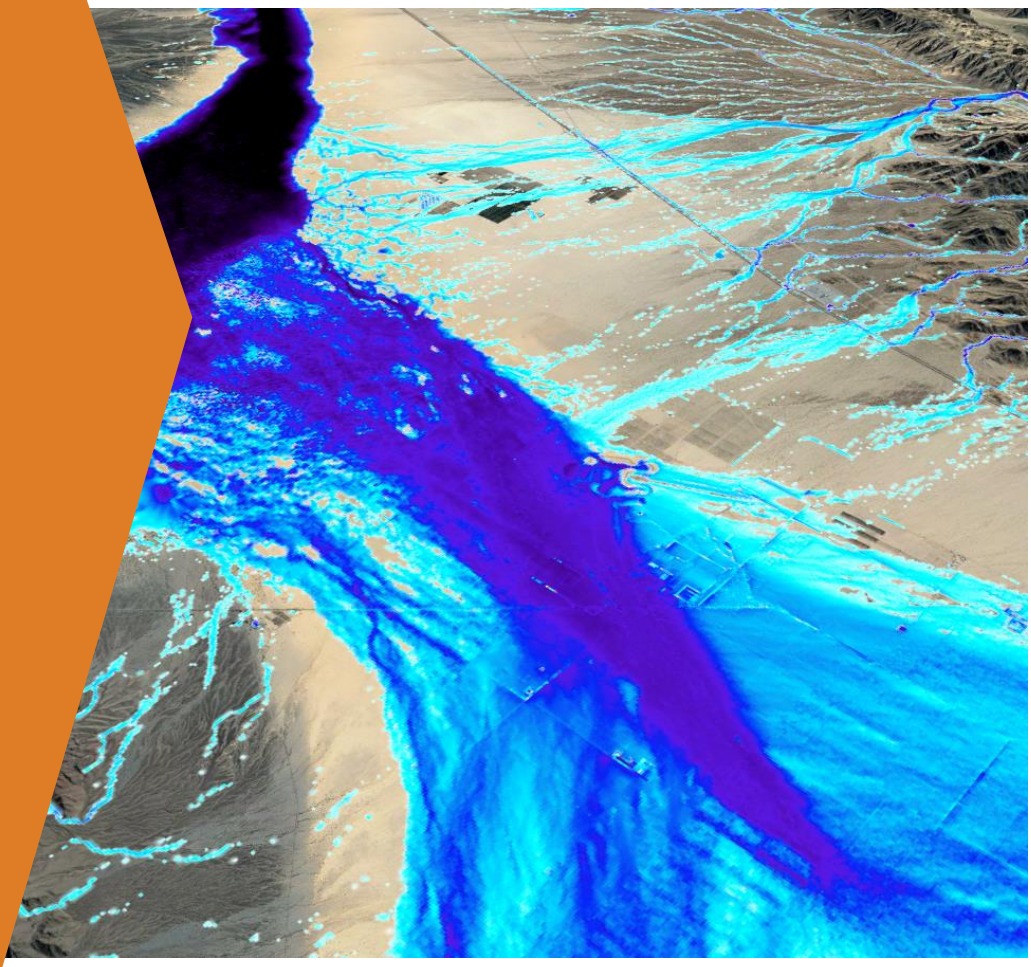
Westwood

Preliminary Hydrology Study

Athos Solar Project

Riverside County, California

June 2018



Prepared For:

Intersect Power

Westwood

Preliminary Hydrology Study for

Athos Solar Project

Prepared for:
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Project Number: 0013768.00
Date: 06/12/2018

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EXHIBITS

APPENDICES

OVERVIEW

The purpose of the study is to describe the hydrology of the proposed Athos Solar Project ("the project") and any impacts that the hydrology may play in the design of the solar array.

The preliminary project boundary encompasses approximately 5.04 square miles of land in Riverside County, starting approximately 3 miles northeast of Desert Center in Riverside County, California (Exhibit 1). At the time of this report, the project consists of preliminary parcels although the layout is not finalized.

The project site is located on a steep to moderate slopes and generally slopes to the southeast. The modeled watershed area encompasses ~264 square miles. The project area has some mild slopes of around 1% and the upper reaches of the watershed has some steeper slopes of 20%-35%.

FEMA has completed a study to determine flood hazard for the selected location, the project area is covered by panels 06065C1825G, 06065C2450G and 06065C2475G. The project area contains no mapped FEMA flood hazards however the project does contain flood hazards from the CA DWR Flood Awareness layer (Exhibit 2).

The hydrologic modeling in this report was created using FLO-2D modeling software. Because of the complex and distributary nature of flow paths upstream and through the project site, FLO-2D hydrologic/hydraulic modeling software was utilized to determine flow depths and velocities throughout the site. These results were then compared against HEC-RAS modeling of the project area.

During a 100 year storm the flood depths vary greatly across the parcels depending on their location. Overall, the analysis shows low water depths and velocities (Exhibits 6 and 7) across the more southern parcels. The southern parcels primarily have flood depths with less than 0.5 feet with velocities less than 1 foot/second except in the more channelized areas. The more northern parcels in and directly adjacent to the main wash have flood depths in excess of 1'-6' of water during the 100 year storm event with velocities exceeding 2 feet/second. See Exhibits 6A and 7A for these areas within the project with higher flood depths and velocities. FLO-2D modeling produced the most conservative water depths across the majority of the site. Final equipment elevations should be based on the FLO-2D maximum depths.

DATA SOURCES

The models and methods for this project utilize a combination of public and private data as shown in Table 1.

Table 1: Data Sources

Data Type	Format	Source	Use
Elevation	2-ft Photogrammetry	Westwood	Onsite FLO-2D Model Elevations
Elevation	5-Meter Digital Elevation Model (DEM)	Intermap Nextmap Lidar	Offsite FLO-2D Model Elevations
Elevation	10-Meter DEM	USGS Data Gateway	Offsite FLO-2D Model Elevations
Crop Data	Shapefile	USDA 2013 Crop Data Layer	Landcover
Soils	Shapefile	USGS SSURGO Dataset	Curve Numbers
Precipitation	PDF File	NOAA Atlas 14	Design storms
HUC-12 Drainage Boundary	Shapefile	USGS	Define Model Extents
Site Boundary	KMZ	Intersect Power	Define Model Extents
2014 Aerial Photography	ArcGIS Map Service	USDA FSA	Reference

OFFSITE HYDROLOGY

The project area is located approximately 3 miles northeast of Desert Center in Riverside County, California. The project site is located on mild slopes of 1% and generally slopes to the southeast h. The modeled watershed area encompasses ~264 square miles and the total tributary area is 1,004 square miles (Exhibit 9). The project area has some mild slopes of around 1%-2% and also includes areas of steeper slopes of 20%-35% through portions of the project area. The potential hydrologic issues in this general landscape are flooding and erosive velocities.

Because of the complex and distributary nature of flow paths upstream and through the project site, a FLO-2D model with 100' grid cells was utilized to determine flow depths and velocities throughout the site.

FLO-2D

FLO-2D is a physical process model that routes rainfall runoff and flood hydrographs over flow surfaces or in channels using the dynamic wave approximation to the momentum equation. FLO-2D offers advantages over 1-D models and unit hydrograph methods by allowing for breakout flows and visualization of flows across a potential site. This is particularly useful on a flat site that receives offsite flows, such as the project site. The primary inputs are a DTM (elevation data), curve numbers and precipitation. No hydraulic structures were modeled (roads/berms are overtopped).

Precipitation data obtained NOAA Atlas 14 (Appendix A) for a 100-year, 24-hour rainfall is 4.09 inches for the modeled project watershed. By using the 100-year rainfall event allows for the best initial analysis in order to determine the worst areas of flooding and erosion.

With such a large tributary area to the parcels inflow hydrographs were used to reduce the model size. The inflows input into the model were obtained from the Flooding Depth Analyses and Scour requirements for PSL#298145 (Appendix C) which was obtained from Riverside County. The peak flow rates for the northern and southern offsite watersheds were then input into the FLO2D model.

Westwood 2-ft photogrammetry was incorporated into the DTM using the export to xyz file function in Global Mapper for onsite model elevations and was used for onsite model elevation data, Intermap Nextmap 5 meter LIDAR and 10-m DEM USGS elevation data was incorporated into the DTM for offsite model elevations. These XYZ files are read directly into FLO-2D.

USDA-NRCS SSURGO soils data provided a general idea of the soils in the area but did not cover the entire area. Soil types were estimated based on landcover and SSURGO data and were hand edited after being approved by Riverside County. Soils in the area are primarily classified as hydrologic group C and D in the watershed area and A soils in the project boundary (Exhibit 3). Land cover was obtained from the USDA 2013 Crop Data Layer or estimated for areas not covered. Exhibit 4 displays the Land Cover Classes for the entire watershed. Curve numbers were applied to each grid cell in the FLO-2D model based on intersecting the grid with the curve numbers (Exhibit 5).

PROJECT HYDRAULICS - GEOHECRAS

The main channel adjacent to the project parcels was also modeled in Geo-HEC-RAS software to determine the extent of the 1% chance area of inundation (100-year floodplain) within the project area compared to FLO-2D. Geo-HEC-RAS is proprietary software that uses HEC-RAS, a U.S. Corps of Engineers product, as its main engine and includes an interface to build models and view results.

In the model, a reach was drawn to depict the direction and connections of stream flow. The same flow rates as input into the FLO-2D model were input on the upstream end of each reach within the project boundary. Cross-sections were then drawn perpendicular to the reaches and elevation contours. A digital terrain model (topographic data) of the project site was uploaded to the model. This data is encoded onto the cross-sections by the software in order to route the flow of water and calculate the width of the floodplain. The GeoHECRAS results and cross sections can be seen on Exhibit 10.

RESULTS AND DESIGN INFORMATION

During a 100 year storm the flood depths vary greatly across the parcels depending on their location. Overall, the analysis shows low water depths and velocities (Exhibits 6 and 7) across the more southern parcels. The southern parcels primarily have flood depths with less than 0.5 feet with velocities less than 1 foot/second except in the more channelized areas. The more northern parcels in and directly adjacent to the main wash have flood depths in excess of 1'-6' of water during the 100 year storm event (Exhibits 6B & 6C). The northern parcels also have a much higher risk of erosion due to the increased velocities exceeding 2 feet/second through the main wash. This flooding through the main wash has a wide expanse and inundates most of the northern parcels. See Exhibits 6A and 7A for these areas within the project with higher flood depths and velocities.

FEMA has completed a study to determine flood hazards and the project area contains no mapped flood zones, however the CA DWR has flood hazards that encompass some of the northern parcels.

A comparison of the FLO-2D results, CA DWR Flood Awareness layer and the GeoHECRAS results can be found in Exhibit 8. The results are similar but do have differences since GeoHECRAS is a 1-D model. FLO-2D modeling produced the most conservative water depths across the majority of the site. Final equipment elevations should be based on the FLO-2D maximum depths.

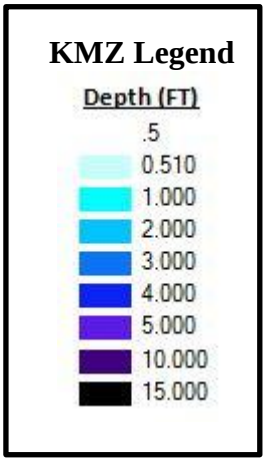
NEXT STEPS

1. Final design should account for avoidance of the flood depths and velocities presented in Exhibits 6 and 7 to protect infrastructure.
2. Facilities to be elevated 1' above the 100-year peak flood elevation.
3. Follow up with geotechnical consultant for additional soil texture data.

Included Output Files:

1. Shapefile of Flow Depth
   2018-05-23_Athos_Prelim_Flow_Depth_at_Cell.shp
   Attribute "ID" = Grid Cell Number
   Attribute "VAR" = Max Flow Depth (Feet)

2. KMZ of Flow Depth
   2018-05-23_Athos_Flow_Depth_Preliminary.kmz
   Overlay in Google Earth for graphical representation.



3. Shapefile of Velocity
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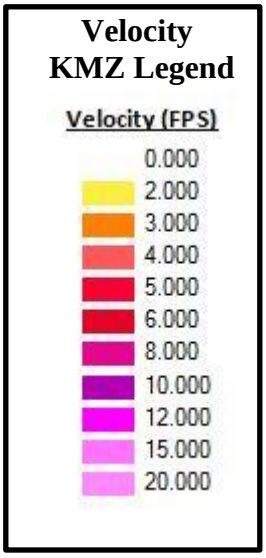
   Attribute "ID" = Grid Cell Number
   Attribute "VAR" = Velocity (FPS)

4. KMZ of Velocity
   2018-05-23_Athos_Velocity_Preliminary.kmz
   Overlay in Google Earth for graphical representation.



REFERENCES

National Engineering Handbook, Part 630 Hydrology. Chapter 9 Hydrologic Soil-Cover Complexes. USDA. NRCS. 210-VI-NEH, July 2004

NOAA, & Service, N. W. AHPS Precipitation analysis. Retrieved May 2018, from http://water.weather.gov/precip/download.php

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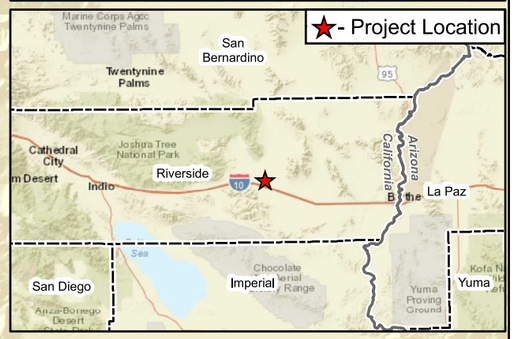
USDA 2013 Crop Data Layer, Landcover data, retrieved May 2018, from https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php

Exhibits



Data Source(s): Westwood (2018); ESRI WMS World Streets Basemap Imagery (Accessed 2018).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary

N

0 3 Miles

Athos Solar Project

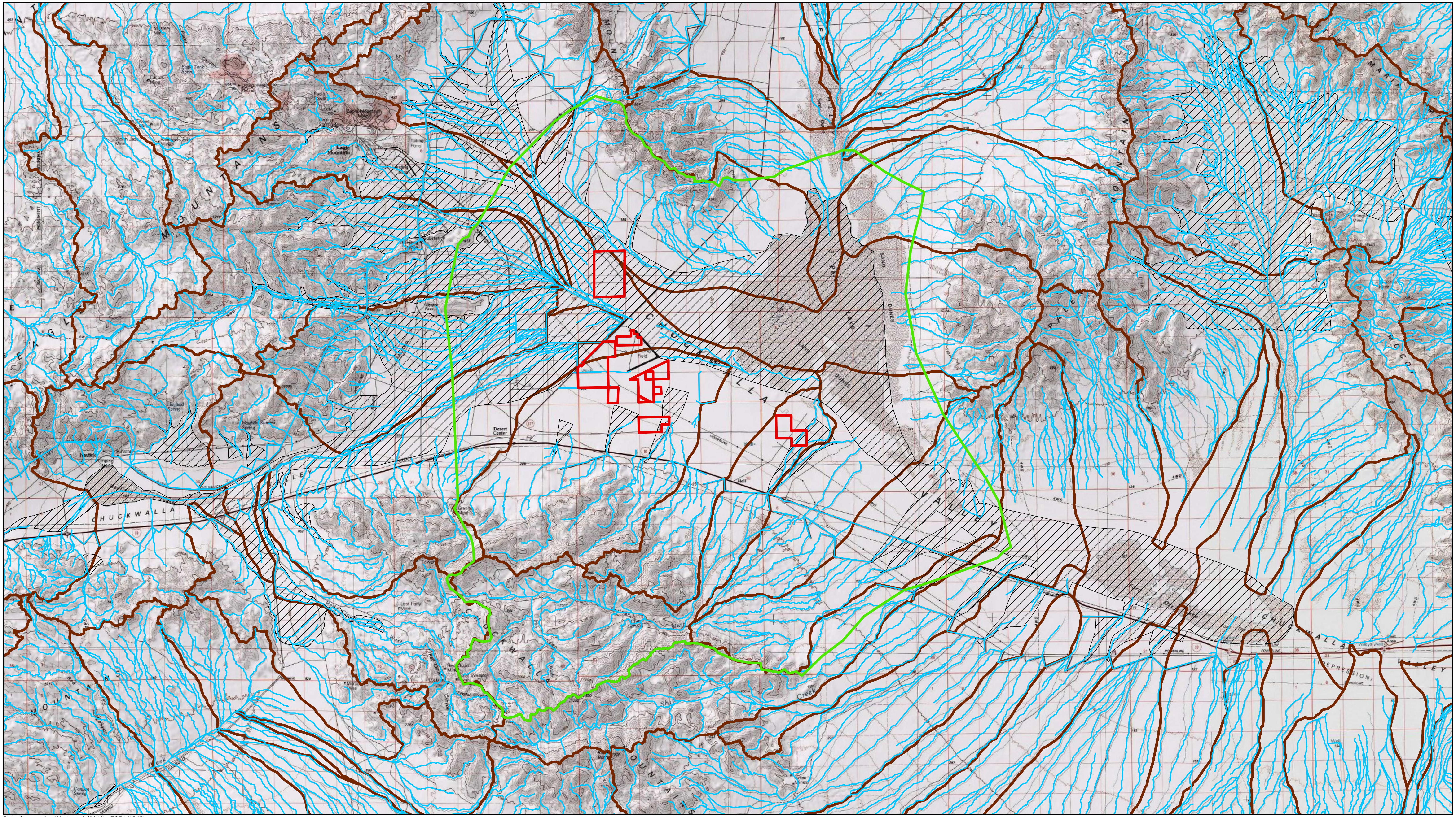
Riverside County, California

Exhibit 1: Location Map

May 29, 2018

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\00013768.00\GIS\Hydro Exhibits\2018-05-29_Athos_EX1LocationMap.mxd 5/29/2018 4:16:30 PM



Data Source(s): Westwood (2018); ESRI WMS World Streets Basemap Imagery (Accessed 2018).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- CA DWR Flood Awareness Layer
- HUC 12 Boundary
- NHD Flowline

N

0 — 3 Miles

Athos Solar Project

Riverside County, California

Exhibit 2: Base Map

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Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-29_Athos_EX2BaseMap.mxd 5/29/2018 4:30:58 PM

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary

Hydrologic Soils Group

- A
- C
- D

N

0 3 Miles

Athos Solar Project

Riverside County, California

Exhibit 3: Soils Map

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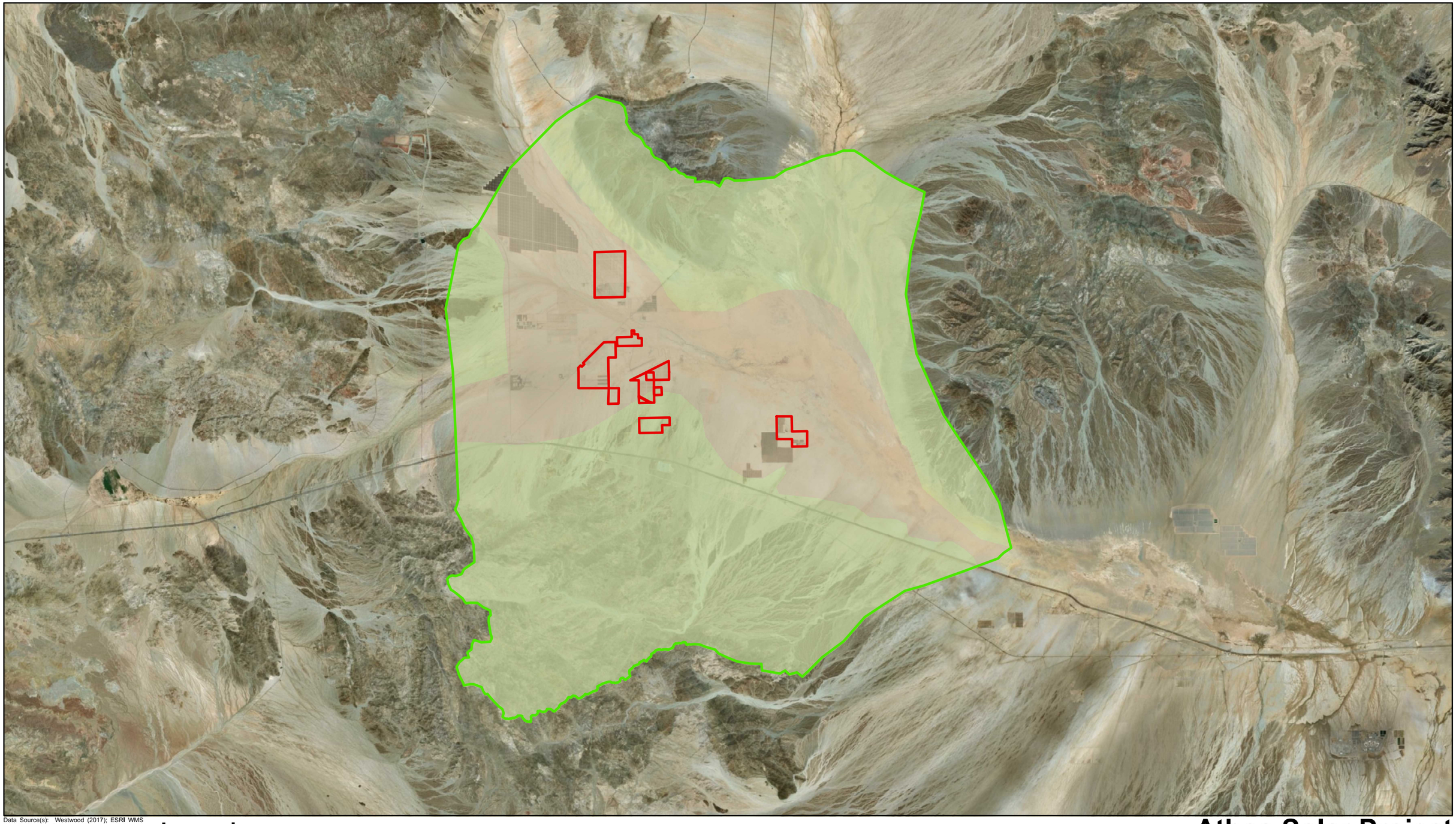
Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX3SoilsMap.mxd 5/29/2018 4:17:08 PM



Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary

Landcover

- Barren
- Shrubland

N

0 3 Miles

Athos Solar Project

Riverside County, California

Exhibit 4: Landcover Map

May 29, 2018

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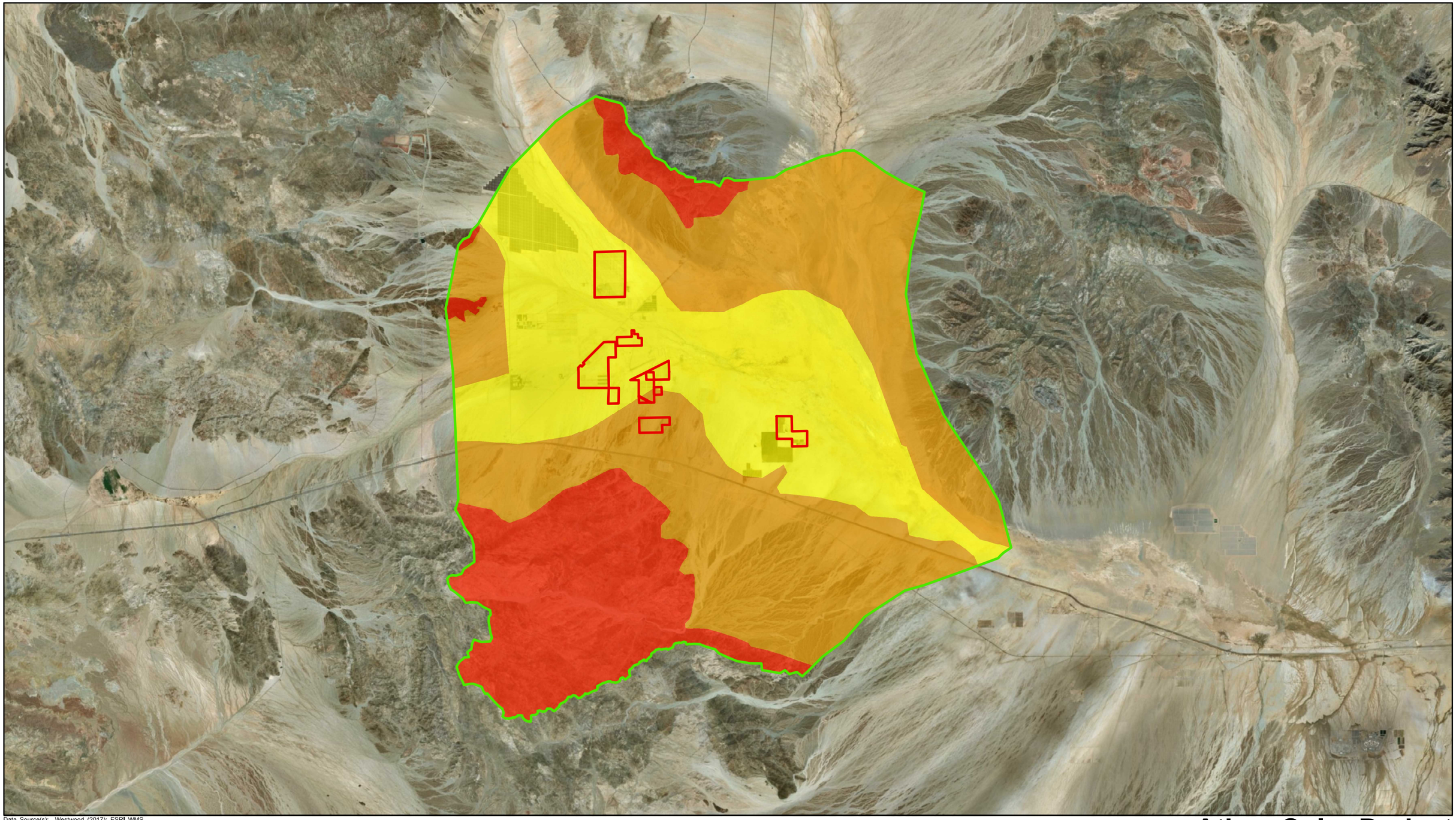
Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX4LandcoverMap.mxd 5/29/2018 4:16:31 PM



Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary

Curve Number

- 77
- 81
- 89

N

0 Miles 3

Athos Solar Project

Riverside County, California

Exhibit 5: Curve Number Map

May 29, 2018

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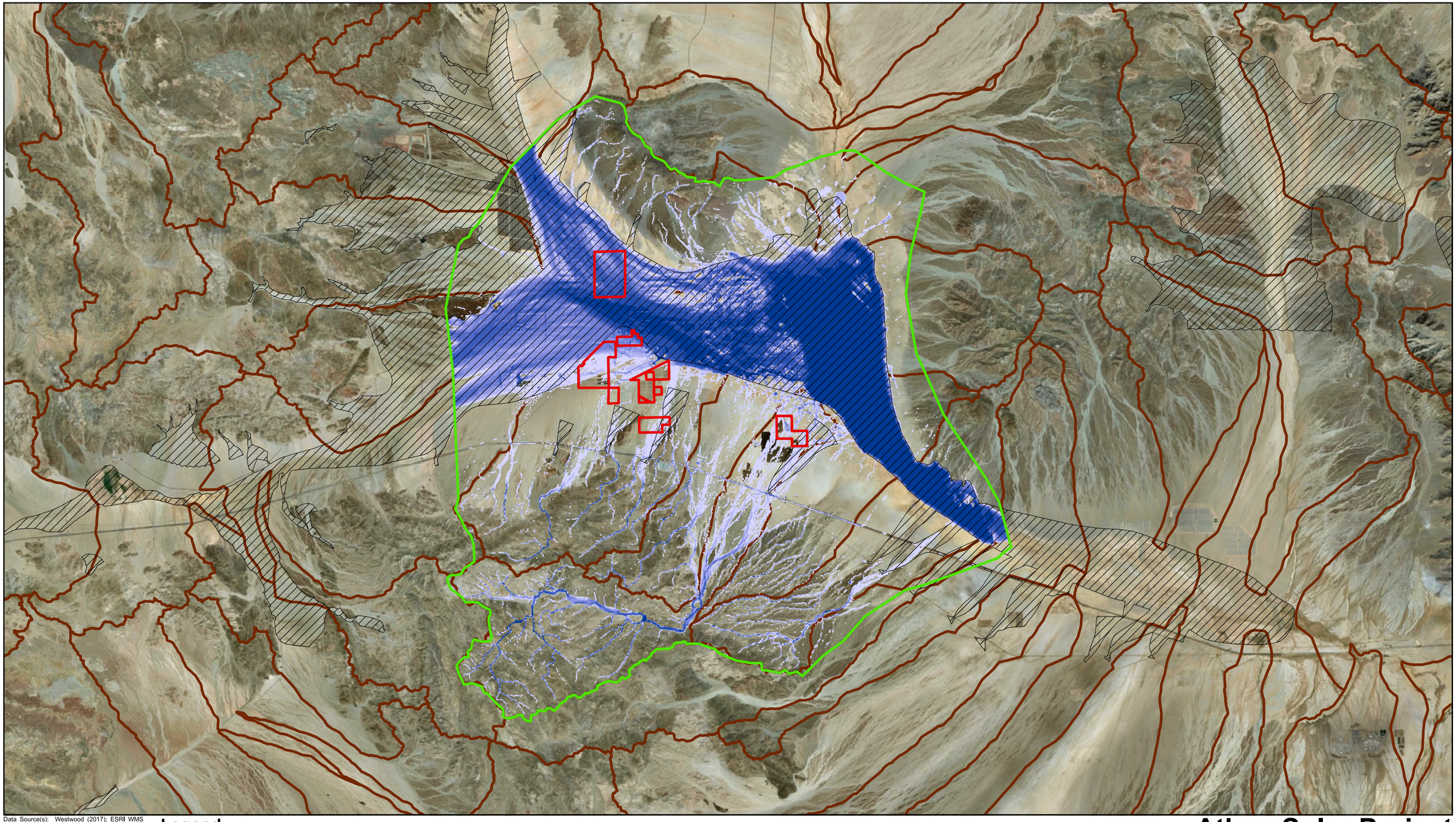
Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX5CNMap.mxd 5/29/2018 4:16:45 PM



Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- HUC 12 Boundary
- CA DWR Flood Awareness Layer

Max Flow Depth (ft)

0.50 - 1.00 | 1.01 - 1.50 | 1.51 - 2.00 | 2.01 - 2.50 | 2.51 - 3.00 | 3.01 - 4.00 | 4.01 - 6.00 | 6.01+

N

0 Miles 3

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Riverside County, California

Exhibit 6: 100-Year Max Water Depth Map

May 29, 2018

Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX6_100MaxWaterDepthMap.mxd 5/29/2018 4:39:52 PM

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- HUC 12 Boundary
- CA DWR Flood Awareness Layer

Max Flow Depth (ft)

0.50 - 1.00 | 1.01 - 1.50 | 1.51 - 2.00 | 2.01 - 2.50 | 2.51 - 3.00 | 3.01 - 4.00 | 4.01 - 6.00 | 6.01+

N

0 Feet 4,500

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Riverside County, California

Exhibit 6A: 100-Year Max Water Depth Project Area Map

May 29, 2018

Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX6A_100MaxWaterDepthMap.mxd 5/29/2018 4:52:44 PM

Data Source(s): Westwood (2018); ESRI WMS World Streets Basemap Imagery (Accessed 2018).

Legend

- Project Boundary
- HUC 12 Boundary
- FLO-2D Model Boundary
- Flood Depth Contour
- County Boundary

N

0 Feet 1,300

Athos Solar Project

Riverside County, California

Exhibit 6B: 100-Year Max Water Depth North Parcel Map

June 12, 2018

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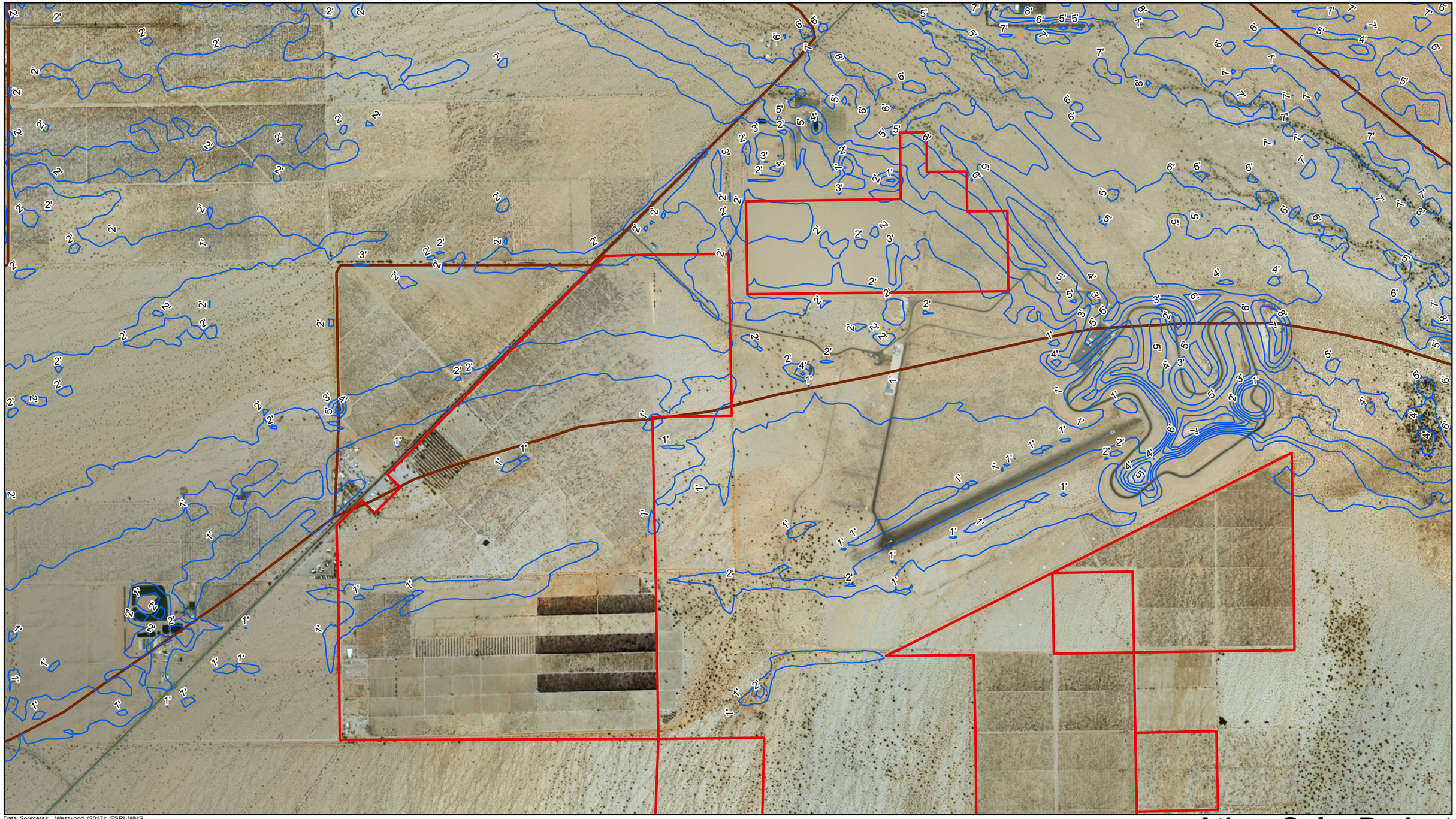
Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EXHB_100MaxWaterDepthMap_North.mxd 6/12/2018 10:38:10 AM



Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- HUC 12 Boundary
- FLO-2D Model Boundary
- Flood Depth Contour
- County Boundary

N

0 — 1,500 Feet

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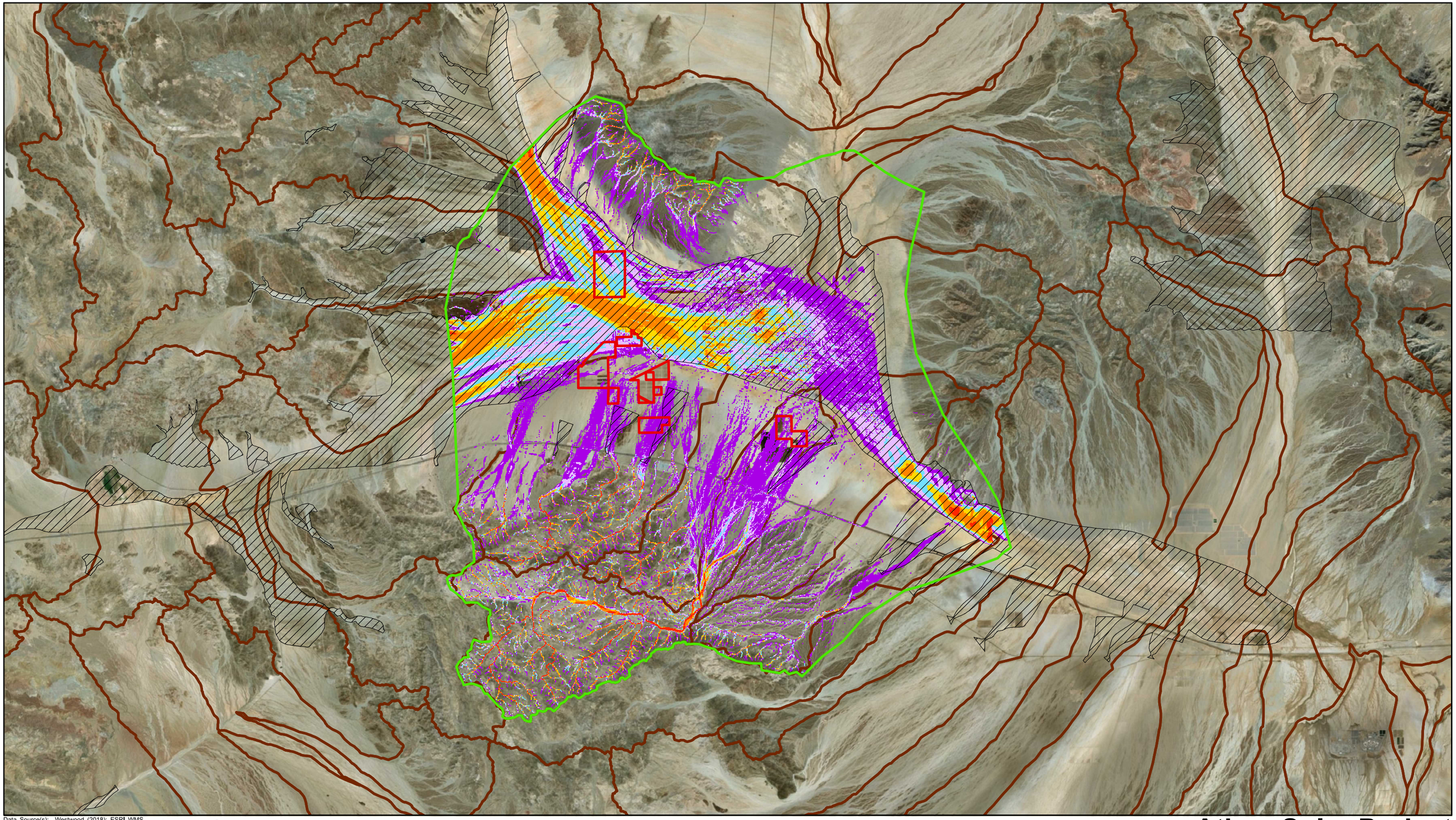
Athos Solar Project

Riverside County, California

Exhibit 6C: 100-Year Max Water Depth Central Parcels Map

June 12, 2018

Map Document: N:\0013788.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX6C_100MaxWaterDepthMap_South.mxd 6/12/2018 10:38:14 AM



Data Source(s): Westwood (2018); ESRI WMS World Streets Basemap Imagery (Accessed 2018).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- HUC 12 Boundary
- CA DWR Flood Awareness Layer

Peak Velocity (fps)

1.00 - 1.50 | 1.51 - 2.00 | 2.01 - 2.50 | 2.51 - 3.00 | 3.01 - 4.00 | 4.01+

N

0 Miles 3

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Riverside County, California

Exhibit 7: 100-Year Peak Velocity Map

May 29, 2018

Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX7_100PeakVelocityMap.mxd 5/29/2018 4:55:29 PM

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- HUC 12 Boundary
- CA DWR Flood Awareness Layer

Peak Velocity (fps)

1.00 - 1.50 | 1.51 - 2.00 | 2.01 - 2.50 | 2.51 - 3.00 | 3.01 - 4.00 | 4.01+

N

0 Feet 4,500

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Athos Solar Project

Riverside County, California

Exhibit 7A: 100-Year Peak Velocity Project Area Map

May 29, 2018

Map Document: N:\0013768.00\GIS\Hydro Exhibits\2019-05-09_Athos_EX7A_100peakVelocityMap.mxd 5/29/2018 4:58:09 PM

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- HUC 12 Boundary
- CA DWR Flood Awareness Layer
- GeoHECRAS 100 Year Results

Max Flow Depth (ft)

0.50 - 1.00 | 1.01 - 1.50 | 1.51 - 2.00 | 2.01 - 2.50 | 2.51 - 3.00 | 3.01 - 4.00 | 4.01 - 6.00 | 6.01+

N

0 Feet 4,500

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Athos Solar Project

Riverside County, California

Exhibit 8: Flooding Extents Comparison Map

May 30, 2018

Map Document: N:\00137\68.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX8_FloodingExtentsMap.mxd 5/30/2018 9:01:21 AM

San Bernardino
County
Riverside

Data Source(s): Westwood (2018); ESRI WMS World Streets Basemap Imagery (Accessed 2018).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- CA DWR Flood Awareness Layer
- HUC 12 Boundary
- Overall Watershed
- NHD Flowline
- Inflow Hydrograph Location

N

0 Miles 5

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Athos Solar Project

Riverside County, California

Exhibit 9: Overall Watershed Map

May 31, 2018

Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-29_Athos_EX9OverallWatershedMap.mxd 5/31/2018 11:01:03 AM

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Boundary
- FLO-2D Model Boundary
- County Boundary
- HUC 12 Boundary
- CA DWR Flood Awareness Layer
- GeoHECRAS 100 Year Results
- GeoHECRAS Cross Sections

N

0 Miles 1.25

Athos Solar Project

Riverside County, California

Exhibit 10: GeoHECRAS Flooding Extents Map

June 12, 2018

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Map Document: N:\0013768.00\GIS\Hydro Exhibits\2018-05-09_Athos_EX10_HECRASFloodingExtentsMap.mxd 6/12/2018 10:46:29 AM

Appendix A

NOAA Atlas 14 Rainfall Data

NOAA Atlas 14, Volume 6, Version 2
Location name: Desert Center, California, USA*
Latitude: 33.7518°, Longitude: -115.3673°
Elevation: 625.2 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	0.081 (0.067-0.098)	0.127 (0.106-0.154)	0.192 (0.159-0.234)	0.248 (0.204-0.304)	0.329 (0.262-0.418)	0.396 (0.309-0.514)	0.468 (0.356-0.622)	0.548 (0.405-0.748)	0.663 (0.470-0.945)	0.760 (0.521-1.12)
10-min	0.116 (0.097-0.140)	0.182 (0.152-0.221)	0.275 (0.228-0.335)	0.355 (0.293-0.436)	0.472 (0.376-0.599)	0.568 (0.443-0.736)	0.671 (0.510-0.892)	0.785 (0.580-1.07)	0.951 (0.674-1.36)	1.09 (0.746-1.61)
15-min	0.140 (0.117-0.170)	0.221 (0.184-0.268)	0.333 (0.276-0.405)	0.430 (0.354-0.528)	0.571 (0.454-0.724)	0.687 (0.535-0.890)	0.812 (0.617-1.08)	0.949 (0.702-1.30)	1.15 (0.815-1.64)	1.32 (0.902-1.95)
30-min	0.195 (0.163-0.237)	0.307 (0.256-0.373)	0.464 (0.385-0.564)	0.599 (0.493-0.735)	0.795 (0.633-1.01)	0.957 (0.745-1.24)	1.13 (0.860-1.50)	1.32 (0.977-1.81)	1.60 (1.14-2.28)	1.84 (1.26-2.71)
60-min	0.264 (0.220-0.320)	0.415 (0.345-0.504)	0.626 (0.520-0.762)	0.809 (0.666-0.992)	1.07 (0.854-1.36)	1.29 (1.01-1.68)	1.53 (1.16-2.03)	1.79 (1.32-2.44)	2.16 (1.53-3.08)	2.48 (1.70-3.66)
2-hr	0.347 (0.289-0.421)	0.526 (0.438-0.638)	0.779 (0.646-0.948)	1.00 (0.823-1.23)	1.33 (1.06-1.68)	1.60 (1.25-2.07)	1.89 (1.44-2.52)	2.22 (1.64-3.04)	2.71 (1.92-3.86)	3.12 (2.13-4.60)
3-hr	0.397 (0.331-0.481)	0.594 (0.494-0.721)	0.874 (0.725-1.06)	1.12 (0.922-1.38)	1.49 (1.18-1.89)	1.79 (1.40-2.32)	2.13 (1.62-2.83)	2.50 (1.85-3.42)	3.06 (2.17-4.36)	3.53 (2.42-5.21)
6-hr	0.484 (0.403-0.587)	0.719 (0.598-0.873)	1.06 (0.875-1.28)	1.35 (1.11-1.66)	1.79 (1.43-2.27)	2.16 (1.69-2.80)	2.57 (1.96-3.42)	3.03 (2.24-4.14)	3.71 (2.63-5.29)	4.30 (2.94-6.34)
12-hr	0.564 (0.470-0.683)	0.851 (0.708-1.03)	1.26 (1.05-1.53)	1.62 (1.33-1.99)	2.15 (1.71-2.73)	2.59 (2.02-3.36)	3.08 (2.34-4.09)	3.62 (2.68-4.95)	4.42 (3.14-6.30)	5.11 (3.50-7.53)
24-hr	0.723 (0.640-0.834)	1.11 (0.984-1.29)	1.67 (1.47-1.93)	2.15 (1.88-2.51)	2.86 (2.42-3.44)	3.45 (2.86-4.23)	4.09 (3.32-5.13)	4.79 (3.79-6.18)	5.83 (4.43-7.82)	6.70 (4.93-9.29)
2-day	0.838 (0.741-0.966)	1.30 (1.15-1.51)	1.96 (1.73-2.27)	2.53 (2.22-2.95)	3.37 (2.86-4.05)	4.06 (3.38-4.99)	4.81 (3.91-6.04)	5.63 (4.46-7.27)	6.84 (5.20-9.17)	7.84 (5.77-10.9)
3-day	0.890 (0.788-1.03)	1.39 (1.23-1.60)	2.09 (1.84-2.42)	2.70 (2.37-3.15)	3.60 (3.05-4.33)	4.34 (3.60-5.32)	5.13 (4.17-6.45)	6.01 (4.75-7.76)	7.29 (5.54-9.78)	8.36 (6.15-11.6)
4-day	0.943 (0.835-1.09)	1.47 (1.30-1.70)	2.21 (1.95-2.56)	2.86 (2.50-3.33)	3.80 (3.22-4.57)	4.58 (3.81-5.62)	5.43 (4.41-6.82)	6.36 (5.03-8.20)	7.71 (5.86-10.4)	8.85 (6.51-12.3)
7-day	0.994 (0.880-1.15)	1.53 (1.35-1.77)	2.29 (2.02-2.65)	2.96 (2.59-3.45)	3.94 (3.34-4.74)	4.75 (3.95-5.83)	5.63 (4.58-7.08)	6.61 (5.23-8.53)	8.04 (6.11-10.8)	9.24 (6.80-12.8)
10-day	1.02 (0.905-1.18)	1.57 (1.38-1.81)	2.34 (2.06-2.71)	3.02 (2.64-3.52)	4.02 (3.40-4.83)	4.85 (4.03-5.95)	5.75 (4.67-7.23)	6.75 (5.34-8.71)	8.22 (6.25-11.0)	9.45 (6.95-13.1)
20-day	1.11 (0.984-1.28)	1.71 (1.51-1.97)	2.55 (2.25-2.95)	3.28 (2.87-3.83)	4.37 (3.70-5.26)	5.27 (4.38-6.46)	6.24 (5.07-7.84)	7.31 (5.78-9.43)	8.87 (6.75-11.9)	10.2 (7.49-14.1)
30-day	1.18 (1.05-1.36)	1.83 (1.62-2.11)	2.75 (2.42-3.18)	3.55 (3.11-4.14)	4.72 (4.00-5.68)	5.69 (4.73-6.98)	6.73 (5.46-8.45)	7.86 (6.22-10.1)	9.50 (7.22-12.7)	10.9 (7.99-15.1)
45-day	1.25 (1.11-1.44)	1.98 (1.75-2.28)	3.00 (2.65-3.48)	3.89 (3.41-4.54)	5.19 (4.40-6.25)	6.25 (5.20-7.68)	7.38 (6.00-9.28)	8.60 (6.80-11.1)	10.3 (7.87-13.9)	11.8 (8.66-16.3)
60-day	1.35 (1.19-1.55)	2.16 (1.91-2.49)	3.30 (2.91-3.82)	4.28 (3.75-5.00)	5.71 (4.84-6.87)	6.87 (5.71-8.43)	8.10 (6.58-10.2)	9.42 (7.45-12.1)	11.3 (8.58-15.1)	12.8 (9.41-17.7)

[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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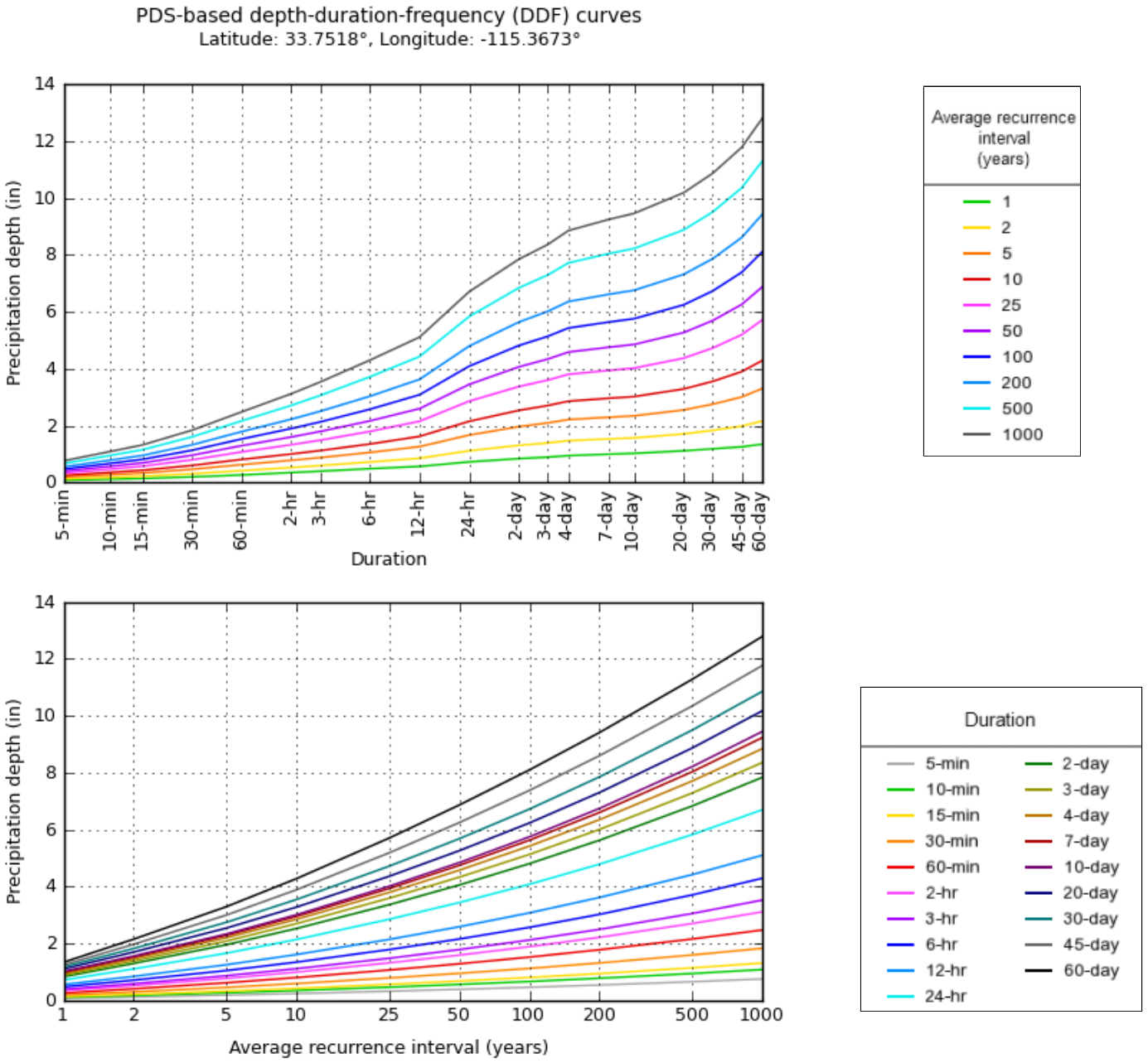
PF graphical



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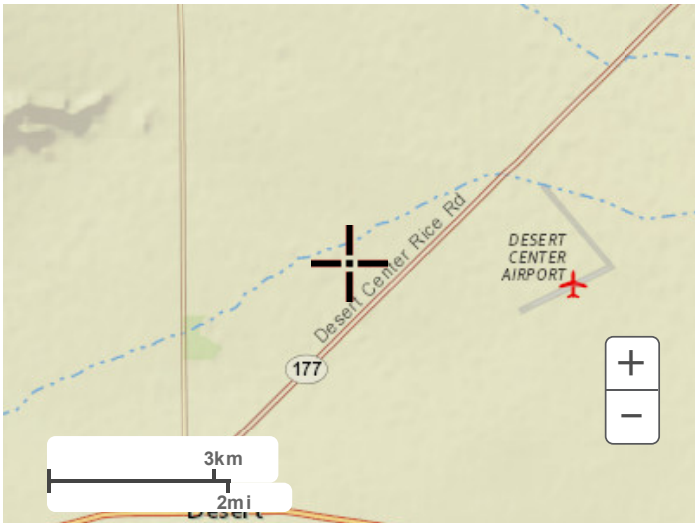
Maps & aerials

Small scale terrain



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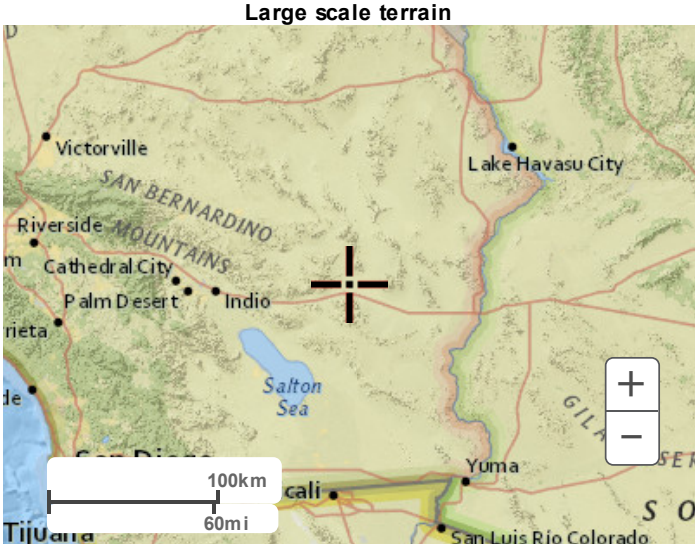
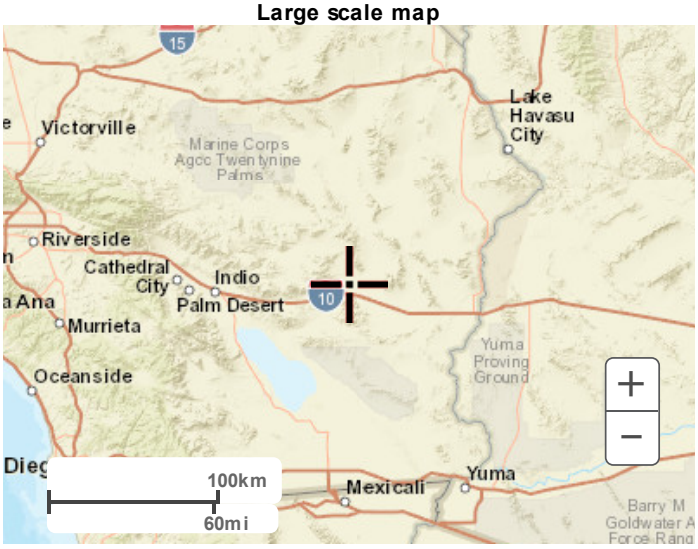
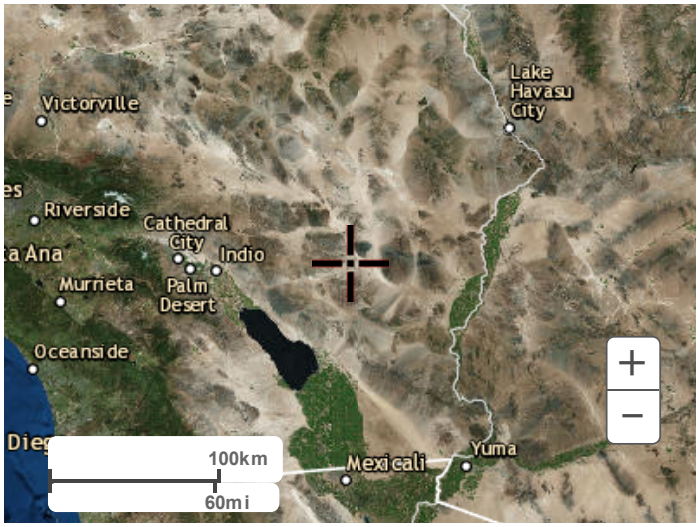


Large scale map



Large scale aerial



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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

Appendix B

Curve Number Table

Table 2. Semi-Arid Curve Numbers (adapted from NEH 630)

Class	Value	Classification Description	Curve Number				
			Soil Type*				
			A	B	C	D	W
Water	11	Open Water - areas of open water, generally with less than 25% cover of vegetation or soil.	98	98	98	98	100
	12	Perennial Ice/Snow - areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover.	98	98	98	98	100
Developed	21	Developed, Open Space - areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.	46	65	77	82	100
	22	Developed, Low Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.	61	75	83	87	100
	23	Developed, Medium Intensity – areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.	77	85	90	95	100
	24	Developed High Intensity -highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.	89	92	94	95	100
Barren	31	Barren Land (Rock/Sand/Clay) - areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.	77	86	91	94	100
Forest	41	Deciduous Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.	43	55	70	77	100
	42	Evergreen Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.	43	55	70	77	100
	43	Mixed Forest - areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.	43	55	70	77	100
Shrubland	51	Dwarf Scrub - Alaska only areas dominated by shrubs less than 20 centimeters tall with shrub canopy typically greater than 20% of total vegetation. This type is often co-associated with grasses, sedges, herbs, and non-vascular vegetation.	55	71	81	89	100
	52	Shrub/Scrub - areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.	55	71	81	89	100
Herbaceous	71	Grassland/Herbaceous - areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.	55	71	81	89	100
	72	Sedge/Herbaceous - Alaska only areas dominated by sedges and forbs, generally greater than 80% of total vegetation. This type can occur with significant other grasses or other grass like plants, and includes sedge tundra, and sedge tussock tundra.	55	71	81	89	100
	73	Lichens - Alaska only areas dominated by fruticose or foliose lichens generally greater than 80% of total vegetation.	55	71	81	89	100
	74	Moss - Alaska only areas dominated by mosses, generally greater than 80% of total vegetation.	55	71	81	89	100
Planted/Cultivated	81	Pasture/Hay – areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.	55	71	81	89	100
	82	Cultivated Crops – areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.	67	78	85	89	100
	83	Small Grains	63	75	83	87	100
Wetlands	91	Woody Wetlands - areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	45	66	77	83	100
	92	Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.	45	66	77	83	100

*A/D, B/D and C/D soils lumped as D soils, W denotes water

**Curve Numbers for NLCD Codes 41-43 have been increased from 30 to 43 as many of these areas are partially grazed Woods-grass combination.

Appendix C

Flooding Depth Analyses (Prepared by Others)

FLOODING DEPTH ANALYSES AND SCOUR REQUIREMENTS FOR PSL#298145 NORTH OF 22100 RICE ROAD

COUNTY OF RIVERSIDE
CALIFORNIA

PREPARED FOR:

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IRVINE, CA 92618
PHONE: (949) 286-7000

PREPARED BY:

JLC Engineering & Consulting, Inc.
36263 CALLE DE LOBO
MURRIETA, CA 92562
(951) 304-9552 • FAX (951) 304-3568

DATE PREPARED:
JUNE 21, 2016
REVISED:

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

Joseph L. Castaneda RCE 59835 Registered Civil Engineer	06/21/2016 Date	Seal

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FIGURES

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EXCERPTS

EXHIBITS

I. INTRODUCTION

PLS # 298145 is a proposed cellular tower site that proposes to construct a building and cellular tower in the unincorporated area of Desert Center, County of Riverside. The project site is located on Rice Road north of Interstate 10. The following is the scope of work for this report:

- Determine the tributary watershed area using the United States Geodetic Survey 20 foot interval topographic mapping.
- Determine the flow rate utilizing a yield obtained from the Enveloping Curves included in the Riverside County Flood Control and Water Conservation District (RCFC & WCD) Hydrology Manual.
- Determine the depth of flooding for the flows tributary to the project site.
- Determine the velocity of flows and required scour depth for the project site.
- Preparation of a report and calculations summarizing the findings and recommendations.

II. PROJECT SITE AND DRAINAGE OVERVIEW

The project is a proposed cellular tower site that will construct a cellular tower and a building within the unincorporated area of Desert Center in Riverside County. The project is located north of Interstate 10 off of Desert Center Rice Road (Highway 177). The project site is approximately 160 acres (with a small northerly portion of the project being developed) located in Section 32 of Township 4 South, Range 16.

The project site will construct one cellular tower and one building within the northerly portion of the project limits. Based upon the United States Geological Survey topographic mapping, two major watersheds are tributary to the project limits. The southerly watershed area may not actually impact the project site, however, it was analyzed since this are of the desert consists of alluvial fan flooding, which can be unpredictable. Therefore, analyzing this southerly tributary watershed would result in more conservative values.

III. HYDROLOGY ANALYSIS

Meetings were held with RCFC&WCD staff regarding the modeling of the tributary watershed area. The total tributary area to the project from both the northerly and southerly watersheds is 1,004 square miles. To analyze this area in the traditional unit hydrograph method by delineating the hydrologic soils and land uses would be be very intense. Therefore, it was agreed upon with RCFC&WCD staff that a yield would be utilized using the Enveloping Curves of Peak Discharges in Southern California included in the RCFC&WCD Hydrology Manual.

The watersheds tributary to the project boundary were determined using the United States Geological Survey topographic mapping, which is 20 foot interval contours. Based upon the mapping, there are two major watersheds tributary to the project designated as Area A and Area B. Area A is the northerly watershed area of 690.08 square miles, and Area B is the southerly watershed area of 313.55 square miles. The southerly watershed may or may not actually enter the project site, however it was analyzed to be conservative.

Using these watershed areas, the Enveloping Curve of Maximum Floods in Interior Basins of Southern California was utilized to determine the discharge in ft^3/s per square mile (see Appendix A for the Enveloping Curves Graph). Area A resulted in 100 ft^3/s per square mile and Area B resulted in 290 ft^3/s per square mile. The table below summarizes the results:

Area	Area (sq. mi.)	Yield (ft^3/s per sq. mi.)	Total Flow Rate (ft^3/s)
Area A	690.08	100	69,008
Area B	313.55	290	90,930

These flow rates were utilized in the following section to determine the maximum depth of flow within the project limits, the velocity of the flows and the required scour depth.

The peak discharge curves have been included in Appendix A, and the watershed map has been included as Exhibit A.

IV. DEPTH AND SCOUR ANALYSIS

Since the flows tributary to the project boundary are part of an alluvial fan, and therefore required an analyses that would accurately represent this flooding condition. The Cabazon Flood Study, prepared by PRC TOUPS, dated June 1980, was utilized as the guidance document for determining the flooded depth, velocity and required scour depth for the proposed building within the project limits.

The Cabazon Flood Study uses the Dawdy Equation (1979), which assumes that an alluvial channel stabilizes itself at the point where a decrease in depth causes a two hundred fold increase in width, or Width = 200 * Depth. Therefore the change in width over the change in depth (dW/dD) equals 200. The study also uses Manning's Equation of:

$$Q = \frac{1.49}{n} * W * D^{5/3} * S^{1/2}$$

Solving for W and D, and then taking the derivative of both equations, and substituting for dW and dW in the Dawdy Equation allows for a solution for W and D (see Appendix C of Excerpt A for a full derivation of these equations). The resulting equation for depth is:

$$D = \left(\frac{Q\ n}{178\ S^{1/2}}\right)^{3/8}$$

The velocity tributary to the project for each area was determined using the following version of Manning's Equation:

$$V = 0.41\ Q^{1/4}\ S^{3/8}\ n^{-3/4}$$

Once the velocity was determined, the scour depth was determined using the graph included in Appendix B, which was obtained from the Cabazon Flood Study. The following table summarizes the results:

Area	Flow Rate	Depth	Velocity	Scour Depth
Area A	69,008 ft^3/s	7.04 ft	11.70 ft/s	9.0 ft
Area B	90,930 ft^3/s	7.81 ft	12.54 ft/s	9.3 ft

Based upon the results, the maximum scour depth of 9.3 feet shall be utilized for the design, and the building should be elevation 8.8 feet above the existing ground to provide 1 foot of freeboard between the depth of flow and the finished surface of the building.

V. CONCLUSIONS

Calculations were performed to determine the tributary flow rates to the project boundary, to determine the flooding depths within the project limits, and to determine the scour depth. Based upon the analyses, the following have been concluded:

1. The potential peak flowrates tributary to the northerly and southerly project limits are 69,008 ft^3/s and 90,930 ft^3/s, respectively.
2. The maximum depth of water within the project is 7.8 feet. Providing 1 foot of freeboard requires the proposed building to be elevated 8.8 feet above the existing ground.
3. The maximum scour depth is 9.3 feet. Rip-rap should be constructed to a depth of 9.3 feet below the existing ground.

VI. REFERENCES

1. Riverside County Flood Control and Water Conservation District Hydrology Manual, April 1978.

FIGURES

FIGURE 1: VICINITY MAP

PSL # 298145 VICINITY MAP

JLC Engineering & Consulting, Inc.
36263 CALLE DE LOBO
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

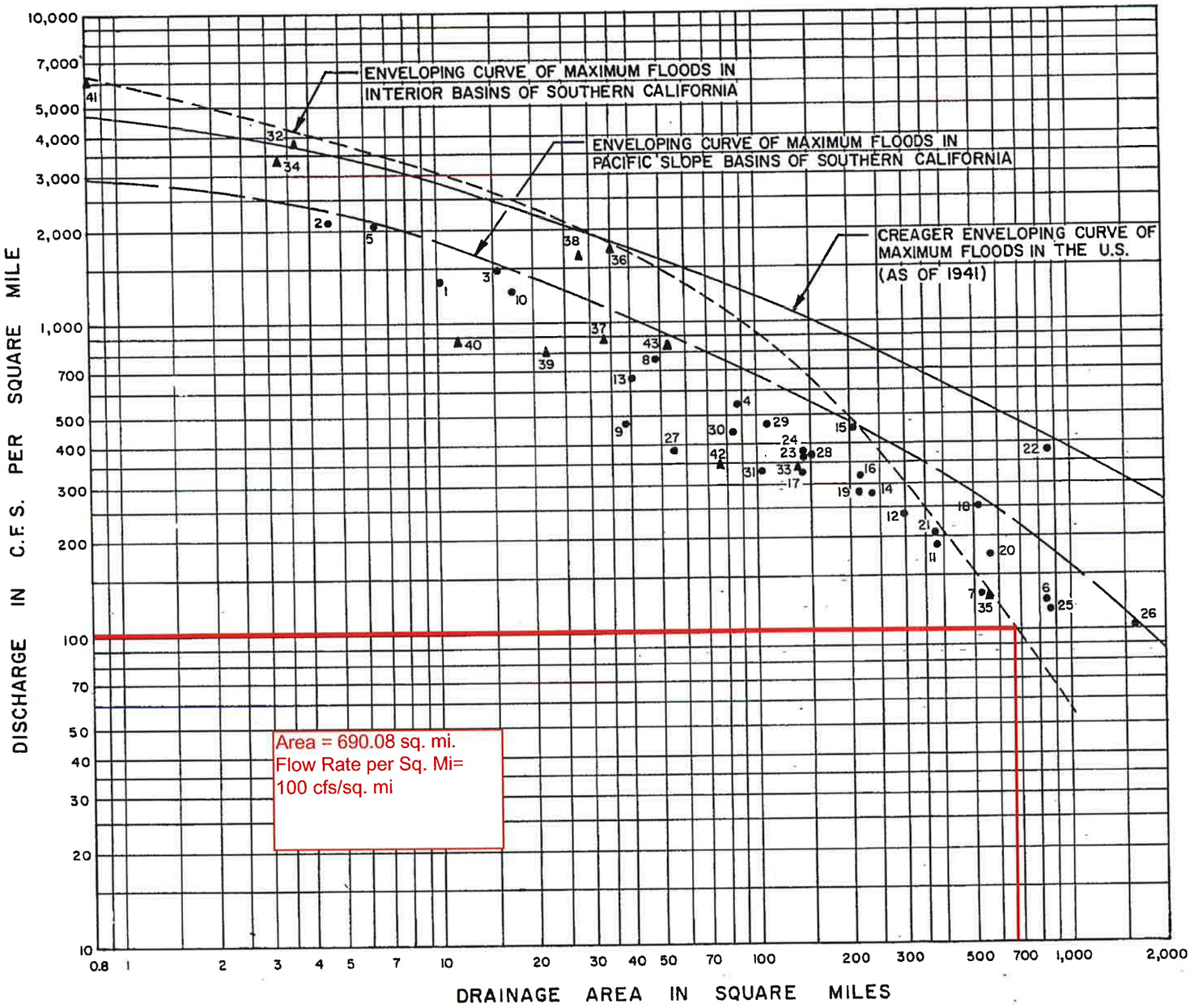
FIGURE 1

Drawing Name: C:\Users\jcarver\Documents\Drawing1.dwg
Last Opened: Jun 21, 2016 – 3:58pm by jcarver

APPENDICES

APPENDIX A: ENVELOPING CURVES OF PEAK DISCHARGES IN SOUTHERN CALIFORNIA

APPENDIX A.1: DISCHARGE PER SQUARE MILE ENVELOPING CURVES – AREA A



RECORDED OR ESTIMATED PEAK DISCHARGES OF RECORD

	STREAM & LOCATION	DRAINAGE AREA (SQUARE MILES)	PEAK DISCHARGE (INCLUDES DEBRIS) C.F.S.	DATE
●	SOUTHERN CALIF.-PACIFIC SLOPE BASINS			
1	CUCAMONGA CREEK NEAR UPLAND	10.1	14,100	25 JAN 1969
2	DAY CREEK NEAR ETIWANDA	4.6	9,450	25 JAN 1969
3	DEVIL'S CANYON ABOVE COGSWELL DAM	15.4	23,000	2 MAR 1938
4	EAST FORK SAN GABRIEL RIVER NEAR CAMP BONITA	88.2	46,000	2 MAR 1938
5	FISH CREEK NEAR DUARTE	6.4	13,000	25 JAN 1969
6	LOS ANGELES RIVER AT LONG BEACH	832	102,000	25 JAN 1969
7	LOS ANGELES RIVER AT LOS ANGELES	514	67,000	3 MAR 1938
8	LYTLE CREEK NEAR FONTANA	47.9	35,900	25 JAN 1969
9	MILL CREEK NEAR YUCAIPA	38.1	18,100	2 MAR 1938
10	SAN ANTONIO CREEK NEAR CLAREMONT	16.9	21,400	2 MAR 1938
11	SAN DIEGO RIVER NEAR SANTEE	377	70,200	27 JAN 1916
12	SAN DIEGUITO RIVER NEAR BERNARDO	299	72,100	27 JAN 1916
13	SAN GABRIEL RIVER AT COGSWELL DAM	40.4	26,900	2 MAR 1938
14	SAN GABRIEL RIVER AT FOOTHILL BLVD	230	61,800	2 MAR 1938
15	SAN GABRIEL RIVER AT SAN GABRIEL DAM	202	90,000	2 MAR 1938
16	SAN GABRIEL RIVER BELOW MORRIS DAM	211	65,700	2 MAR 1938
17	SAN JACINTO RIVER BELOW NORTH FORK NEAR SAN JACINTO	141	45,000	18 FEB 1927
18	SAN LUIS REY RIVER AT BONSALL	512	128,000	23 FEB 1891
19	SAN LUIS REY RIVER NEAR MESA GRANDE	209	58,600	27 JAN 1916
20	SAN LUIS REY RIVER AT OCEANSIDE	557	95,600	27 JAN 1916
21	SAN LUIS REY RIVER NEAR PALA	373	75,300	27 JAN 1916
*22	SANTA ANA RIVER AT AGUA MANSA	855	320,000	22 JAN 1862
23	SANTA ANA RIVER NEAR MENTONE	144	52,300	2 MAR 1938
24	SANTA ANA RIVER NEAR MENTONE	144	53,700	23 FEB 1891
25	SANTA ANA RIVER AT RIVERSIDE NARROWS	858	100,000	2 MAR 1938
26	SANTA CLARA RIVER NEAR SATICOY	1595	165,000	25 JAN 1969
27	SANTA YSABEL CREEK NEAR MESA GRANDE	53.9	21,100	27 JAN 1916
28	TUJUNGA CREEK BELOW HANSEN DAM	150	54,000	3 MAR 1938
29	TUJUNGA CREEK NEAR SUNLAND	106	50,000	3 MAR 1938
30	TUJUNGA CREEK AT TUJUNGA DAM (INFLOW)	81.4	35,000	3 MAR 1938
31	WEST FORK SAN GABRIEL RIVER AT CAMP RINCON	102	34,000	2 MAR 1938
▲	SOUTHERN CALIF.-INTERIOR BASINS			
32	CAMERON CREEK NEAR TEHACHAPI	3.59	13,500	30 SEP 1932
33	DEEP CREEK NEAR HESPERIA	137	46,600	2 MAR 1938
34	LITTLE SAN GORGONIO CREEK NEAR BEAUMONT	3.23	11,000	25 FEB 1969
35	MOJAVE RIVER NEAR VICTORVILLE	530	70,600	2 MAR 1938
36	PINE TREE CANYON 12 MILES NORTH OF MOJAVE	35	59,500	12 AUG 1931
37	PINE TREE CREEK NEAR MOJAVE	33.5	30,000	23 AUG 1961
38	SACRAMENTO WASH NEAR NEEDLES	27	43,000	17 AUG 1939
39	SAN GORGONIO RIVER NEAR BANNING	21.2	17,000	2 MAR 1938
40	SNOW CREEK NEAR PALM SPRINGS	11	9,500	FEB 1927
41	UPPER WILLOW SPRINGS CANYON NEAR MOJAVE	0.81	4,900	30 SEP 1932
42	WEST FORK MOJAVE RIVER NEAR HESPERIA	74.8	26,100	2 MAR 1938
43	WHITEWATER RIVER ABOVE WHITEWATER	51.4	42,000	2 MAR 1938

NOTES:

*1. Because of the extreme variation of this value from the other data, this point was disregarded in construction of the enveloping curve for California.

2. References for flow estimates are USGS Water Supply Papers and Bibliography item No. 13.

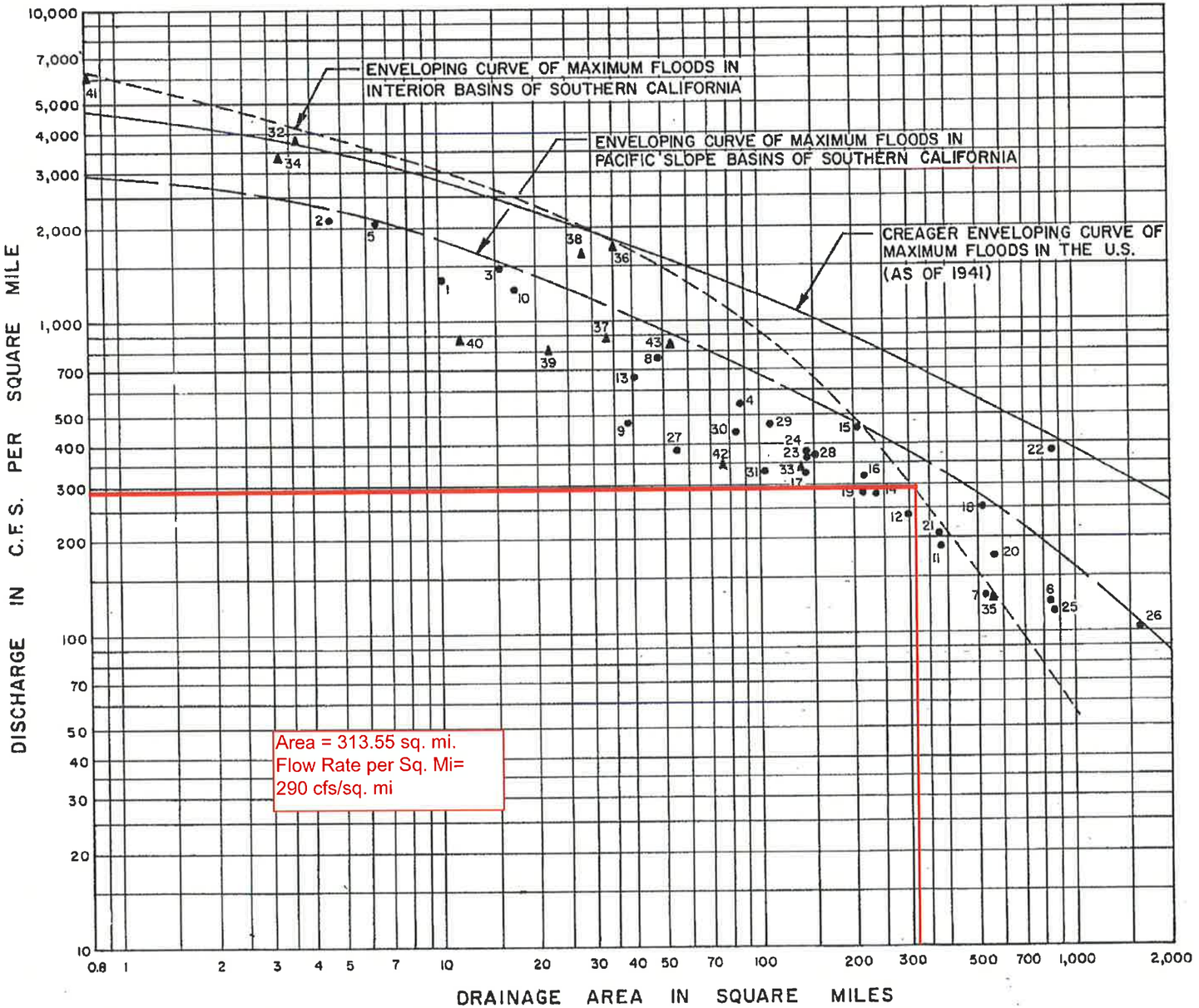
RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

ENVELOPING CURVES OF PEAK DISCHARGES IN SOUTHERN CALIFORNIA

REVISED | APPROVED CHIEF ENGINEER R.E. NO. 3655 | DATE | DRAWN BY R.B.S. | PLATE A-4 | SHEET NO. | DR. NO.

APPENDIX A.2: DISCHARGE PER SQUARE MILE ENVELOPING CURVES – AREA A



RECORDED OR ESTIMATED PEAK DISCHARGES OF RECORD

	STREAM & LOCATION	DRAINAGE AREA (SQUARE MILES)	PEAK DISCHARGE (INCLUDES DEBRIS) C.F.S.	DATE
	● – SOUTHERN CALIF.-PACIFIC SLOPE BASINS			
1	CUCAMONGA CREEK NEAR UPLAND	10.1	14,100	25 JAN 1969
2	DAY CREEK NEAR ETIWANDA	4.8	9,450	25 JAN 1969
3	DEVIL'S CANYON ABOVE COGSWELL DAM	15.4	23,000	2 MAR 1938
4	EAST FORK SAN GABRIEL RIVER NEAR CAMP BONITA	88.2	46,000	2 MAR 1938
5	FISH CREEK NEAR DUARTE	6.4	13,000	25 JAN 1969
6	LOS ANGELES RIVER AT LONG BEACH	832	102,000	25 JAN 1969
7	LOS ANGELES RIVER AT LOS ANGELES	514	87,000	3 MAR 1938
8	LYTLE CREEK NEAR FONTANA	47.9	35,900	25 JAN 1969
9	MILL CREEK NEAR YUCAIPA	38.1	18,100	2 MAR 1938
10	SAN ANTONIO CREEK NEAR CLAREMONT	16.9	21,400	2 MAR 1938
11	SAN DIEGO RIVER NEAR SANTEE	377	70,200	27 JAN 1916
12	SAN DIEGUITO RIVER NEAR BERNARDO	299	72,100	27 JAN 1916
13	SAN GABRIEL RIVER AT COGSWELL DAM	40.4	26,900	2 MAR 1938
14	SAN GABRIEL RIVER AT FOOTHILL BLVD	230	61,800	2 MAR 1938
15	SAN GABRIEL RIVER AT SAN GABRIEL DAM	202	90,000	2 MAR 1938
16	SAN GABRIEL RIVER BELOW MORRIS DAM	211	65,700	2 MAR 1938
17	SAN JACINTO RIVER BELOW NORTH FORK NEAR SAN JACINTO	141	45,000	16 FEB 1927
18	SAN LUIS REY RIVER AT BONSALL	512	128,000	23 FEB 1891
19	SAN LUIS REY RIVER NEAR MESA GRANDE	209	58,600	27 JAN 1916
20	SAN LUIS REY RIVER AT OCEANSIDE	557	95,600	27 JAN 1916
21	SAN LUIS REY RIVER NEAR PALA	373	75,300	27 JAN 1916
*22	SANTA ANA RIVER AT AGUA MANSA	855	320,000	22 JAN 1862
23	SANTA ANA RIVER NEAR MENTONE	144	52,300	2 MAR 1938
24	SANTA ANA RIVER NEAR MENTONE	144	53,700	23 FEB 1891
25	SANTA ANA RIVER AT RIVERSIDE NARROWS	858	100,000	2 MAR 1938
26	SANTA CLARA RIVER NEAR SATICOY	1595	165,000	25 JAN 1969
27	SANTA YSABEL CREEK NEAR MESA GRANDE	53.9	21,100	27 JAN 1916
28	TUJUNGA CREEK BELOW HANSEN DAM	150	54,000	3 MAR 1938
29	TUJUNGA CREEK NEAR SUNLAND	106	50,000	3 MAR 1938
30	TUJUNGA CREEK AT TUJUNGA DAM (INFLOW)	81.4	35,000	3 MAR 1938
31	WEST FORK SAN GABRIEL RIVER AT CAMP RINCON	102	34,000	2 MAR 1938
	▲ – SOUTHERN CALIF.-INTERIOR BASINS			
32	CAMERON CREEK NEAR TEHACHAPI	3.59	13,500	30 SEP 1932
33	DEEP CREEK NEAR HESPERIA	137	46,500	2 MAR 1938
34	LITTLE SAN GORGONIO CREEK NEAR BEAUMONT	3.23	11,000	25 FEB 1969
35	MOJAVE RIVER NEAR VICTORVILLE	530	70,600	2 MAR 1938
36	PINE TREE CANYON 12 MILES NORTH OF MOJAVE	35	59,500	12 AUG 1931
37	PINE TREE CREEK NEAR MOJAVE	33.5	30,000	23 AUG 1961
38	SACRAMENTO WASH NEAR NEEDLES	27	43,000	17 AUG 1939
39	SAN GORGONIO RIVER NEAR BANNING	21.2	17,000	2 MAR 1938
40	SNOW CREEK NEAR PALM SPRINGS	11	9,500	FEB 1927
41	UPPER WILLOW SPRINGS CANYON NEAR MOJAVE	0.81	4,900	30 SEP 1932
42	WEST FORK MOJAVE RIVER NEAR HESPERIA	74.8	26,100	2 MAR 1938
43	WHITEWATER RIVER ABOVE WHITEWATER	51.4	42,000	2 MAR 1938

NOTES:

*1. Because of the extreme variation of this value from the other data, this point was disregarded in construction of the enveloping curve for California.

2. References for flow estimates are USGS Water Supply Papers and Bibliography Item No. 13.

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

ENVELOPING CURVES OF PEAK DISCHARGES IN SOUTHERN CALIFORNIA

APPROVED — CHIEF ENGINEER R.C.F.C. & W.C.D. — DATE
DRAWN BY R.A.S.
PLATE A-4
SHEET No.
DWG No
REVISED

APPENDIX B: SCOUR DEPTH CALCULATIONS

APPENDIX B.1: VELOCITY VS. SCOUR DEPTH – AREA A

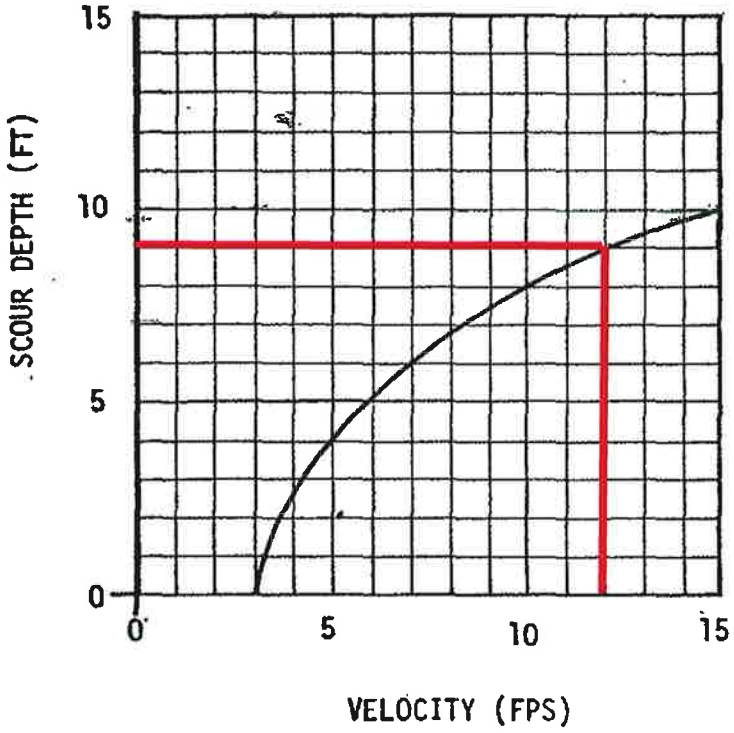


FIGURE 3 SCOUR DEPTH

APPENDIX B.2: VELOCITY VS. SCOUR DEPTH – AREA B

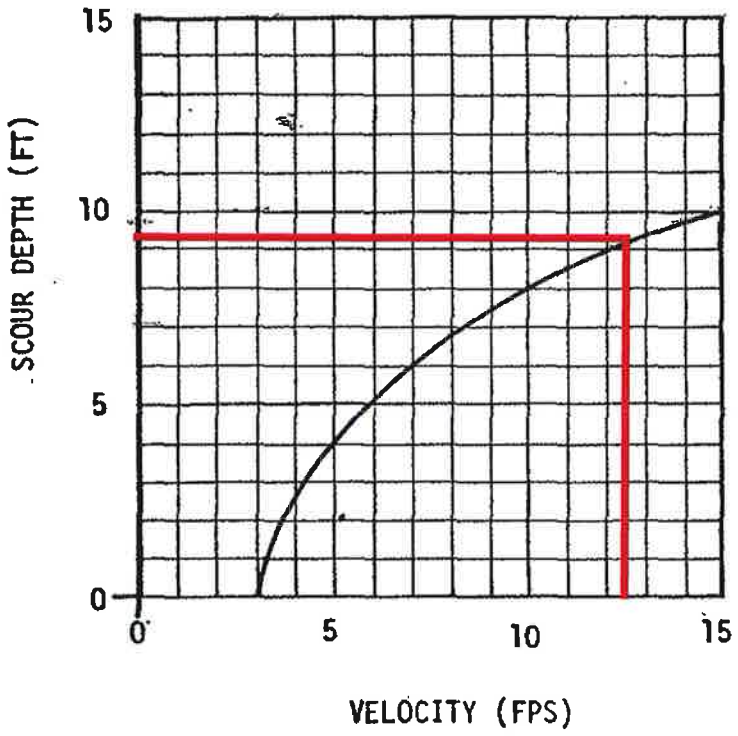


FIGURE 3 SCOUR DEPTH

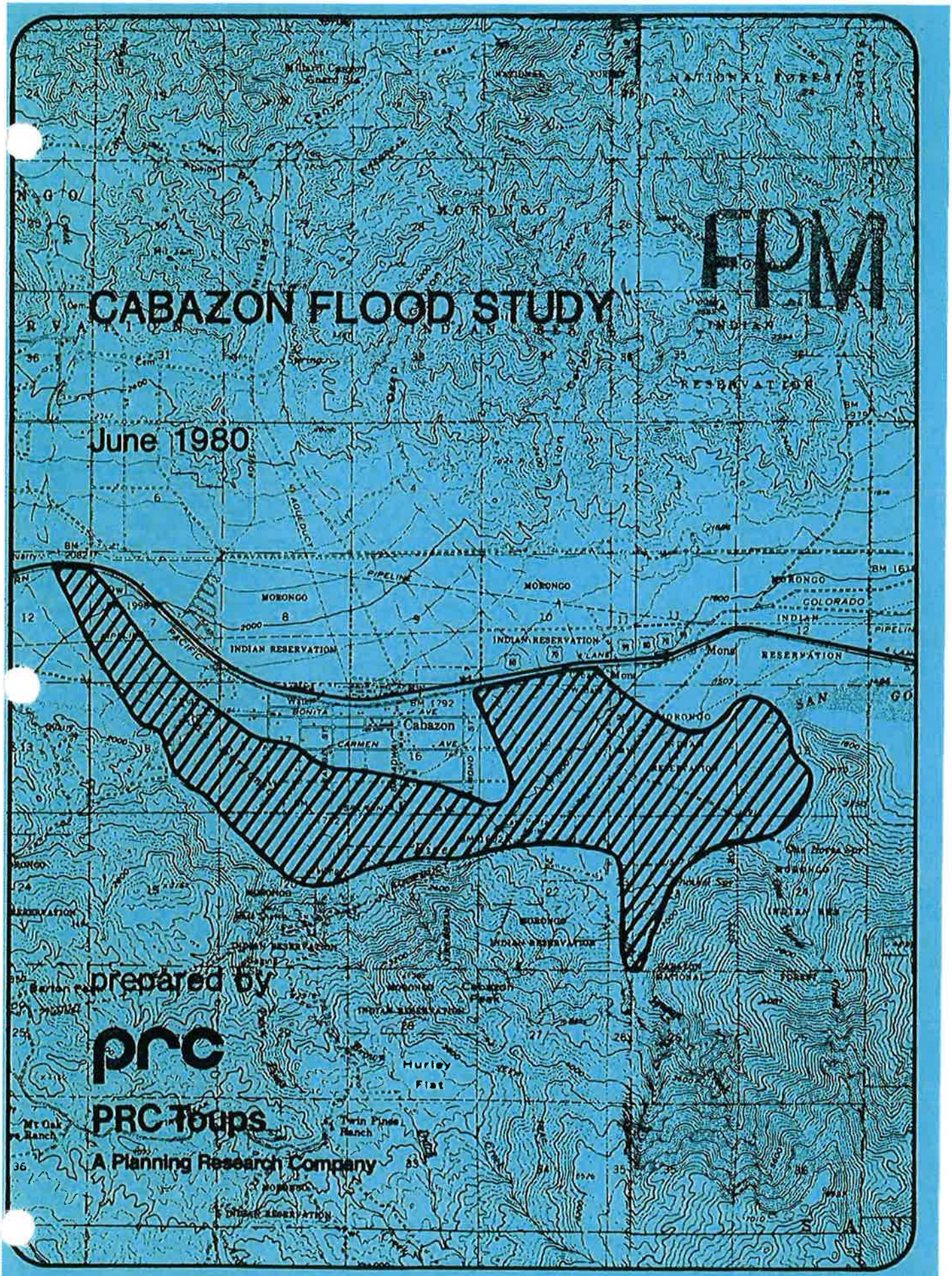
EXCERPTS

EXCERPT A: **CABAZON FLOOD STUDY, PREPARED BY PRC TOUPS, DATED JUNE 1980**

CABAZON FLOOD STUDY

FPM

June 1980



prepared by

prc

PRC Toups

A Planning Research Company

PRC Toups

June 12, 1980

Mr. Kenneth L. Edwards, Chief Engineer
Riverside County Flood Control
and Water Conservation District
1995 Market Street
Riverside, California 92502

Subject: Cabazon Flood Study

Dear Mr. Edwards:

PRC Toups is pleased to submit this report on flood hazards in Cabazon. The report identifies the extent and character of flooding from the San Gorgonio River, Jenson Creek, and Millard Canyon Creek. Recommendations on the type of development suitable within the identified flood plains are made and floodproofing guidelines provided. By the application of the guidelines and development limitations outlined in the report, flood damages can be avoided for future development.

The identification of flood hazards is important to the continuing development of the community of Cabazon. We appreciated the opportunity to participate in this study and look forward to providing additional assistance as necessary.

Very truly yours,

PRC TOUPS

Jens Thielmann

Jens Thielmann
Project Manager

JT:fa

A Planning Research Company
6529 Riverside Avenue, Riverside, California 92506
Telephone (714) 359-4301

CABAZON FLOOD STUDY

Prepared for:

Riverside County Flood Control
and
Water Conservation District

Prepared by:

PRC TOUPS
6529 Riverside Avenue
Riverside, California 92506

JUNE 1980

CONTENTS

CABAZON FLOOD STUDY

Recent development pressures in the Cabazon area have created an urgent need for definitive guidelines on development within the floodprone segments of this community. Devastating floods in recent years have underscored this critical need. Prior flood studies have been done for the area, but lack sufficient detail for use in regulating development. This report, prepared by PRC Toups was authorized by the Riverside County Flood Control and Water Conservation District in response to this need.

The study area, an unincorporated portion of Riverside County located between Banning and Palm Springs at Cabazon, can generally be described as including those areas south of Interstate 10 (I-10) freeway and east of Fingal Point which are subject to flooding from the San Gorgonio River, Jenson Creek, and Millard Canyon Creek. The study area is delineated on Figure 1.

This report provides a detailed study of the indicated flooding sources and determines not only the boundaries of the flooding, but the character of flooding including velocity, depth and width. Other factors such as erosion, scour and siltation are also addressed. Recommendations on where development should be permitted or prohibited are made. Guidelines on methods of flood proofing structures are provided. Land density and other land planning recommendations relative to the flood prone areas are made.

SHR - SHDL2

The steep slopes and easily erodable alluvial bed material characteristic of the study area required the development of methodologies which addressed these conditions. A research of current methodologies was made and the most appropriate was selected for use in this study. Modifications to the selected methodology were made to suit the unique features of the study area. The developed methodology permits the determination of flood boundaries, depths, widths and velocities. Additional methods were developed to determine maximum land development densities consistent with the flood hazard potential.

SHR - UFR (alluvial)

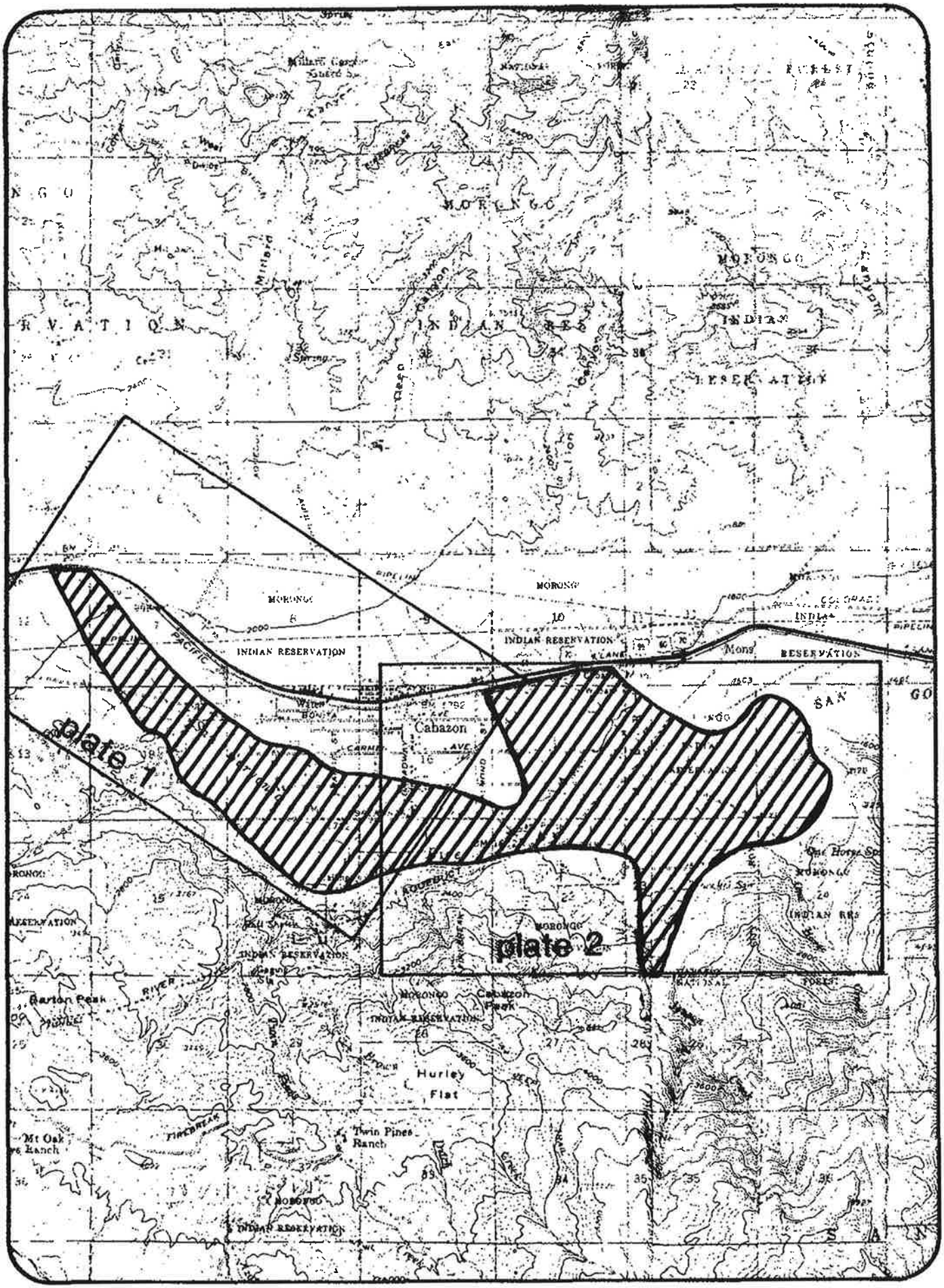


Figure 1 STUDY AREA

The study results delineating flood hazard areas are shown on the two report plates attached to the back of this report. Flood proofing guidelines are summarized on Figure 4.

BACKGROUND

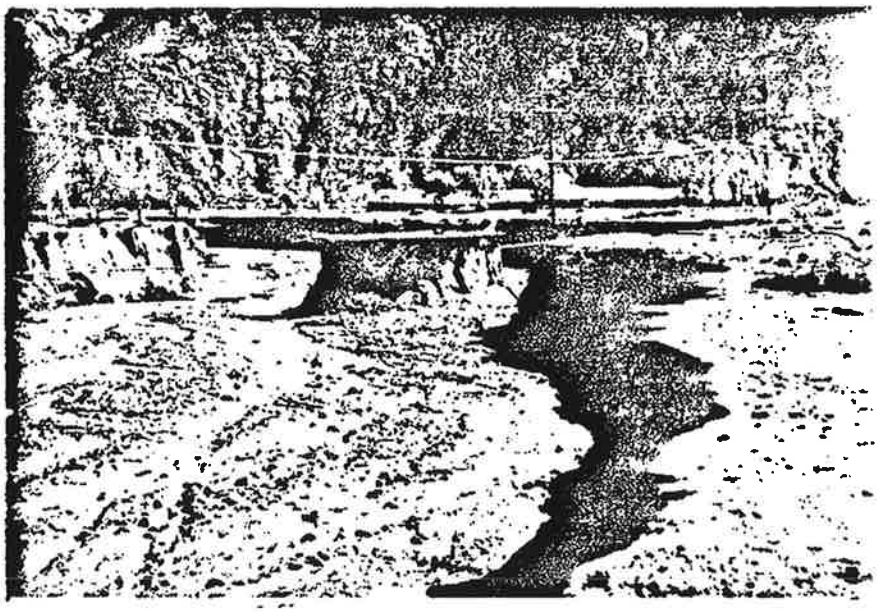
Both the San Bernardino and San Jacinto Mountains form the watershed contributing to flood flows in the study area. The San Gorgonio River, which drains a roughly rectangular watershed area of about 150 square miles from both mountains is characterized as a wide sandy watercourse. Upstream of the Esperanza Avenue dip crossing, the river's steep bed slope of two to three percent, coupled with the soft alluvial bed material subject the river to severe and unpredictable lateral and vertical erosion. During major floods, the river's course can change dramatically, creating new overflow channels. Downstream of the Esperanza Avenue dip crossing, the river's bed slope decreases to about one percent, with resulting lower velocities. Sediments carried along with the higher upstream velocities can settle out in the lower portions of the river. The lower velocities and topographic conditions in the lower reaches reduce the likelihood of occurrence of the unpredictable flow paths characteristic of the upper reaches. Instead, the lower reaches have a well defined water course. Within the study area, flows in the river are ephemeral, occuring only during and shortly after a significant rainfall.

Millard Canyon Creek, which drains approximately 15 square miles of watershed within the San Bernardino Mountains, flows over an alluvial fan, ultimately reaching the San Gorgonio River. Within the study reach, numerous well defined watercourses emanate from culverts under the Southern Pacific Railroad which, combined with the I-10 freeway intersects the otherwise unobstructed alluvial fan. The steep two to three percent bed slopes give rise to the same unpredictable flow paths during floods as are characteristic of the upper reaches of the San Gorgonio River.

Jenson Creek, which drains approximately four square miles of watershed within the San Jacinto Mountains flows over a steep alluvial cone formed out of sediment and boulders originating within the watershed. The Jenson Cone has the shape of a classical alluvial fan with a narrow apex and well defined convex cone with boundaries defined by the adjacent mountains. A feature distinguishing the cone from a normal alluvial cone, however, is the predominance of large boulders interspersed in the alluvial material within the upper reaches. Field investigations along with aerial topography show a well defined incised channel in the upper reaches, approximately above elevation 1,650 feet. This channel, which hugs the easterly toe of the San Jacinto Mountains has the characteristics of a typical mountain stream. The creek bed and sides are well defined and highly armored with large adjoining boulders, up to ten feet in diameter. Flows in the upper reaches are perennial, giving rise to an established riparian growth. Below elevation 1,650 feet the boulders become scattered and decrease rapidly in size with decreasing elevation. At the lower portion of the cone, the boulders are absent altogether and the fan is comprised entirely of non-cohesive alluvial sediment.

Flooding from these sources can occur anytime of the year, although the significant floods of record have all occurred during the winter months. Floods resulting from tropical storms may occur during the summer and earlier fall months. The smaller watersheds such as Jenson and Millard Creeks are more likely to flood from this kind of weather condition whereas the San Gorgonio River is more likely to be affected by a general winter storm.

The most damaging flood of record occurred during January 1969, where the severe erosive force of the San Gorgonio River scoured new channels which did not previously exist. Figure 2 shows a portion of the scoured area at Broadway Avenue near Dolores Avenue. Flood flows from Jenson Creek inundated a subdivision located at the base of the cone. Land erosion occurred on the Millard Cone as a result of the flood flows there.



(FIGURE 2 - SAN GORGONIO CREEK OVERFLOW CHANNEL)

Other damaging floods of record occurred during February 1969, November 1965 and March 1938. Significant to the study undertaken herein, are the paths of flow taken by the floods, the magnitude of flow that occurred, and the severe erosion and siltation that was observed. This information is useful in the prediction of future flood characteristics in the area.

Prior flood studies have been made within the Cabazon Area. The U.S. Army Corps of Engineers published a "Flood Plain Information" Report for the San Gorgonio River and Smith Creek in June of 1973 [U.S.C.O.E., 1973]. The study included a hydrologic and hydraulic analysis which determined flood flow frequencies and flood plain limits, widths, depths and velocities for the San Gorgonio River. A detailed study of the river below Experanza Avenue was made, but the analysis of the reach above the Esperanza Avenue provided only an approximate indication of areas subject to flooding.

Recognizing the need for additional studies in the area, the Corps of Engineers extended their study the following year to include tributaries of the San Gorgonio River including Jenson Creek and Millard Canyon Creek. This study also provided only an approximate indication of areas subject to flooding [U.S.C.O.E. 1974].

In 1976, the Federal Emergency Management Agency (formerly Federal Insurance Administration) studied the Cabazon area for purposes of determining flood hazard areas and setting flood insurance rates [HUD, 1976]. Flood boundaries published by FEMA correspond to those of the Corps of Engineers reports. Information contained in the FEMA report was limited to mapping of flood boundaries and did not provide flood depths, velocities or other flood characteristics. Also, no floodproofing guidelines were provided nor were conditions imposed to restrict development within the area, except that flood insurance is mandatory in the flood hazard areas delineated.

No significant flood control facilities are located along the San Gorgonio River or at Jenson Creek which would control flood flows. A sand levee located in the upper reaches of the San Gorgonio River controls only low flows and is considered ineffective in controlling major flood flows.

A concrete-lined channel along the westerly boundary of the Millard Canyon Creek cone serves to define that boundary and prevent flows from spreading laterally to the west of the channel. It does not however, protect lands to the east.

The I-10 freeway and the Southern Pacific Railroad are the only man-made structures which could have a significant effect on the nature of flooding in this area. Their effects are considered and described in a subsequent section of this report.

Existing development within the flood plains of the three flooding sources lies principally at the base of the Jenson Cone, where existing structures are subject to flooding from both Jenson Creek and the San Gorgonio River. Along the upper reaches of the San Gorgonio River some isolated structures can be found. In the Millard Cone only one structure is currently located there, but much subdivided land is located within the Millard flood plain.

METHODOLOGY

This section describes the methods used in determining the hydrologic and hydraulic analysis necessary to this study. A literature search was conducted to determine the most appropriate method of flood plain analysis, particularly with regard to alluvial fans. Modifications were made as needed to accurately account for the unique conditions characteristic of the study site.

HYDROLOGY

In the preparation of the Flood Plain Information Reports, the Corps of Engineers prepared a detailed hydrologic analysis of all the streams under study. Their method of analysis was based on a statistical analysis of stream gage records for gaged streams in the same hydrologic vicinity as the study streams. Peak discharges computed by the Corps were considered appropriate to this study and used. Criteria established by the Riverside County Flood Control and Water Conservation District and FEMA set the 100-year flood as the basis for flood plain regulations and therefore is the base frequency used herein. Since the indicated discharges are based on stream gage data, no bulking factors for debris were applied to the values for use in this study as stream gage data includes the effects of debris. Table 1 lists 100-year peak discharges used in the study.

TABLE 1. 100-YEAR PEAK DISCHARGES

Flood Source & Location	100-Year Peak Discharge (cfs)	Drainage Area (S.M.)
San Gorgonio River [b]		
at U/S of Fingal Point	30,000	148
at D/S of SPRR	21,000	46
Jenson Creek		
at Canyon Mouth [a]	5,000	3.8
Millard Canyon		
at Canyon Mouth [a]	11,000	15.5

[a] U.S. COE, 1974
[b] U.S. COE, 1973

FLOOD DEPTH, WIDTH AND VELOCITIES

The primary characteristic of flooding on the alluvial fans and plains within the study area is that the flood flows form their own channels in the generally non-cohesive alluvial material through which they flow. Conventional "backwater" hydraulic analyses are usually inappropriate in all but the flatter reaches of the study area because there is no consideration given to the change in the channel geometry which is caused by the flows. Conventional analytical methods are based on an assumption of rigid channel boundaries.

In recognition of this deficiency, the Federal Emergency Management Agency (FEMA) recently developed and adopted specific methodology for analysis of flood hazards on alluvial fans [HUD, undated]. The method predicts not only the width, but the depth of the channel that is formed by the flood flows. The study bases the predicted channel geometry on the observation that an alluvial channel will continue to widen until the ratio of width to depth approaches 200. At this point the channel width stabilizes. Coupled with this observation is the contention that flows on alluvial fans are at critical depth. Statistical equations are also used to take into account the probability of a flooding event occurring on a specific point on the fan, since the width of the channel formed is generally only a fraction of the possible width over which the flooding could occur.

Other studies on alluvial fan methodologies have been conducted [Leopold and Maddock 1953] [Leopold and Langbein 1962] however, these studies only provide general relationships of parameters associated with alluvial flooding but not sufficient information for predicting width and depths of channel formation. Additional studies have been made which provide only indications of velocities in alluvial channels [Mostafa 1978].

A review of the indicated literature was made in order to determine the appropriate methodology to use in the study. The FEMA method was the only study which would predict all of the parameters needed in the flood hazard analysis. However, although the FEMA method is appropriate for determining statistical velocities and depths useful in setting insurance rates, in our opinion it does not reflect transitory peak conditions to which improvements within the flood plain

must be designed to in order to protect them from a 100-year peak discharge. Moreover, the bed slopes for which the FEMA methodology was developed were on the order of 2 to 3 percent, whereas slopes in the study area are as high as 18 percent. For this study, it is believed that the Manning's resistance equation is more appropriate than the critical depth used in the FEMA study. Therefore, using the observation that a channel will cease to widen when the depth-width ratio approaches 200, and equating this to the first order derivative of depth with respect to width using Manning's equations, yields the following equations:

$$D = 0.143\,(Qn)^{3/8} S^{-3/16}$$

and

$$W = 17.2\,(Qn)^{3/8} S^{-3/16}$$

and using $V = Q/A$

$$V = 0.41\, Q^{1/4} S^{3/8} n^{-3/4}$$

A full derivation of the indicated equations is included in the Appendix. Using these equations for the conditions within the study site, figures of 1 to 3 feet of depth and 10 to 25 feet per second (fps) of velocity and widths of 100 to 500 feet are computed. We believe that the computed velocities are supported by field evidence of past floods at the study site. Discussions with Mark Busby (Senior Hydrologist, U.S.G.S.) indicate that indirect field measurements of flood flows on alluvial fans in the general vicinity of the study site yield velocities in the range of 15 to 25 fps. Using equations developed for rapid flow in alluvial channels [Mostafa 1978], velocities up to 35 feet per second are calculated. Both of these lend support to the velocities predicted by the substitution of Manning's equation for critical depth in the original FEMA methods. Although much additional research is needed in the subject, it is believed that the methodology developed herein will provide reasonable estimates.

Using 100-year peak discharges previously established by the U.S. Army Corps of Engineers for the streams within the study area along with the bed slopes and appropriate Manning's values, sufficient parameters are available for the calculations of depths, widths and velocities. As indicated earlier, the width

computed corresponds to the width of channel eroded by the flood flows. The depth of flow is the "normal" depth corresponding to that width. It must be noted that the depth of flow and depth of channel are not necessarily identical because of the action of scour which tends to deepen the channel.

FLOOD BOUNDARIES

Prior floods have shown that flooding can occur anywhere along a given contour across an alluvial fan. Therefore, flood hazard boundaries to be determined in this study are not based upon the width of channel erosion computed in the developed methodology, but are derived from topographic constraints using available 400 scale aerial topographic maps. Photographs showing historic flooding in the study site and on other similar alluvial fans were also used in the determination. The effects of man-made structures such as railroads, freeways and culverts were considered by the use of conventional hydraulic analyses.

SHR - UFR1 (alluvial)

For the San Gorgonio River, the upstream study limit coincides with the I-10 freeway. A conventional hydraulic analysis indicates that the 100-year flood flows will pass under the existing freeway bridge. With this as a starting point or apex of the flows, and the observation that alluvial fan flooding diverges at an angle of about 15 degrees from the apex, boundaries of flooding immediately downstream of the I-10 crossing were delineated. Further downstream, the adjacent mountains provide a well-defined boundary for the southerly flood hazard limits. For the northerly side, the point where the contour lines abruptly change direction provide a reasonable boundary when used along with photos showing historical flooding in that area.

For the lower portion of the San Gorgonio River, conventional "backwater" analyses were made using the Corps of Engineers' HEC-2 computer program. It is believed that this portion of the river permits the use of this method because of the much flatter slopes (1 percent) in this reach as compared with 2 and 3 percent in the upper reach. A "floodway" section was computed by determining the extent of area on the southerly bank of the river where encroachment could be permitted without raising the water surface by more than one foot.

As indicated earlier, the Jenson alluvial fan has a classical fan shape, with well-defined boundaries formed by the adjacent mountains. However, the presence of large boulders forming an effective bed and side armoring for the incised channel in the upper reaches of the cone suggest that flooding will be confined to the creek's channel in the upper reaches although excessive debris generated within the watershed can reduce its capacity. As flows progress downstream, the diminishing size and number of boulders permits the flows to take unpredictable directions as they scour their own channels.

The Millard fan is somewhat complicated by the presence of the I-10 freeway and the railroad which bisect the entire fan. Conventional hydraulics indicate that flows upstream of the freeway are likely to approach the freeway in two paths due to upstream dykes and topographic constraints. Within the freeway, a series of seven culverts divides the flow further. Between the freeway and the railroad, the flows recombine and flow out of a series of 8 culverts under the railroad. However, the combined capacity of the culverts is not sufficient to prevent overtopping of the railroad embankment. The geometry of the railroad embankment along with other uncertainties prevent a prediction of where the flows will break out. It can, however, be safely assumed that there will be at least three major breakout points along the railroad embankment. Therefore, the effect that the railroad and freeway system has is that it reduces the severity of the 100-year flooding to the extent of spreading the width of flooding over a wider area than it would be under natural conditions, but does not make the location of the flooding any more predictable than if it were a natural alluvial fan. The westerly boundary of the Millard fan can by inspection of the aerial photography, be located at the existing concrete channel. The easterly boundary, which begins at the last railroad culvert crossing the Millard fan, is extended using the divergence angle previously discussed for the San Gorgonio River. The southerly boundary is made to coincide with the floodway limit of the San Gorgonio River.

DEVELOPMENT CRITERIA

Using the previously established flood hazard boundaries, velocities, depths and channel widths, criteria for development can be established. Flood velocities are a significant consideration because they provide an indication of the potential for erosion and scour. Using Los Angeles Flood Control District criteria, and field observations of scour from historical floods in the study area, scour depths as shown on Figure 3 can be anticipated. UFR1(1)

Protection of a structure would require that non-erosive material, e.g., rock rip rap, etc., be placed below grade to the indicated scour depths. Moreover, the potential exists for the flows to be abruptly interrupted by a structure causing the velocity head of the flows to be converted to an equivalent depth of water. This would require raising of pads for structures to a height equal to the sum of depth plus velocity head. UFR1(1) An alternative to slope protection is the construction of pile foundations, which must extend below the indicated scour depths. The publication "Elevated Residential Structures" [HUD, 1976] provides guidelines to this type of construction.

The width of the channel created by the flood flows is significant because it provides an indication of how much area must be left undisturbed in order to permit conveyance of flows through a fully developed community. UFR1(1) Using the ratio of channel width to available flooding width provides a basis for setting permissible housing density. Calculations (see Appendix) indicate that minimum lot sizes for the Millard and the Jenson fans should be one-third acre and one-half acre, respectively. In addition to minimum lot size requirements, calculations show that 30 percent and 35 percent of the lot width in the direction of flow for the Millard and Jenson fans respectively must remain unobstructed.

It is believed that strict limitations on development should be made after an upper limit is reached on flow velocities, not only because of the severe flood proofing requirements to individual structures but because of the severe impact that a flood would have to the adjacent areas such as surrounding roads and utilities. SHDL2 It is believed that when velocities reach 15 fps development should be limited. This

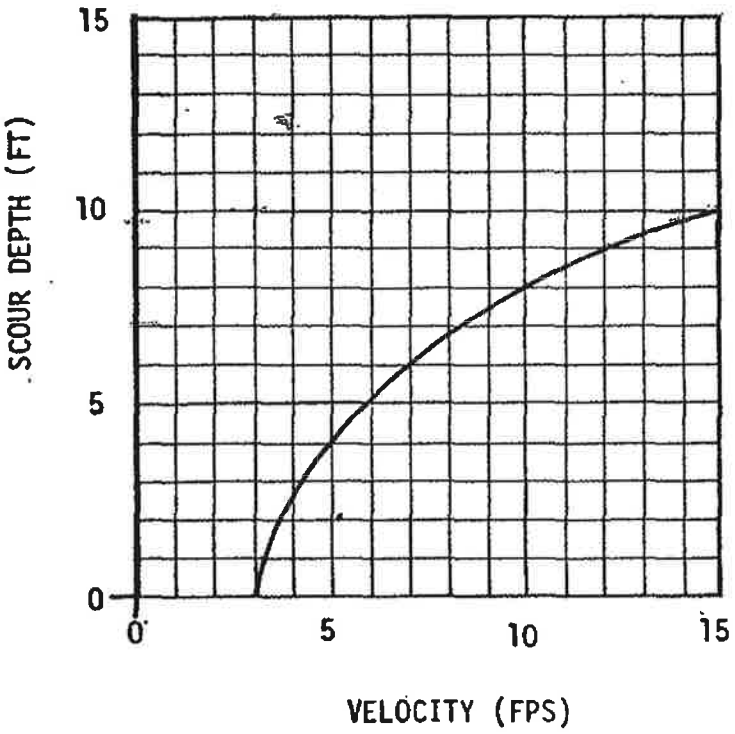


FIGURE 3 SCOUR DEPTH

velocity is based on criteria used by agencies involved in flood control. The Corps of Engineers, in the "Flood Proofing Regulations Manual" [U.S.C.O.E. 1972] states that "a velocity of 10 feet per second is considered to be an upper limit for which flood proofing measures are economically effective, except for special structures and facilities built at the edge of a channel, where permitted." Los Angeles County Flood Control District generally permits construction of levees for protection of structures only up to 20 feet per second [LACFCD, 1970]. Areas delineated on Plates 1 and 2 which have velocities of 15 fps or greater are designated as a "Severe Flood Hazard Area." Within these areas, development should be limited to those uses consistent with the County of Riverside's W-1 Zone (Watercourse Area) as amended December 10, 1975 (see Appendix). SHDL2

The upper reaches of the San Gorgonio River fall into this category, with the 20 fps velocities computed at that location. Based on the channel widths computed, and field observations of the 1969 floods, it is clear that unacceptable damages would be sustained to a community located within the flood hazard boundaries. During a 100-year flood, a channel 500 feet wide and more than ten feet deep could form resulting in complete isolation for affected areas. Portions of the Millard and Jenson fans with 15 fps or greater velocities are subject to similar conditions.

For areas with lower velocity potential, such as portions of the Millard fan and Jenson fan, some development could proceed subject to strict flood proofing requirements and density limitations as outlined herein. UFR1(1) The indicated precautions notwithstanding, prospective developers of lands should be made aware of potential for damage to adjacent surrounding improvements. Figure 4 summarizes flood-proofing measures which should be taken.

For the lower reaches of the San Gorgonio River, development could occur in most of the flood fringe areas, provided pads are raised to the elevation of the 100-year flood and protection of the fill is provided for velocities of 3 fps or greater. The requirements of County Ordinance No. 458 are applicable to the flood fringe area. One hundred year flood elevations are profiled on Figure 5. A 6- to 12-inch freeboard above the 100-year flood elevation would provide additional safety and is encouraged. The only exception to development in the fringe is the reach of river between mile 6.5 and 7.3, delineated as a "Special Fringe Area" on Plate 2. Since

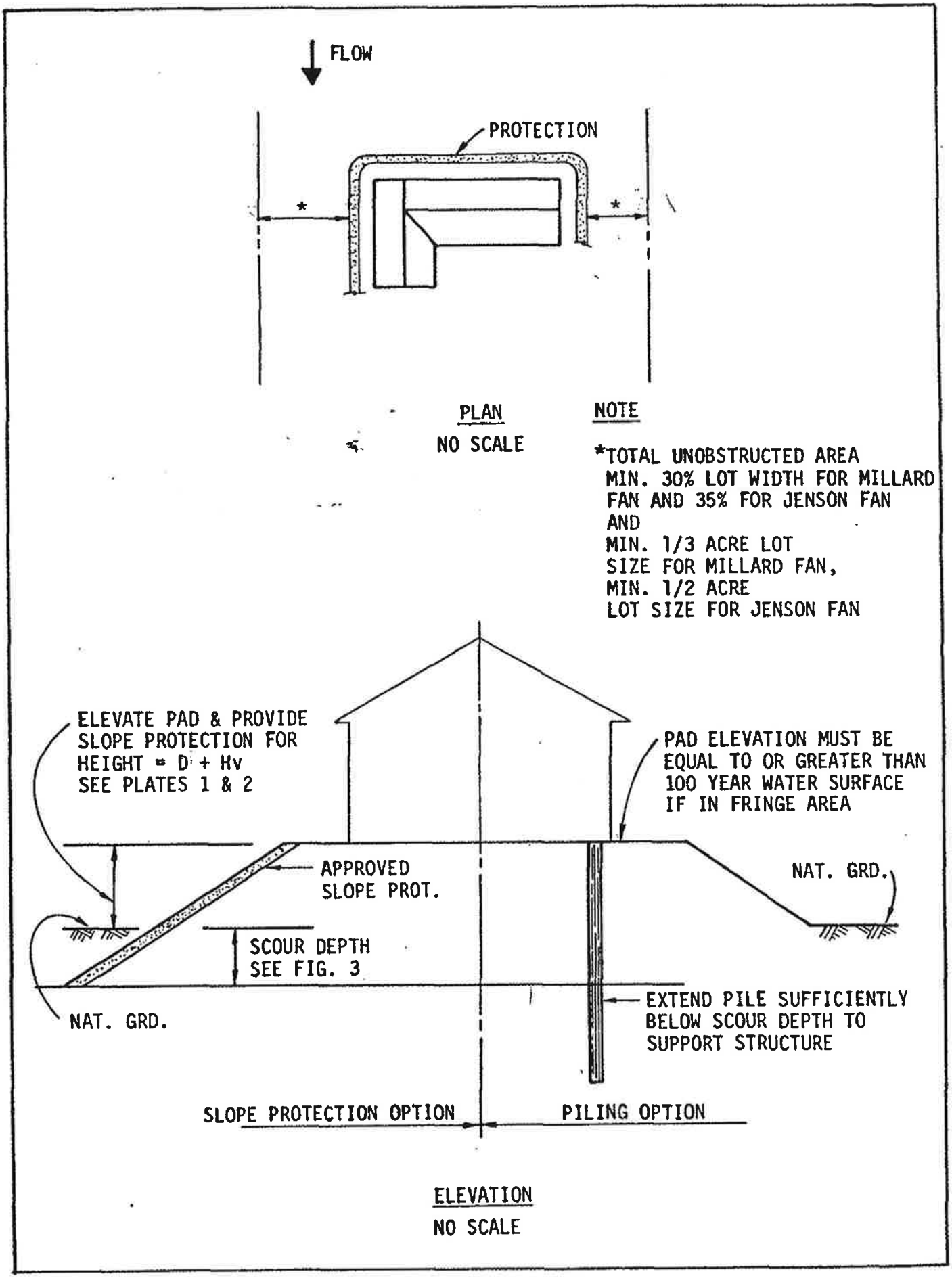


FIGURE 4

FLOODPROOFING CRITERIA

the main flows impinge directly on the river curve there, development should not proceed until bank protection is provided for the entire curve. The floodway portion of the San Gorgonio River should remain unobstructed as outlined in Ordinance No. 458.

For all three of the flooding sources, no obstructions should be placed within any of the defined drainage swales. Plates 1 and 2 delineate defined drainage swales with a line designated as "watercourse." No structures or other obstructions should be placed within 25 feet of the bank.

An additional area located southwest of the intersection of Elm Street and Esperanza Avenue, which is outside the influence of the San Gorgonio River and Jenson fan but is affected by small flows from the surrounding mountains, was also studied for flood hazards. Since the flows are small, it is recommended that development in this area provide for raising of pads a minimum of one foot above the natural ground as a protection against local sheet flooding.

REGIONAL SOLUTIONS

An alternative to protection of individual residences is the construction of regional flood control facilities, which would protect the entire area. Floodproofing criteria for individual structures presented earlier was given not because it is preferable to a regional solution, but because a means of implementing regional facilities is currently unattainable. Regional solutions are the preferred method of flood control in the area because they will protect surrounding support facilities such as roads, water lines and other utilities in addition to serving the primary function of structure protection.

Solutions to all three flooding sources studied must give adequate consideration to the high volumes of debris transported during floods. This is particularly acute for the Jenson Creek area, where large quantities of debris generated within the watershed are carried with the high velocity flows in the steep areas of the cone and can settle out and fill in channels in the flatter reaches.

The construction of subdivisions should proceed only if adequate flood proofing for each building is provided, and the densities recommended in this report are complied with. An alternative would be to construct a regional facility which would protect the development but would not divert flows to adjacent lands.

RECOMMENDATIONS

Study results indicate that a severe flood potential exists within the flood plains of the Cabazon community. In some locations, it is believed to be so severe that strict limitations should be placed on development. In other areas, it is recommended that development only occur if flood proofing measures as outlined herein are strictly followed. Plates 1 and 2, showing the location and type of flooding, along with Figures 3 and 4, which provide flood proofing criteria, and Figure 5 showing 100-year water surface elevations provide the necessary conditions for development in the area to the extent of providing for protection against a 100-year flood.

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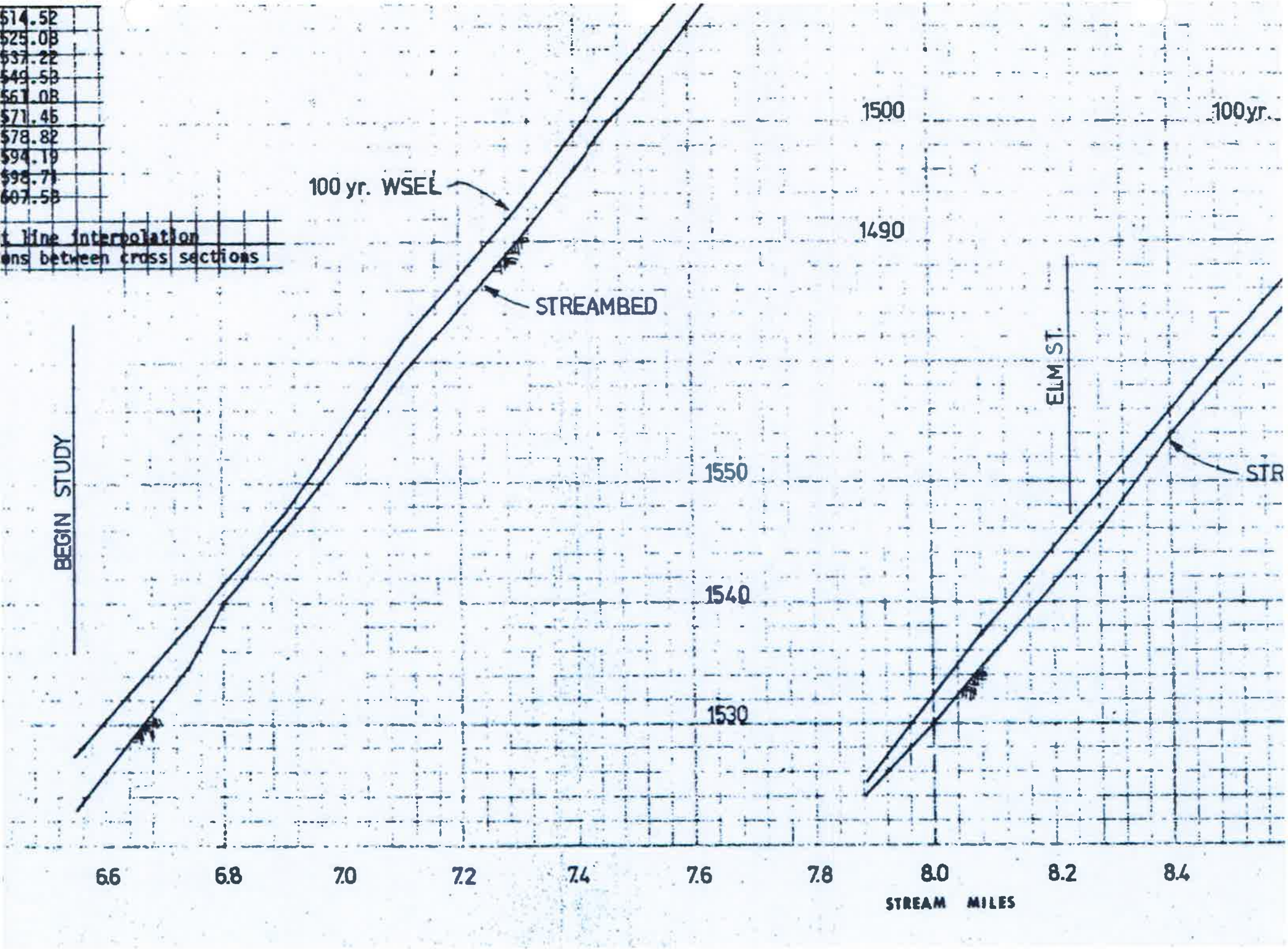
$14.52
$25.08
$37.22
$49.53
$61.08
$71.46
$78.82
$94.19
$98.71
607.53
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100 yr. WSEL
STREAMBED
BEGIN STUDY
1500
1490
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100yr.
ELM ST.
STR
6.6
6.8
7.0
7.2
7.4
7.6
7.8
8.0
8.2
8.4
STREAM MILES

Appendix A

PRC Toups

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**********************************************
  HEC2 RELEASE DATED NOV 76 UPDATED AUG 1977
  ERROR CODE -  01,02
  MODIFICATION -  10,11,12,13
**********************************************

C
T1      CAPAZON STUDY 100 YEAR FLOW
T2      SAN GORGONIO RIVER
T3      CH TOWES VENTURA

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
      -0        2         -0        -0  -1.000000     -0.00     -0.0       -0   1449.000    -0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLOC     IRU       CHNIM     ITRACE
     1.000     -0.000    -1.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    15.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
    38.000    42.000    39.000    63.000     1.000     2.000    25.000     5.000    10.000    43.000

     4.000    53.000    54.000    -0.000    38.000    43.000    50.000    55.000    26.000    56.000

    13.000    14.000    15.000    36.000    27.000    28.000     8.000    -0.000   100.000    -0.000

   200.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000

J5  LPRAT   NUMSEC                 ********REQUESTED SECTION NUMBERS********
    -10.000   -10.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000
NC      .035      .035      .035      .200      .400     -0.000    -0.000    -0.000    -0.000    -0.000
QT     2.000  30000.000  30000.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000
ET    -0.000    -0.000     4.100  3981.130  4941.520     -0.000    -0.000    -0.000    -0.000    -0.000

        FLOW LINE SET AT 4000

        STATIONING FROM LEFT TO RIGHT LOOKING UPSTREAM

X1      6.550    12.000  3920.000  5160.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000
GR   1460.000  3950.000  1444.000  3990.000  1443.000  4010.000  1444.000  4150.000  1445.000  4180.000
GR   1444.000  4250.000  1444.000  4450.000  1446.000  4700.000  1444.000  4940.000  1444.000  4930.000
GR   1456.000  4970.000  1460.000  5160.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000
ET     -0.000    -0.000     4.100  3890.000  5350.000    -0.000    -0.000    -0.000    -0.000    -0.000

X1      6.740    22.000  3920.000  5350.000  1390.000   550.000  1983.200    -0.000    -0.000    -0.000
GR   1460.000  3920.000  1440.000  3910.000  1459.000  3110.000  1454.000  3160.000  1446.000  3210.000
GR   1456.000  3971.000  1449.000  3450.000  1456.000  3650.000  1457.000  3950.000  1456.000  3930.000
GR   1454.600  4000.000  1447.000  4090.000  1456.000  4290.000  1458.000  4240.000  1455.000  4390.000
GR   1454.000  4540.000  1457.300  4700.000  1456.000  4740.000  1454.700  5000.000  1452.000  5230.000
GR   1450.000  5270.000  1[illegible]  5[illegible]0.000    -0.000    -0.000    -0.000    -0.000    -0.000
ET     -0.000    -0.000     4.100  3890.000  5630.000    -0.000    -0.000    -0.000    -0.000    -0.000
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X1	6.000	18.000	1700.000	5600.000	2000.000	900.000	944.300	-0.000	-0.000	-0.000
GR	1480.000	1680.000	1468.000	1750.000	1465.000	1950.000	1456.700	2350.000	1448.000	2590.000
GR	1468.000	3350.000	1465.000	3390.000	1466.000	4000.000	1468.000	4100.000	1476.700	4200.000
GR	1468.000	4300.000	1472.000	4320.000	1472.000	4370.000	1469.000	4540.000	1474.000	5100.000
GR	1464.000	5200.000	1468.000	5290.000	1472.000	5500.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	2630.000	5870.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	7.100	27.000	1450.000	5850.000	2200.000	1100.000	1056.000	-0.000	-0.000	-0.000
GR	1488.000	1450.000	1484.000	1620.000	1480.000	1920.000	1490.000	2150.000	1478.500	2450.000
GR	1480.000	2730.000	1482.000	3090.000	1480.000	3130.000	1478.000	3170.000	1480.700	3210.000
GR	1478.000	3280.000	1480.000	3350.000	1481.000	3500.000	1480.000	3540.000	1479.000	4090.000
GR	1480.000	4190.000	1496.200	4250.000	1490.000	4450.000	1480.000	4930.000	1482.000	4960.000
GR	1480.000	5050.000	1484.000	5070.000	1485.000	5200.000	1484.000	5330.000	1480.000	5370.000
GR	1484.000	5400.000	1488.000	5850.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	2770.000	5920.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	7.300	16.000	1720.000	5920.000	1100.000	600.000	1056.000	-0.000	-0.000	-0.000
GR	1500.000	1720.000	1496.000	1930.000	1495.000	2120.000	1492.000	2400.000	1492.000	3290.000
GR	1491.000	3310.000	1492.000	3630.000	1494.000	3750.000	1492.000	3920.000	1490.000	4090.000
GR	1492.000	4200.000	1493.000	4300.000	1492.000	4370.000	1490.000	4420.000	1492.000	4920.000
GR	1488.000	5100.000	1492.000	5700.000	1496.000	5920.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3010.000	5690.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	7.490	23.000	1650.000	5600.000	1100.000	900.000	1003.200	-0.000	-0.000	-0.000
GR	1520.000	1650.000	1512.000	1710.000	1510.700	1890.000	1512.000	2100.000	1508.000	2500.000
GR	1504.000	2770.000	1502.700	2830.000	1504.000	2920.000	1505.500	3000.000	1504.000	3010.000
GR	1502.700	3090.000	1504.000	3250.000	1504.000	3320.000	1502.000	3500.000	1504.000	3950.000
GR	1501.300	4000.000	1501.300	4350.000	1504.000	4740.000	1504.000	4990.000	1502.000	5100.000
GR	1504.000	5320.000	1504.000	5450.000	1508.000	5600.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3350.000	5640.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	7.660	14.000	1860.000	5640.000	700.000	850.000	997.500	-0.000	-0.000	-0.000
GR	1520.000	1860.000	1518.000	2000.000	1519.500	2250.000	1516.000	2430.000	1512.000	3050.000
GR	1510.000	3350.000	1512.000	3400.000	1512.000	3870.000	1514.000	3950.000	1512.000	3995.000
GR	1512.000	4000.000	1512.000	4360.000	1516.000	5070.000	1520.000	5540.000	-0.000	-0.000
NH	2.000	.060	3550.000	.035	5600.000	-0.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3570.000	5600.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	7.880	28.000	3320.000	5600.000	1300.000	800.000	1161.500	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1525.000	1530.000	-0.000
GR	1538.000	1950.000	1535.000	2070.000	1532.000	2170.000	1528.000	2250.000	1532.000	2370.000
GR	1528.000	2900.000	1524.000	2970.000	1523.000	3000.000	1504.000	3050.000	1524.000	3270.000
GR	1525.000	3320.000	1524.000	3335.000	1523.000	3430.000	1524.000	3550.000	1528.000	3600.000
GR	1524.000	3940.000	1524.000	4000.000	1524.000	4050.000	1525.500	4200.000	1524.000	4290.000
GR	1524.000	4500.000	1520.000	4700.000	1524.000	4800.000	1525.300	4850.000	1524.000	4900.000
GR	1524.000	5050.000	1524.000	5400.000	1530.000	5500.000	-0.000	-0.000	-0.000	-0.000
NH	2.000	.060	3550.000	.035	5670.000	-0.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3510.000	5670.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	8.020	34.000	2100.000	5670.000	1450.000	850.000	1056.000	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1541.000	1544.000	-0.000
GR	1544.000	1720.000	1540.000	1930.000	1540.000	2030.000	1541.000	2100.000	1540.000	2150.000
GR	1537.000	2500.000	1530.000	2770.000	1538.000	2820.000	1540.000	2920.000	1536.000	3020.000
GR	1534.700	3040.000	1536.000	3070.000	1536.800	3290.000	1535.000	3400.000	1536.000	3520.000

GR	1540.000	3500.000	1540.000	3510.000	1540.000	3550.000	1536.000	3650.000	1534.000	3590.000
GR	1536.000	3750.000	1537.000	3920.000	1535.000	3900.000	1535.000	3985.000	1534.500	4000.000
GR	1536.000	4150.000	1535.000	4440.000	1532.000	4950.000	1532.000	4340.000	1536.000	5050.000
GR	1540.000	5100.000	1539.500	5300.000	1540.000	5500.000	1544.000	5670.000	-0.000	-0.000
NH	2.000	.060	3550.000	.035	5670.000	-0.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3510.000	5210.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	8.280	27.000	3140.000	5210.000	1090.000	800.000	1056.000	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1548.000	1556.000	-0.000
GR	1556.000	1000.000	1552.000	1300.000	1551.500	1900.000	1548.000	2010.000	1548.000	2350.000
GR	1549.500	2400.000	1548.500	2470.000	1549.000	2550.000	1548.000	2650.000	1547.400	2725.000
GR	1548.000	3030.000	1548.000	3140.000	1546.500	3190.000	1548.000	3270.000	1549.300	3400.000
GR	1546.000	3430.000	1548.000	3460.000	1551.200	3430.000	1549.000	3510.000	1547.000	3630.000
GR	1548.000	3800.000	1546.000	4000.000	1544.000	4070.000	1548.000	4400.000	1552.000	4770.000
GR	1552.000	5020.000	1556.000	5210.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
NH	2.000	.060	3550.000	.035	5210.000	-0.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3650.000	4730.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	8.480	19.000	3200.000	4730.000	1100.000	1100.000	1056.000	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1560.000	1568.000	-0.000
GR	1580.000	1250.000	1564.000	1300.000	1563.000	1390.000	1563.000	2150.000	1560.000	2410.000
GR	1561.200	2570.000	1560.000	2595.000	1560.000	3200.000	1558.300	3350.000	1560.000	3550.000
GR	1555.400	3600.000	1563.300	3650.000	1560.000	3670.000	1557.000	3949.000	1558.500	4000.000
GR	1557.800	4200.000	1560.000	4600.000	1564.000	4650.000	1568.000	4730.000	-0.000	-0.000
NH	2.000	.060	3500.000	.035	4780.000	-0.000	-0.000	-0.000	-0.000	-0.000
ET	-0.000	-0.000	4.100	3570.000	4790.000	-0.000	-0.000	-0.000	-0.000	-0.000
X1	8.660	20.000	2560.000	4790.000	750.000	1000.000	1056.000	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1572.000	1580.000	-0.000
GR	1572.000	1500.000	1568.000	1630.000	1568.000	1790.000	1570.000	2200.000	1572.000	2550.000
GR	1568.000	2450.000	1566.500	3050.000	1568.000	3170.000	1560.000	3250.000	1572.000	3300.000
GR	1576.000	3640.000	1568.000	3700.000	1571.000	3900.000	1568.000	4000.000	1568.000	4050.000
GR	1571.000	4150.000	1570.000	4550.000	1572.000	4650.000	1572.000	4750.000	1580.000	4790.000
ET	-0.000	-0.000	4.100	2790.000	4400.000	-0.000	-0.000	-0.000	-0.000	-0.000
XL	8.820	19.000	2730.000	4400.000	650.000	850.000	739.200	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1579.500	1588.000	-0.000
GR	1580.000	1900.000	1576.000	2030.000	1576.000	2420.000	1579.500	2720.000	1576.000	2790.000
GR	1568.000	2410.000	1565.800	2870.000	1568.000	2930.000	1576.000	2950.000	1580.000	2950.000
GR	1580.000	3100.000	1576.000	3470.000	1590.000	3500.000	1580.000	3530.000	1577.000	4000.000
GR	1576.000	4100.000	1576.000	4180.000	1590.000	4330.000	1588.000	4400.000	-0.000	-0.000
X1	9.000	24.000	3130.000	4700.000	1050.000	1200.000	1214.400	-0.000	-0.000	-0.000
X3	10.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	1595.500	1600.000	-0.000
GR	1600.000	2355.000	1596.000	2980.000	1595.000	3070.000	1595.500	3130.000	1595.000	3150.000
GR	1593.000	3200.000	1593.000	3430.000	1592.000	3470.000	1590.500	3530.000	1592.000	3575.000
GR	1595.500	3610.000	1592.000	3640.000	1590.000	3770.000	1592.000	3910.000	1596.000	3950.000
GR	1588.000	3990.000	1587.500	4000.000	1598.000	4070.000	1592.000	4175.000	1596.000	4130.000
GR	1596.000	4250.000	1594.000	4490.000	1595.000	4550.000	1600.000	4700.000	-0.000	-0.000

ESPERANZA CROSSING

X1	9.120	9.000	3550.000	4670.000	450.000	700.000	363.600	-0.000	-0.000	-0.000
GR	1620.000	3510.000	1600.000	3530.000	1535.000	3690.000	1534.000	3940.000	1543.000	4000.000
GR	1555.000	4100.000	1545.000	4340.000	1600.300	4570.000	-0.000	-0.000	-0.000	-0.000

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XI      9.250      10.000    3540.000    4400.000     300.000     940.000     944.100      -0.000      -0.000      -0.000
GR   1620.000    3550.000    1604.000    3720.000    1602.300    3710.000    1504.000    3900.000    1592.000    4000.000
GR   1603.500    4030.000    1597.000    4140.000    1604.000    4310.000    1505.000    4550.000    1610.000    4400.000
EJ      0.000      -0.000      -0.000      -0.000      -0.000      -0.000      -0.000      -0.000      -0.000      -0.000
```

FLOW DISTRIBUTION FOR SECNO= 6.95 CWSEL= 1447.55

STA= 3961 5150
PER Q= 100.0
AREA= 2970.8
VEL= 10.1

FLOW DISTRIBUTION FOR SECNO= 6.74 CWSEL= 1458.01

STA= 3080 5350
PER Q= 100.0
AREA= 4754.1
VEL= 6.3

FLOW DISTRIBUTION FOR SECNO= 6.90 CWSEL= 1467.32

STA= 1780 5600
PER Q= 100.0
AREA= 3968.5
VEL= 7.6

FLOW DISTRIBUTION FOR SECNO= 7.10 CWSEL= 1481.54

STA= 1804 5850
PER Q= 100.0
AREA= 4764.0
VEL= 6.3

FLOW DISTRIBUTION FOR SECNO= 7.30 CWSEL= 1492.83

STA= 2341 5920
PER Q= 100.0
AREA= 1201.2
VEL= 5.8

FLOW DISTRIBUTION FOR SECNO= 7.49 CWSEL= 1504.52

STA= 2735 5600
PER Q= 100.0
AREA= 4280.1
VEL= 7.0

FLOW DISTRIBUTION FOR SECNO= 7.66 CWSEL= 1514.52

STA= 2819 5640
PER Q= 100.0
AREA= 4594.8
VEL= 6.5

FLOW DISTRIBUTION FOR SECNO= 7.88 CWSEL= 1525.09

STA= 2843 3050 3270 3320 5600

```
  PER Q=     12.5      11.9       .1      35.4
   AREA=    891.9    2437.6     20.8    2128.8
    VEL=      5.5       6.4       .9       3.1

 FLOW DISTRIBUTION FOR SECNO=      8.09          CWSEL=   1537.22

 STA=     2567     5670
   PER Q=    100.0
    AREA=   3754.5
     VEL=      8.0

 FLOW DISTRIBUTION FOR SECNO=      8.29          CWSEL=   1549.53

 STA=     1962     2350     2725     3930     3140     5210
   PER Q=     1.8      3.4      6.7      1.8     92.4
    AREA=   554.9    376.8    556.5    167.7   3239.1
     VEL=     3.1      2.7      3.5      3.2      7.5

 FLOW DISTRIBUTION FOR SECNO=      8.48          CWSEL=   1561.09

 STA=     2317     3200     4730
   PER Q=     6.9     93.1
    AREA=   789.9   3305.5
     VEL=     2.6      8.4

 FLOW DISTRIBUTION FOR SECNO=      8.68          CWSEL=   1571.45

 STA=     2691     4790
   PER Q=    100.0
    AREA=   3421.1
     VEL=      8.8

 FLOW DISTRIBUTION FOR SECNO=      8.82          CWSEL=   1578.82

 STA=     2734     4490
   PER Q=    100.0
    AREA=   3071.3
     VEL=      9.8

 FLOW DISTRIBUTION FOR SECNO=      9.05          CWSEL=   1590.19

 STA=     3184     4790
   PER Q=    100.0
    AREA=   2981.2
     VEL=     10.1


 FLOW DISTRIBUTION FOR SECNO=      9.17          CWSEL=   1598.71

 STA=     3619     4670
   PER Q=    100.0
    AREA=   2960.6
     VEL=     10.1

 FLOW DISTRIBUTION FOR SECNO=      9.29          CWSEL=   1607.58
```

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED AUG 1977
  ERROR CORR -  01,02
  MODIFICATION -  50,51,52,53
**************************************************

T1      CABAZON STUDY 100 YEAR FLOODWAY METHOD 1
T2      SAN GORGONIO RIVER
T3      CH TOUFS.VENTURA

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
        -0         3         -0        -0 -0.000000    -0.00     -0.0        -0  1447.550    -0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLOC     IBW       CHNIM     ITRACE
     15.000    -0.000    -1.000    -0.000    -0.000    -0.000    -0.000    -0.000    -0.000    15.000


FLOW DISTRIBUTION FOR SECNO=      6.55          CWSEL=   1447.56

STA=      3981      5160
  PER Q=     100.0
   AREA=    2978.9
    VEL=      10.1

FLOW DISTRIBUTION FOR SECNO=      6.74          CWSEL=   1458.00

STA=      3080      5350
  PER Q=     100.0
   AREA=    4745.3
    VEL=       6.3

FLOW DISTRIBUTION FOR SECNO=      6.90          CWSEL=   1468.27

STA=      2800      5600
  PER Q=     100.0
   AREA=    4094.0
    VEL=       7.3

FLOW DISTRIBUTION FOR SECNO=      7.10          CWSEL=   1482.02

STA=      2630      5650
  PER Q=     100.0
   AREA=    4226.0
    VEL=       7.1

FLOW DISTRIBUTION FOR SECNO=      7.30          CWSEL=   1497.95
```

FLOW DISTRIBUTION FOR SECNO= 7.47 CWSEL= 1504.50

STA= 3010 5100
PER Q= 100.0
AREA= 4046.9
VEL= 7.4

FLOW DISTRIBUTION FOR SECNO= 7.56 CWSEL= 1515.13

STA= 3350 5640
PER Q= 100.0
AREA= 3963.4
VEL= 7.6

FLOW DISTRIBUTION FOR SECNO= 7.84 CWSEL= 1526.49

STA= 3575 5690
PER Q= 100.0
AREA= 3836.6
VEL= 7.8

FLOW DISTRIBUTION FOR SECNO= 8.08 CWSEL= 1537.58

STA= 3642 5670
PER Q= 100.0
AREA= 3655.1
VEL= 8.2

FLOW DISTRIBUTION FOR SECNO= 8.28 CWSEL= 1549.89

STA= 3510 5210
PER Q= 100.0
AREA= 3057.9
VEL= 9.8

FLOW DISTRIBUTION FOR SECNO= 8.48 CWSEL= 1561.96

STA= 3658 4730
PER Q= 100.0
AREA= 3207.6
VEL= 9.4

FLOW DISTRIBUTION FOR SECNO= 8.68 CWSEL= 1571.44

STA= 2592 4790
PER Q= 100.0
AREA= 3407.2
VEL= 8.8

FLOW DISTRIBUTION FOR SECNO= 8.82 CWSEL= 1579.94

STA= 2750 4400
PER Q= 100.0
AREA= 3047.4
VEL= 9.7

FLOW DISTRIBUTION FOR SECNO= 9.12 CWSEL= 1598.71

STA=	3819	4670
PER Q=	100.0	
AREA=	2980.6	
VEL=	10.1	

FLOW DISTRIBUTION FOR SECNO= 9.29 CWSEL= 1607.58

STA=	3711	4600
PER Q=	100.0	
AREA=	3296.9	
VEL=	9.1	

HEC2 RELEASE DATED NOV 76 UPDATED AUG 1977
ERROR CORR - 01,02
MODIFICATION - 50,51,52,53

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

CH TOUPS VENTURA

SUMMARY PRINTOUT

	SECNO	ELMIN	XLOB	ELMAX	CWSEL	CRIWS	AREA	10**S	HV	Q	TOPWID	SSTA	ESTA
	FLOW LINE SET AT 4000												
	STATIONING FROM LEFT TO RIGHT LOOKING UPSTREAM												
*	6.550	1443.00	-0.00	1450.00	1447.55	1447.55	2978.77	135.79	1.58	30000.00	950.69	3981.13	4941.82
*	6.550	1443.00	-0.00	1450.00	1447.56	1447.56	2978.91	124.68	1.57	30000.00	950.69	3981.13	4941.82
	6.740	1452.00	1003.20	1464.00	1458.01	0.00	4754.08	71.20	.62	30000.00	2032.43	3079.97	5237.51
	6.740	1452.00	1003.20	1464.00	1458.00	0.00	4745.26	71.60	.62	30000.00	2032.01	3080.03	5237.49
*	6.900	1464.00	844.40	1472.00	1467.32	1467.32	3964.47	150.79	.89	30000.00	2272.73	1779.94	5266.37
*	6.900	1464.00	844.40	1472.00	1468.27	1468.27	4093.98	136.04	.83	30000.00	2273.84	2990.00	5301.23
	7.100	1478.00	1056.00	1488.00	1481.54	0.00	4753.95	115.89	.62	30000.00	2945.11	1804.00	5381.60
	7.100	1478.00	1056.00	1488.00	1482.02	0.00	4225.99	123.79	.78	30000.00	2290.53	2630.00	5385.19
	7.300	1488.00	1056.00	1498.00	1492.83	0.00	5201.18	96.94	.52	30000.00	3208.96	2341.30	5746.12
	7.300	1488.00	1056.00	1498.00	1492.95	0.00	5171.19	83.29	.52	30000.00	2820.55	2770.00	5752.11
	7.490	1501.30	1003.20	1508.00	1504.52	1504.47	4280.06	146.63	.75	30000.00	2688.56	2735.19	5478.05
*	7.490	1501.30	1003.20	1508.00	1504.50	1504.50	4046.79	157.69	.85	30000.00	2467.49	3010.00	5477.48
	7.660	1510.00	897.60	1520.00	1514.52	0.00	4505.81	85.72	.65	30000.00	2144.65	2659.05	4807.70
	7.660	1510.00	897.60	1520.00	1515.13	0.00	3963.42	92.51	.89	30000.00	1565.31	3330.00	4895.31
*	7.880	1520.00	1161.60	1530.00	1525.08	1525.08	5269.60	27.03	.51	30000.00	2001.30	2843.09	5144.50
	7.880	1520.00	1161.60	1530.00	1526.49	0.00	3836.57	104.32	.95	30000.00	1584.00	3575.00	5269.20
*	8.080	1532.00	1056.00	1544.00	1537.22	1537.22	3754.48	140.47	.99	30000.00	2060.28	2567.12	5065.24
	8.080	1532.00	1056.00	1544.00	1537.58	0.00	3635.08	106.74	1.05	30000.00	1427.56	3642.13	5069.69
	8.280	1544.00	1056.00	1556.00	1549.53	0.00	4895.14	95.19	.77	30000.00	2552.78	1952.00	4541.04
*	8.280	1544.00	1056.00	1556.00	1549.89	1549.89	3967.86	131.08	1.49	30000.00	1054.44	3510.00	4574.44
*	8.480	1557.40	1056.00	1568.00	1561.08	1561.08	4095.48	116.83	1.04	30000.00	2249.89	2316.70	4513.44
	8.480	1557.30	1056.00	1568.00	1561.95	0.00	3207.63	99.03	1.35	30000.00	966.36	3658.13	4624.49
*	8.680	1565.50	1056.00	1572.00	1571.45	1571.45	3421.11	47.85	1.19	30000.00	1550.25	2591.16	4622.55
*	8.680	1565.00	1056.00	1580.00	1571.44	1571.44	3407.24	48.34	1.20	30000.00	1549.99	2591.15	4622.10

CH TOUPS VENTURA

SUMMARY PRINTOUT

	STCNC	Q	DIFWSP	VLOB	VCH	VROB	QLOB	QCH	QPOB	PERENC	STENCL	STENCR	DEPTH
	FLOW LINE SET AT 4000												
	STATIONING FROM LEFT TO RIGHT LOOKING UPSTREAM												
*	6.550	30000.00	0.00	0.00	10.10	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	4.55
*	6.550	30000.00	.01	0.00	10.07	0.00	0.00	30000.00	0.00	350.69	3951.13	4941.82	4.56
	6.740	30000.00	0.00	0.00	5.31	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	6.01
	6.740	30000.00	-.01	0.00	6.32	0.00	0.00	30000.00	0.00	2270.00	3080.00	5350.00	6.00
*	6.900	30000.00	0.00	0.00	7.56	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	3.32
*	6.900	30000.00	.95	0.00	7.33	0.00	0.00	30000.00	0.00	2800.00	2800.00	5600.00	4.27
	7.100	30000.00	0.00	0.00	6.30	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	3.54
	7.100	30000.00	.49	0.00	7.10	0.00	0.00	30000.00	0.00	3220.00	2630.00	5850.00	4.02
	7.300	30000.00	0.00	0.00	5.77	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	4.83
	7.300	30000.00	.12	0.00	5.80	0.00	0.00	30000.00	0.00	3150.00	2770.00	5920.00	4.95
	7.490	30000.00	0.00	0.00	7.01	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	3.22
*	7.490	30000.00	-.02	0.00	7.41	0.00	0.00	30000.00	0.00	2590.00	3010.00	5600.00	3.20
	7.660	30000.00	0.00	0.00	6.53	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	4.92
	7.660	30000.00	.60	0.00	7.57	0.00	0.00	30000.00	0.00	2230.00	3350.00	5640.00	5.13
*	7.880	30000.00	0.00	6.13	4.99	0.00	19372.86	10627.14	0.00	0.00	0.00	0.00	5.08
	7.880	30000.00	1.41	0.00	7.82	0.00	0.00	30000.00	0.00	2025.00	3575.00	5600.00	6.49
*	8.080	30000.00	0.00	0.00	7.99	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	5.22
	8.080	30000.00	.36	0.00	9.21	0.00	0.00	30000.01	0.00	2050.00	3610.00	5670.00	5.58
	8.280	30000.00	0.00	3.19	7.63	0.00	5245.65	24713.34	0.00	0.00	0.00	0.00	5.53
*	8.280	30000.00	.35	0.00	9.81	0.00	0.00	30000.00	0.00	1700.00	3510.00	5210.00	5.89
*	8.480	30000.00	0.00	2.43	9.16	0.00	2075.09	27924.91	0.00	0.00	0.00	0.00	5.68
	8.480	30000.00	.84	0.00	9.35	0.00	0.00	30000.00	0.00	1080.00	3650.00	4730.00	4.95
*	8.680	30000.00	0.00	0.00	8.77	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	5.95
*	8.680	30000.00	-.01	0.00	8.80	0.00	0.00	30000.00	0.00	2220.00	2570.00	4790.00	5.94
*	8.820	30000.00	0.00	0.00	9.77	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	13.02
*	8.820	30000.00	.02	0.00	9.72	0.00	0.00	30000.01	0.00	1530.00	2750.00	4400.00	13.04
*	9.050	30000.00	0.00	0.00	10.05	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	6.69
*	9.050	30000.00	.01	0.00	10.06	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	6.69
	ESPERANZA CROSSING												
*	9.120	30000.00	0.00	0.00	10.13	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	5.71
*	9.120	30000.00	-.00	0.00	10.13	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	5.71
	9.280	30000.00	0.00	0.00	9.10	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	5.58
	9.280	30000.00	.01	0.00	9.10	0.00	0.00	30000.00	0.00	0.00	0.00	0.00	5.58

CH TOUPS VENTURA

SUMMARY PRINTOUT TABLE 100

SECNO	ESLNO	ELLO	SGPRS	CLTPO	QPO	QWEIR	CLASS	M3	DEPTH	CWSEL	VCH	CG

SUMMARY OF ERRORS

CAUTION SECNO= 6.550 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.550 PROFILE= 2 CRITICAL DEPTH ASSUMED

CAUTION SECNO= 6.900 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.900 PROFILE= 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 6.900 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 6.900 PROFILE= 2 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 7.490 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.490 PROFILE= 2 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 7.880 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 7.880 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 8.080 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.080 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.080 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSE.

CAUTION SECNO= 8.280 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.280 PROFILE= 2 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 8.480 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.480 PROFILE= 1 MINIMUM SPECIFIC ENERGY

CAUTION SECNO= 8.680 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.680 PROFILE= 1 MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.680 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.680 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.680 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 8.820 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.820 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.820 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 8.820 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 8.820 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 8.820 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 9.050 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 9.050 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 9.050 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION SECNO= 9.050 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 9.050 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 9.050 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO= 9.120 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 9.120 PROFILE= 1 PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO= 9.120 PROFILE= 1 20 TRIALS ATTEMPTED TO BALANCE WSE.
CAUTION SECNO= 9.120 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= 9.120 PROFILE= 2 PROBABLE MINIMUM SPECIFIC ENERGY

CAUTION SECRDE 9.121 PROFILE= 2 20 TRIALS ATTEMPTED TO BALANCE NSF.

Appendix B

ORDINANCE NO 458

AN ORDINANCE OF THE COUNTY OF RIVERSIDE REGULATING FLOOD HAZARD AREAS AND IMPLEMENTING THE NATIONAL FLOOD INSURANCE PROGRAM

The Board of Supervisors of the County of Riverside, State of California, do ordain as follows:

Section 1. This ordinance is adopted pursuant to the requirements of the National Flood Insurance Program, 42 United States Code 4001 et seq., as amended, including all regulations adopted pursuant thereto. The purpose of the ordinance is to protect the public health, safety, and welfare and minimize public and private costs caused by flooding by regulating development within flood hazard areas.

Section 2. Definitions. As used in this ordinance, the following terms shall have the following meanings.

a. 100 Year Flood/Base Flood: A flood that has a 1% chance of being equalled or exceeded in any given year.

b. Floodway: The channel of a river or other watercourse and adjacent land areas necessary to discharge the waters from the 100 year flood without increasing the water surface elevation of that flood more than one foot at any one point.

c. Floodplain: The land areas that are subject to flooding from the 100 year flood, but not including any actual floodway.

d. Structure: All buildings and structures, including mobilehomes, agricultural buildings that require a registration certificate and solid walls and fences, the use of which requires a more or less permanent location on the ground, or an attachment to something having a permanent location on the ground.

e. Substantial Improvements/Substantially Improved: Any improvement or repair of a structure, the cost of which equals or exceeds 50% of the market value of the structure either before the improvement is commenced or, if the structure has been damaged, before the damage occurred. The term does not include any alterations necessary to comply with state or local health, sanitary or safety code specifications or regulations, or any alterations of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

f. Existing mobilehome park or subdivision: A parcel, or contiguous parcels of land divided into two or more mobilehome lots for rent or sale, for which the construction of facilities for servicing the lot on which the mobilehome is to be affixed, including the installation of utilities, either final site grading or the pouring of concrete pads, and the construction of streets is completed prior to the effective date of this Ordinance.

Section 3. This ordinance shall apply to all the following unincorporated areas of the County of Riverside.

a. The flood hazard areas shown on the maps prepared by the Federal Insurance Administration entitled "The Flood Insurance Study for the County of Riverside"

b. The flood hazard areas shown on the maps prepared by the U.S Army Corps of Engineers entitled:

(1) Salt Creek (Hemet to Railroad Canyon Reservoir), June 1971

(2) San Gorgonio River and Smith Creek, June 1973

(3) San Gorgonio River and Tributaries, October 1972

(4) San Jacinto River (San Jacinto to Railroad Canyon), May 1970

(5) Santa Ana River (Imperial Highway to Prado Dam), June 1971

c. The flood hazard areas shown on the map prepared by the Department of Water Resources of the State of California entitled "Riverside County Flood Hazard Investigation: Murrieta Creek" dated May, 1975

d. Any maps of flood hazard areas hereafter adopted by resolution of the Board of Supervisors after a public hearing on the proposed adoption.

Section 4. Notwithstanding the provisions of any other ordinance to the contrary, within the unincorporated area of Riverside County shown on the maps referred to in Section 3, no structure shall be constructed, located or substantially improved and no land shall be graded or developed, and no permit or approval shall be granted therefor, unless it complies with all the applicable requirements of this ordinance and all other applicable ordinances. If there is any conflict in the requirements of this ordinance or between the requirements of this and any other ordinance, the more stringent requirements shall apply.

Section 5. Procedure.

a. Insofar as it is feasible, it is intended that the requirements of this ordinance shall be integrated into the processing of applications for permits under the provisions of Ordinances No. 348, 457, 460 and 555. When the information required, or the procedures involved, in the processing of such applications is not sufficient to address the matters required by this ordinance, a separate application shall be filed as hereinafter provided.

b. Whenever an application for a permit involves land which lies within the boundaries of any maps referred to in Section 3 of this ordinance, the department head that accepts the application shall determine if a separate application should be filed. If a permit shall approve the location of any structure or substantial improvement thereto, or permit the alteration of land by grading or otherwise, and the existing procedure does not provide for a specific recommendation by a flood control district, a separate application shall be filed by the applicant.

c. All separate applications shall be filed with the department head that accepts the basic application, accompanied by a fee of $200.00 plus $10.00 per lot or $10.00 per acre, whichever is larger, and shall contain plans drawn to scale, by a civil engineer registered in the State of California, which include the following:

(1) A plot map of the property proposed to be developed showing floodways and floodplains, including

(2) Contours, with maximum interval of:

Slope	Interval
0 — 2%	2'
2 — 9%	4'
10% plus	10'

(3) Elevations, in relation to mean sea level, of the area to be developed, including adjoining properties necessary to be shown for continuity.

(4) The method by which the applicant proposes to comply with the requirements of this ordinance, including proposed elevations of any structures or fills, floodproofing, any proposals to modify existing flow of stormwaters, and any other relevant information.

d. Upon acceptance of both applications as being complete for filing, the department head shall forward copies of the basic application and the separate application to the Chief Engineer of the Riverside County Flood Control and Water Conservation District, unless the proposed development lies within the area jurisdiction of the Coachella Valley County Water District, in which case it shall be forwarded to the General Manager of that District.

e. Within 30 days of receipt thereof, the Chief Engineer or General Manager, respectively, shall determine if any further information is required in order to process the application and, if required, shall inform the applicant or his representative by regular mail of the need for additional information.

f. Within 30 days after determining that all required information has been obtained, the Chief Engineer or General Manager shall issue a report approving, with conditions or modifications, or denying the proposed plan.

Section 6. Within the areas shown on the maps listed in Section 3, the following requirements shall apply:

a. Floodways. No structure shall be constructed, located or substantially improved and no land shall be graded or developed in the areas designated as floodways, except upon approval of a plan which provides that the proposed development will not result in any increase in flood levels during the occurrence of the base flood discharge. If a proposed permit qualifies for approval in the floodway, it shall then meet all the requirements necessary for approval of a permit in the floodplain area.

b. Floodplain. Within the areas shown on the maps as floodplains, all proposed developments shall meet the following requirements.

(1) All new structures and substantial improvements to existing structures shall be constructed on a pad the elevation of which is up to or above the base flood elevation, except that:

(a) Nonresidential structures may alternatively comply with the following requirements upon approval of the flood control district having jurisdiction:

i. Utilize structural components capable of resisting the pressures, velocities, impact and uplift forces associated with floodwaters.

ii. Be floodproofed so that the structure is

b. Mobilehomes placed in existing mobilehome subdivisions or parks may alternatively comply with the following requirements upon approval of the flood control district having jurisdiction:

i. Over-the-top ties shall be provided at each of the four corners of a mobilehome, with two additional ties per side at intermediate locations, except that mobilehomes less than 50 feet in length shall require only one additional tie per side.

ii. Frame ties shall be provided at each corner of a mobilehome, with five additional ties per side at intermediate points, except that mobilehomes less than 50 feet in length shall require only four additional ties per side.

iii. All components of the anchoring system shall be capable of carrying a force of 4,800 pounds.

(2) All new structures and substantial improvements to existing structures shall:

(a) Be constructed and adequately anchored to prevent flotation, collapse or lateral movement of the structure.

(b) Be constructed with materials and utility equipment resistant to flood damage.

(c) Be constructed by methods and practices that minimize flood damage.

(3) All on-site water supply and waste disposal systems shall be constructed and located to minimize infiltration of flood waters and to avoid impairment to, or contamination to or from, utilities during flooding.

Section 7. Appeals and Requests for Variances.

a. An applicant, or any interested party, shall have the right to appeal the decision that is made on an application if he believes that an error has been made by the Chief Engineer or General Manager. An applicant shall also have the right to request that a variance be granted to the requirements of this ordinance, or to the conditions imposed upon a permit.

b. Applications for an appeal or for a variance shall be made to the Board of Supervisors, upon the form provided by the Clerk of the Board, accompanied by a fee of $60.00. Upon receipt of a completed application, the Clerk of the Board shall set the matter for hearing before the Board not less than 5 nor more than 45 days thereafter and shall give notice, by mail, to the applicant, the appellant, the department head with whom the application was originally filed and the Chief Engineer or the General Manager. The Board shall render its decision on the matter within 30 days after the close of the hearing on the matter.

c. Appeals may be granted by the Board if there has been an error in any requirement, decision or determination relating to the application for the permit.

d. Variances on the requirements of this ordinance or the conditions of an approved permit may only be granted if the Board finds:

(1) that there is good and sufficient cause.

(2) that failure to grant the variance would result in exceptional hardship to the applicant.

(3) that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimize the public or conflict with existing laws or ordinances.

(4) that the variance is the minimum necessary, considering the flood hazard, to afford relief.

e. Any applicant to whom a variance is granted shall be given written notice that the cost of flood insurance will be commensurate with the increased risk resulting from the granting of the variance.

Section 8. Disclaimer of Liability. The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Flood heights may be increased by man-made or natural causes, and this ordinance does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of the County of Riverside, any officer or employee thereof, or the Federal Insurance Administration, or the Riverside County Flood Control and Water Conservation District, or the Coachella Valley County Water District, for any flood damages resulting from reliance on this ordinance or any determination made thereunder.

Section 9. This ordinance shall take effect 30 days after its adoption.

BOARD OF SUPERVISORS
OF THE
COUNTY OF RIVERSIDE,
STATE
OF CALIFORNIA
By WALT ABRAHAM
Chairman, Board of
Supervisors
ATTEST: (SEAL)
DONALD D. SULLIVAN
Clerk
By DeWana Waples
Deputy

I HEREBY CERTIFY that at a regular meeting of the board of Supervisors of said county held on June 5, 1979, the foregoing ordinance consisting of Nine (9) sections was adopted by said Board by the following vote:

AYES: Supervisors Schroeder, McCandless, Youngjove and Abraham.

NOES: None.

ABSENT: Supervisor Record.

Dated: June 5, 1979
(SEAL)
DONALD D. SULLIVAN
Clerk of the Board
By DeWana Waples
Deputy

6/11

ARTICLE XVI

W-1 ZONE

SHDL2

(WATERCOURSE, WATERSHED AND CONSERVATION AREAS)

SECTION 16.1. W-1 ZONE (WATERCOURSE AREA) STATEMENT OF POLICY. There are some areas of the County which under present conditions are not suited for permanent occupancy or residency by persons for the reason that they are subject to periodic flooding and other hazards.

The provisions of this Article are temporary in nature, awaiting detailed plans of development for the lands and areas so classified. The regulations of this Article shall apply to lands so classified until either (1) a drainage and storm water control plan approved by the Planning Commission and the Board of Supervisors shall have been carried out and put into effect, or (2) the lands have been subdivided and a final subdivision map placed on record in accordance with the applicable state and county regulations, including approval by the Planning Commission and Board of Supervisors. In either of these two instances, the property may thereafter be reclassified into any other zone pursuant to regular zoning procedure.

SECTION 16.2. USES PERMITTED.

(a) The following uses are permitted in the W-1 Zone:

(1) Field, tree and bush crops; flower and herb gardening.
(2) Apiaries.
(3) The grazing only, of cattle, horses, sheep and goats and similar livestock, subject to the restrictions as to the number of animals per acre set forth in Section 13.1 (b) (4) of this Ordinance.
(4) Golf courses, not including the construction of buildings.
(5) Water works facilities, both public and private intended primarily for the production and distribution of water for agricultural purposes.
(6) Utilities, both public and private.

(b) The following uses are permitted provided a conditional use permit has been granted:

(1) Airports and heliports.
(2) Borrow pits and quarrying.
(3) Exploratory oil drilling, producing oil wells, oil storage tanks and appurtenant facilities, but not including refineries.
(4) Racing and competition events other than between humans.
(5) Hunting clubs, skeet, trap, rifle and pistol ranges.
(6) Travel trailer parks.
(7) Recreational trailer parks.

(8) Tennis, badminton, volleyball, squash, lacrosse, handball, baseball, racketball and football, courts and sport and recreation fields and uses.

(9) Buildings and structures in conjunction with any use that is permitted under Section 16.2 (a) of this ordinance.

(c) The following uses are permitted upon approval of a plot plan pursuant to Section 18.30 of this ordinance.

(1) Signs, on-site advertising, unless previously approved as a part of a granted conditional use permit.

SECTION 16.3. Automobile storage space shall be provided as required by Section 18.12 of this ordinance.

SECTION 16.4. STRUCTURE HEIGHT. All buildings and structures shall not exceed 50 feet in height, unless a height up to 105 feet is specifically permitted for structures other than buildings under the provisions of Section 18.34 of this ordinance.

Amended Effective:	February 19, 1962	
	May 4, 1972	(Ord. 348.1023)
	August 23, 1973	(Ord. 348.1190)
	September 13, 1973	(Ord. 348.1201)
	May 30, 1974	(Ord. 348.1327)
	April 3, 1975	(Ord. 348.1435)
	December 10, 1975	(Ord. 348.1481)

Appendix C

PRC Toups

DERIVATION OF EQUATIONS

ASSUMPTIONS:

1) MANNINGS EQUATION: $Q = \frac{1.49 W D^{5/3} S^{1/2}}{n}$

2) $dD/dW = -0.005$

SOLVING FOR W:

$$W = \frac{Qn}{1.49 D^{5/3} S^{1/2}}$$

DIFFERENTIATING:

$$dW/dD = \left(\frac{Qn}{1.49 S^{1/2}}\right)\left(-\frac{5}{3}\right) D^{-8/3}$$

OR:

$$dD/dW = -\left(\frac{1.49 S^{1/2}}{Qn} \times \frac{3}{5}\right)\left(D^{8/3}\right)$$

COMBINING:

$$\left(\frac{1.49 S^{1/2}}{Qn}\right)\frac{3}{5} D^{8/3} = 0.005$$

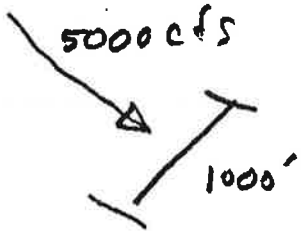
$$\boxed{D = \left(\frac{Qn}{178 S^{1/2}}\right)^{3/8}}$$

SUBSITUTING FOR D IN MANNINGS EQ.:

$$\boxed{W = \frac{17.2 (Qn)^{3/8}}{S^{3/16}}}$$

Land Density Calculations

Jenson Fan



from topo map, 1000' appear widest width that flows could diverge over

At the 12 fps velocity zone $E = 4.1'$

Length required to pass flow between houses $= L = \frac{Q}{C H^{1.5}} = \frac{5000}{2.5(4.1)^{1.5}} = 241'$

Using scoured channel equations $L = 220'$

then max width = 241' and with 50% uncertainty factor $\frac{241(115)}{1000} = 36\%$

Using typical lot obstruction of 80', then min lot size

$= \frac{80}{.64} = 125'$

$\frac{125^2}{43560} = .36\ Ac \rightarrow$ use 1/2 min lot

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PRC Toups

CONSULTING ENGINEERS AND PLANNERS

BY CT DATE _____ CLIENT RCFC&C SHEET NO. 4 OF ____

CHECKED _____ DATE _____ JOB CARBON CANYON JOB NO. _____

ANALYSIS OF FREEWAY & RAILROAD CROSSING AT MILLIKEN CANYON WASH IS COVERED ON PAGES 6 TO 14. TOPO MAPS AND FIELD INVESTIGATIONS WERE USED TO DETERMINE THE DISTRIBUTION OF THE TOTAL 100 YR STORM APPROACHING THE SYSTEM. STANDARD CULVERT, WILEY, AND CHANNEL EQUATIONS WERE USED TO CALCULATE THE DISTRIBUTION WITHIN THE SYSTEM AND LOCAL PONDING AT POINTS

ANALYSIS OF THE FREEWAY AND RAILROAD CROSSING AT THE SAN GORGONIO RIVER IS COVERED ON PAGES 15 TO 17. ALTHOUGH THE RAILROAD CROSSING ACTS AS A CHANNEL, THE 100 YR STORM CAN BE PASSED WITHOUT BYPASSING.

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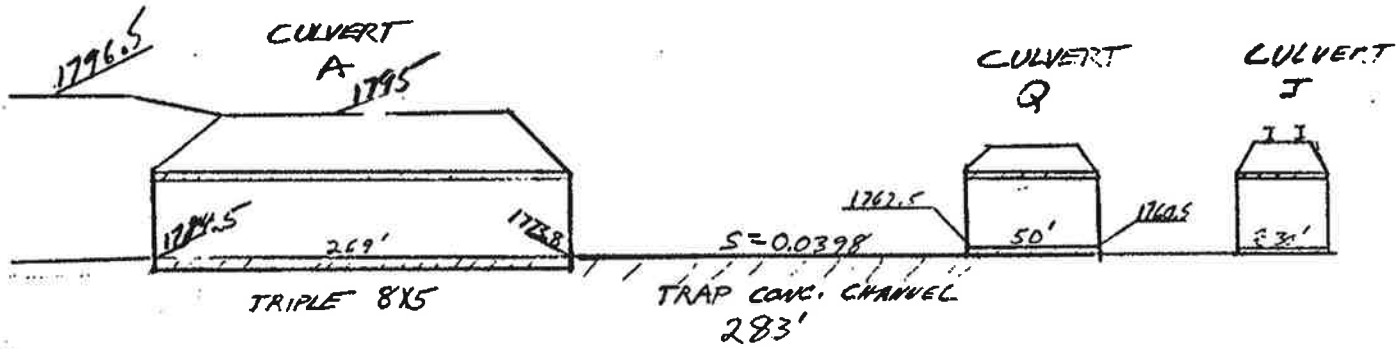
CONSULTING ENGINEERS AND PLANNERS

BY CJ DATE 4/10 CLIENT RCFCD SHEET NO. 6 OF ____

CHECKED ____ DATE ____ JOB CANYON SVDY JOB NO. ____

FREEWAY ANALYSIS AT MILLARD CANYON WASH

SEE DIAGRAM FOR CULVERT LABELS AND FLOW DISTRIBUTION



$Q_{TOTAL} = 2750$ CFS

1) CHECK CAPACITY OF CHANNEL

$Q = 2,750$ CFS
$S = 0.0398$
$b = 24'$
$z = 1.5:1$
$n = 0.015$

$d_n = 2.8'$

$V_n = 34.7$

$Q(d=4.5) = 6257$ CFS
$V = 45$ F/S

IF $Q > 6257$ EROSION IN OVERBANKS WILL OCCUR AND CHANNEL WALL BE UNDERMINED

CHECK CULVERT A

$Q_{TOTAL} = 2750$ CFS

ASSUME NO CLOGGING AND EVEN DISTRIBUTION OF FLOW IN EACH BARREL:

CONTINUED

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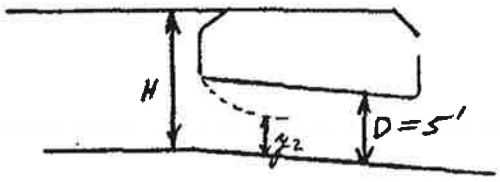
BY _____ DATE _____ CLIENT _____ SHEET NO. 7 OF ____

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

SINCE THE CULVERT SLOPE IS STEEP, ASSUME A FULL DISCHARGE AND CALC. Q BASED ON ENTRANCE CONTROL



$H = 1795.0 - 1784.5 = 10.5'$

$H/D = 2.1$

$Q = C_1 B D \sqrt{2g(H - C_1 D)}$ HENDERSON (7-5)

$C_1 = 0.8$ (ROUNDED SOFFIT) $y_2 = 4'$

$Q_{\text{PER BARREL}} = 654$ CFS $> d_c = 5.9$ $d_n = 2.9$

$D > d_n$

$Q_T = 1962$ CFS $\Rightarrow d = 2.3'$ IN D/S CHANNEL

∴ CULVERT WILL FLOW FREE FOR 1962 CFS

SINCE $Q = 2750$ CFS FLOW WILL OVERTOP FWY

∴ BALENCE WEIR FLOW ONTO FWY WITH FLOW THRU CULVERT

NOTE: FLOW WILL GO OVER FREEWAY @ ELV 1794.8
FLOW WILL GO INTO DRAINAGE DITCH ALONG FREEWAY @ ELV 1796.5

$1796.5 - 1794.8 = 2' \Rightarrow Q = 1488 + 1962 = 3450 > 2760$

$Q = CLH^{3/2}$ $L = 200'$ $C = 2.63$ OVER FWY.

BALENCE FLOW THRU CULVERT, OVER FWY

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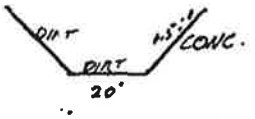
BY _____ DATE _____ CLIENT _____ SHEET NO. 9 OF ____

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

CALC CAPACITY OF CULVERT (C)

$Q = 2750$ CFS

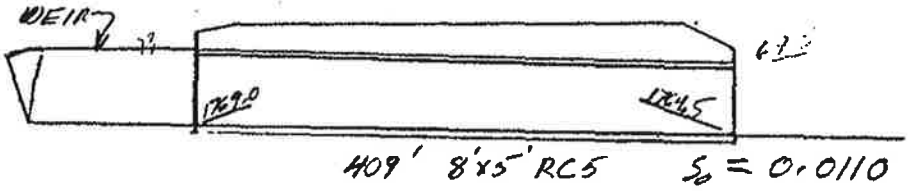


$$n = \left[\frac{(25.4)(.035)^{3/2} + 5.4(.015)^{3/2}}{29}\right]^{2/3}$$

FOR D=3'

$n = 0.033$

DEPTH OF FLOW APPROACHING THE CULVERT = 4.76 $V = 21.3$ F/S



BALENCE FLOW THRU CULVERT WITH FLOW OVER WEIR

TRY ELV 1775

CULVERT:

$Q = .8(8)5\sqrt{2g(6-4)} = 625$ CFS

$d_4 = 4.5$ VERY CLOSE TO 5' CULVERT WILL [illegible]

$\therefore Q = 450$ CFS

WEIR: $Q = 3.5(32)2^{3/2} = 316$ CFS

TRY 1778

CULVERT → 550 CFS

WEIR → 1252 CFS

1802 CFS

TRY 1780.0

CULVERT — 680 CFS

WEIR — 2070

2750

Q CULVERT (C) = 680 CFS (FULL)

Q CULVERT (B) = 2070 CFS ($d = 4.4'$) FLOWS FREE

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BY _____ DATE _____ CLIENT _____ SHEET NO. 8 OF ____

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

TRY ELV 1795.0

CULVERT: $Q = .8(8)5\sqrt{2g(11.5-11)} = 634.7$ CFS

$d_n = 2.92 < 5$

$Q_{TOTAL} = 3(634.7) = 1904$ CFS

FLAT: $Q = C L H^{3/2}$

$= 3.33(200)(1795-1794.5)^{3/2} = 471.2$ CFS

$Q_{TOTAL} = 2375.2$ CFS < 2750 CFS

TRY ELV 1796

CULVERT: $Q = 5(8)\sqrt{2g(7.5)} = 703$ CFS $\Rightarrow$ 2107

$d_n = 3.1 < 5$

FLAT: $Q = 3.33(200)(1)^{3/2} = 667$

$Q_{TOTAL} = 2800$ CFS WITHIN 3% OF 2750

RATIO Q'S

$Q_{CULVERT} = \frac{2750}{3375}(2107) = 2071$ CFS

$Q_{FLAT} = \frac{625}{3375}(667) = 679$ CFS

CALC DEPTH OF FLOW ON FLAT

$Q = 678$

$L = 85'$

$S_o = 0.024$

$n = 0.015$

$d_n = .67$ $V = 11.9$ F/S

FLOW IS SUPERCRITICAL

PRC Toups
CONSULTING ENGINEERS AND PLANNERS

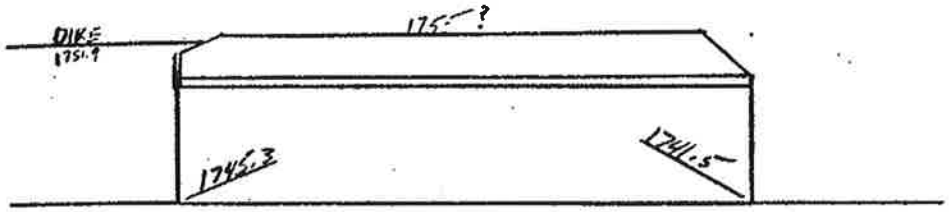
BY _____ DATE _____ CLIENT _____ SHEET NO. 10 OF ____

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

CALC. CAPACITY OF CULVERT D

$Q = 2070 + 678 = 2748$ CFS $n = 0.0??$ $S_e = .0?1$

DEPTH OF FLOW APPROACHING CULVERT : 4.6' $V = 21.7$ F/S



234' $S_o = 0.01632$

DBL 8X4

$H = 51.9 - 45.3 = 6.6$ (MAX HEAD BEFORE WATER FLOWS OVER DIKE)

$Q = .8(8)4\sqrt{2g(6.6-3.2)}(2) = 757$ CFS << 2070

$d_n = 2.72$

TRY ELV 1754

CULVERT ⇒ $Q = 954.8$ $d_n = 3.2'$ $Q_T = 1282.66$

FLOW OVER DIKE ⇒ $Q = 2.7(40)2.1^{3/2} = 328$
$C = 2.7$ $L = 40$

TRY ELV 1755

CULVERT ⇒ ~~$Q = 45.42$~~ $d_n = 3.44$ CULVERT WILL ~~NOT~~
$Q = 1120$ CFS

FLOW OVER DIKE $Q = 2.7(50)3.1^{3/2} = 736$ CFS ⇒ 1856 CFS

TRY ELV 1755.7

(NOMOGRAPH)

CULVERT ⇒ $Q = 1200$ CFS
FLOW OVER DIKE ⇒ $Q = 2.7(76)38^{3/2} = 1520$ ⇒ 2720 CFS

$Q_c = 1212$

RATIO $Q_o = 1555$

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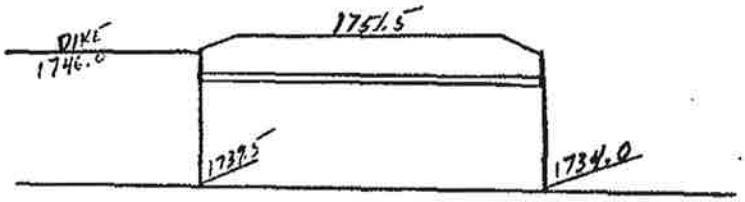
BY _____ DATE _____ CLIENT _____ SHEET NO. 11 OF ___

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

CALC CAPACITY OF CULVERT (E)

Q = 1520 CFS



257' DBL 8'x4'

WSE 1750

CULVERT ⇒ 1170 CFS

FLOW OVER DIKE ⇒ $2.7(52)4^{3/2} = 1123$

TOTAL FLOW = 2293

TRY 1748

CULVERT ⇒ 1120 CFS

FLOW OVER DIKE ⇒ $2.7(52)2^{3/2} = 397.1$

TOTAL FLOW = 1517 CFS

CULVERT Q

Q = 2070 CFS

TRIPLE 8'x5' RCB L = 60' INLET @ 1762.5 OUT LET 1760.5
4' H.W.

$Q = .8(8)5\sqrt{2g(9-4)} = 574$ CFS / BARREL

FLOW WILL OVERTOP ROAD & SUBMERGE CULVERT

TRY 1.0' DEPTH OVER ROAD H = 1772.5 − 1767.5 = 5'

CULVERT = 1732 CFS NOMOGRAPH USED.

FLOW OVER ROAD = $2.67(135)1.0^{3/2} = 360$

Q_T = 2092 CFS

Q_C = 1713 CFS

Q_W = 356 CFS

CULVERT J

$Q = 2070$ CFS

$Q_{CULVERT} = .8(11)5\sqrt{2g(8-4)} = 706$/BARREL $\Rightarrow$ 1410 CFS

$Q_{OVERFLOW} = 660$ CFS

CULVERT K

$Q_{CAP.} = .6(10.5)5\sqrt{2g(8-3)} = 565$ CFS

Q APPROACH = 1340 CFS

OVERFLOW = 775.0 CFS

CULVERT L

$Q_{CAP} = 8.6(10.5)5\sqrt{2g(8.3)} = 665$ CFS

$Q_{APPROACH} = 1212 + 775.0 = 1987$ CFS

OVERFLOW = 1422 CFS

CULVERT M

$Q_{CAP} = 565$ CFS

$Q_{APPROACH} = 1120 + 1422 = 2542$ CFS

OVERFLOW = 1977 CFS

CULVERT N

$Q_{CAP} = 1130$ (DBL. BARREL)

$Q_{APPROACH} = 1977 + 397 = 2374$

OVERFLOW = 1244.0

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CONSULTING ENGINEERS AND PLANNERS

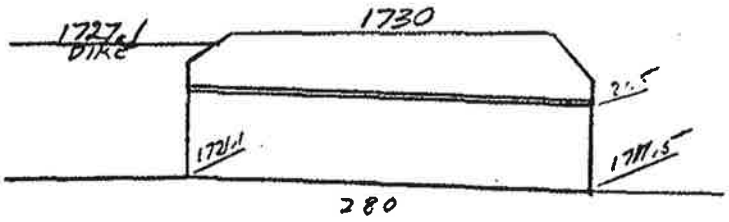
BY _____ DATE _____ CLIENT _____ SHEET NO. 13 OF ____

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

CULVERT (G)

TRIPLE 6 X 4 — INLET @ 1721.1 — L = 280' — DIKE ELV = 1727.1
OUTLET @ 1717.5 — S_o = 0.012

Q APPROACH 2750 CFS — FWY @ 1730



@ WSE 1729.1

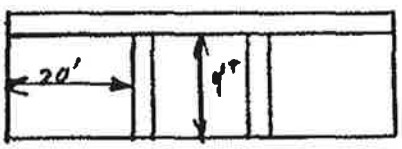
CULVERT (FULL) = 1010 CFS
OVER DIKE = 332
1340 CFS

WSE 1730 — CULVERT = 1090 CFS
OVER DIKE = 660
1750 CFS

WSE 1731 — CULVERT = 1120 CFS
OVER DIKE = $2.7(65)3.9^{3/2}$ = 1372

WSE 1731.2 — CULVERT = 1150 CFS
OVER DIKE = $2.7(70)4.1^{3/2}$ = 1570
2720 CFS

BRIDGE (H)



S_o = 0.0200
η = 0.03

Q APPROACH = 4350 CFS — d_n = 4.8' — NO NEED TO DO PEAK ANALYSIS

prc

PRC Toups

CONSULTING ENGINEERS AND PLANNERS

BY _____ DATE _____ CLIENT _____ SHEET NO. 14 OF ____

CHECKED _____ DATE _____ JOB _____ JOB NO. _____

CULVERT O

$Q_{CAP} = 1130$ (SAME AS A')

APPROACH = 1244 + 1150 = 2394 CFS

$Q_{OVERFLOW} = 1264$ CFS

CULVERT P

$Q_{CAP} = 690$ CFS

APPROACH = 4614 + 1264 = 5878 CFS

$Q_{OVERFLOW} = 5614 - 690 = 4924$

FLOW ALONG R.R. BETWEEN I & L = 775 CFS

$Q = 775$
$L = 80'$
$n = .035$
$S_o = 0.01666$

$d_n = 1.4$ $V_n = 6.8$

VEL. IS ERODSIVE. RAILROAD IS SUBJECT TO UNDERMINING IN THIS REACH (775 CFS WILL OVERTOP)

VEL ALONG R.R. BETWEEN I & P VARIES FROM 6.3 TO 5.7 (BREAK OUT FLOW I TOL ACCOUNTED FOR)

VEL IS ALSO ERODSIVE AND BREAK OUT WILL OCCUR

∴ THERE ARE THREE AREAS OF BREAKOUT FROM Q TO R

prc

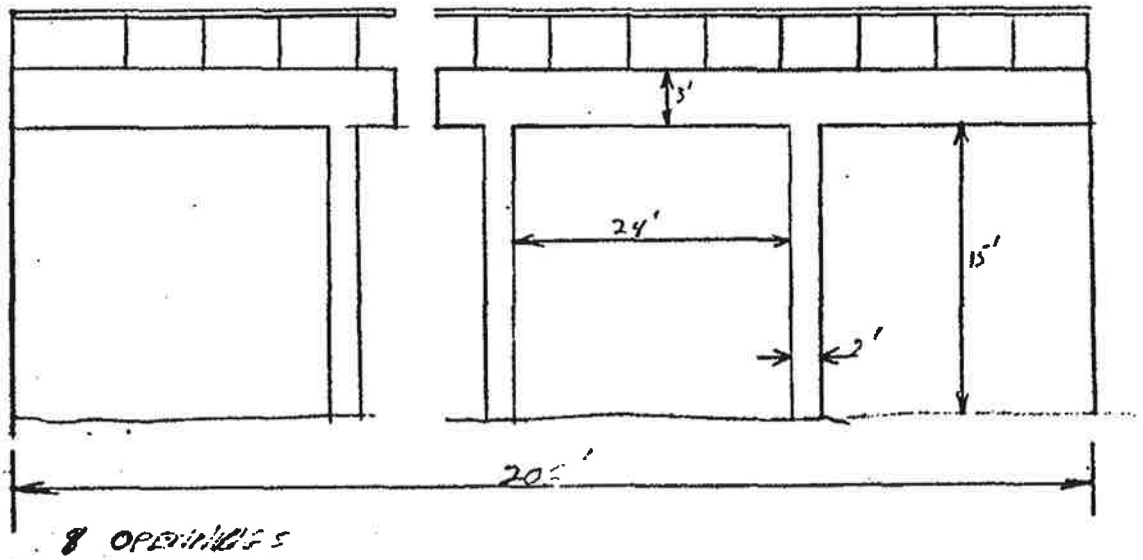
PRC Toups

CONSULTING ENGINEERS AND PLANNERS

BY CS DATE 4/12 CLIENT RCFCD SHEET NO. 15 OF ___

CHECKED ___ DATE ___ JOB CAHUZON STUDY JOB NO. ___

FREEWAY CROSSING @ SAN GORGONIO RIVER



8 OPENINGS

$Q = 21{,}000$ CFS
$L = 206'$
$n = 0.035$
$S = 0.030$

$d_n = 4.9'$ $V = 20.9$ F/S
$d_c = 6.9'$

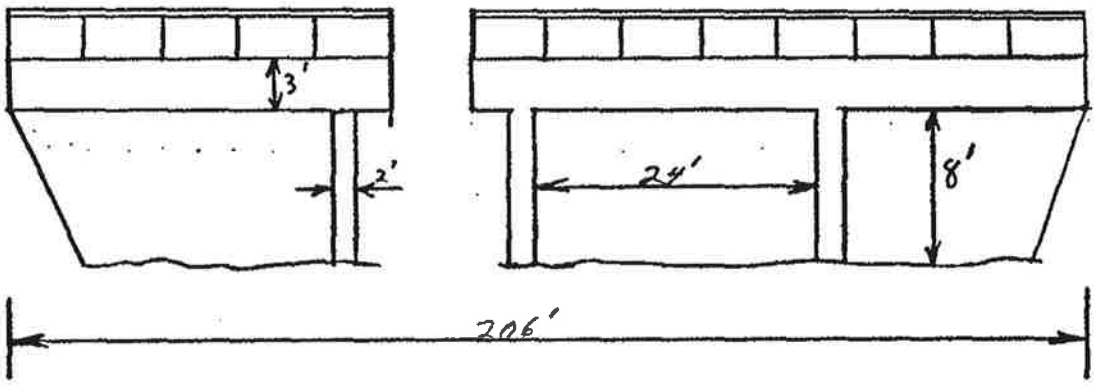
USING MOMENTUM CURVES

$d_{i/s} = 4.9$

$d_{PIER} = 6.5$

$d_{o/s} = 5.6$

FRONTAGE RD CROSSING



8 OPENNINGS

U/S DEPTH OF FRONTAGE CROSSING = D/S DEPTH OF FREWAY CROSSING = 5.6'

MOMENTUM DIAGRAMS INDICATE FLOW DOES NOT MAKE ENOUGH MOMENTUM TO PASS THRU BRIDGE. A SLIGHT JUMP WILL FORM U/S OF PIER

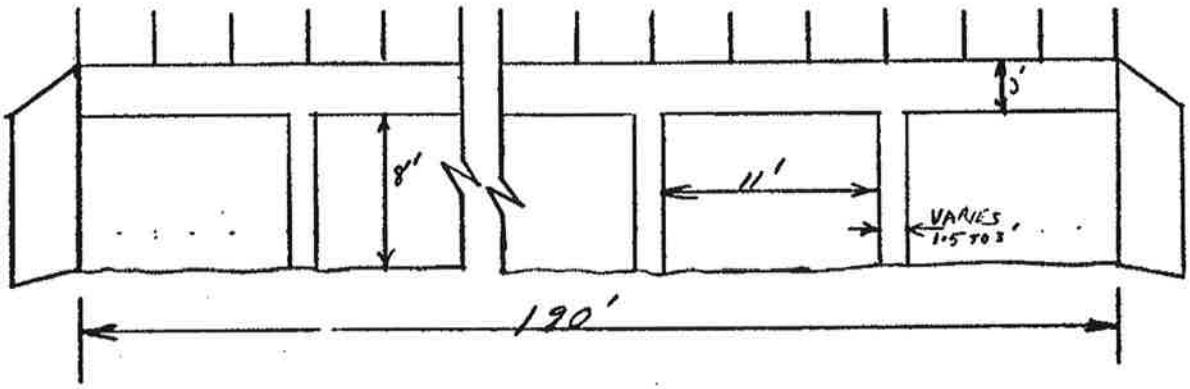
$d_{PIER} = 7.6'$ (MIN. MOMENTUM) $\Rightarrow$ VEL 15 F/S

$d_{u/s} = 9.4$

$d_{d/s} = 5.8$

VEL'S OF 15 TO 20 F/S. ARE HIGH ENOUGH TO BE ERROSIVE. ∴ AN OPENNING DEPTH > 8' WILL OCCUR

RAILROAD CROSSING



14 OPENNINGS

U/S DEPTH OF RR CROSSING = D/S DEPTH OF FRONTAGE CROSSING = 5.8'

MOMENTUM DIAGRAMS INDICATE FLOW DOES NOT HAVE ENOUGH MOMENTUM TO PASS THRU BRIDGE @ $D_{U/S} = 5.8'$

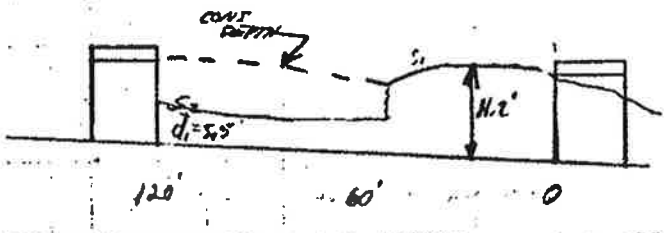
∴ A JUMP WILL OCCUR U/S OF CROSSING

$d_{PIER} = 8.0'$ (MIN MOMENTUM)

$d_{U/S} = 11.2'$

$d_{D/S} = 5.5'$

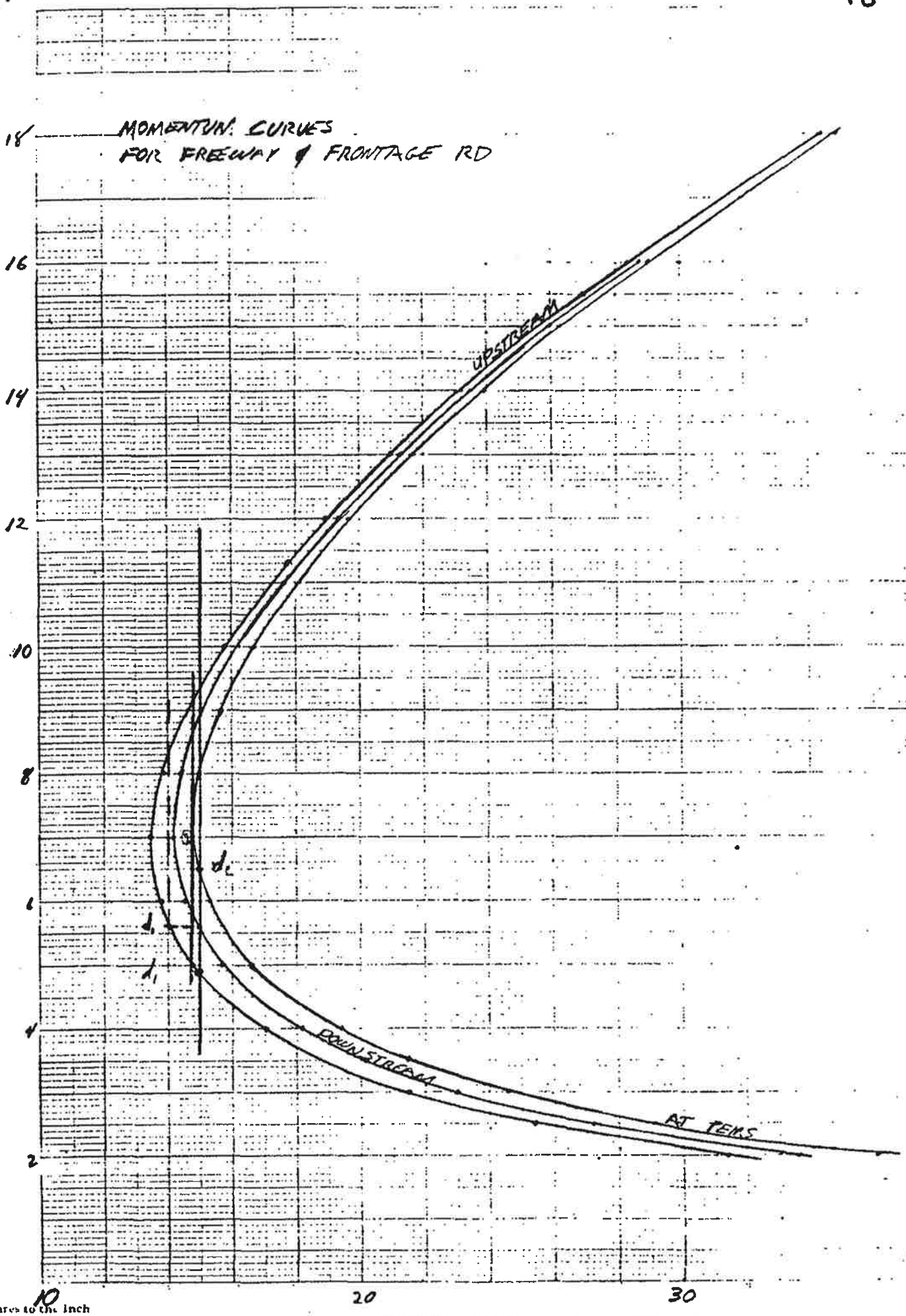
CHECK TO SEE IF JUMP WILL DROWN OUT D/S SIDE OF FRONTAGE ROAD



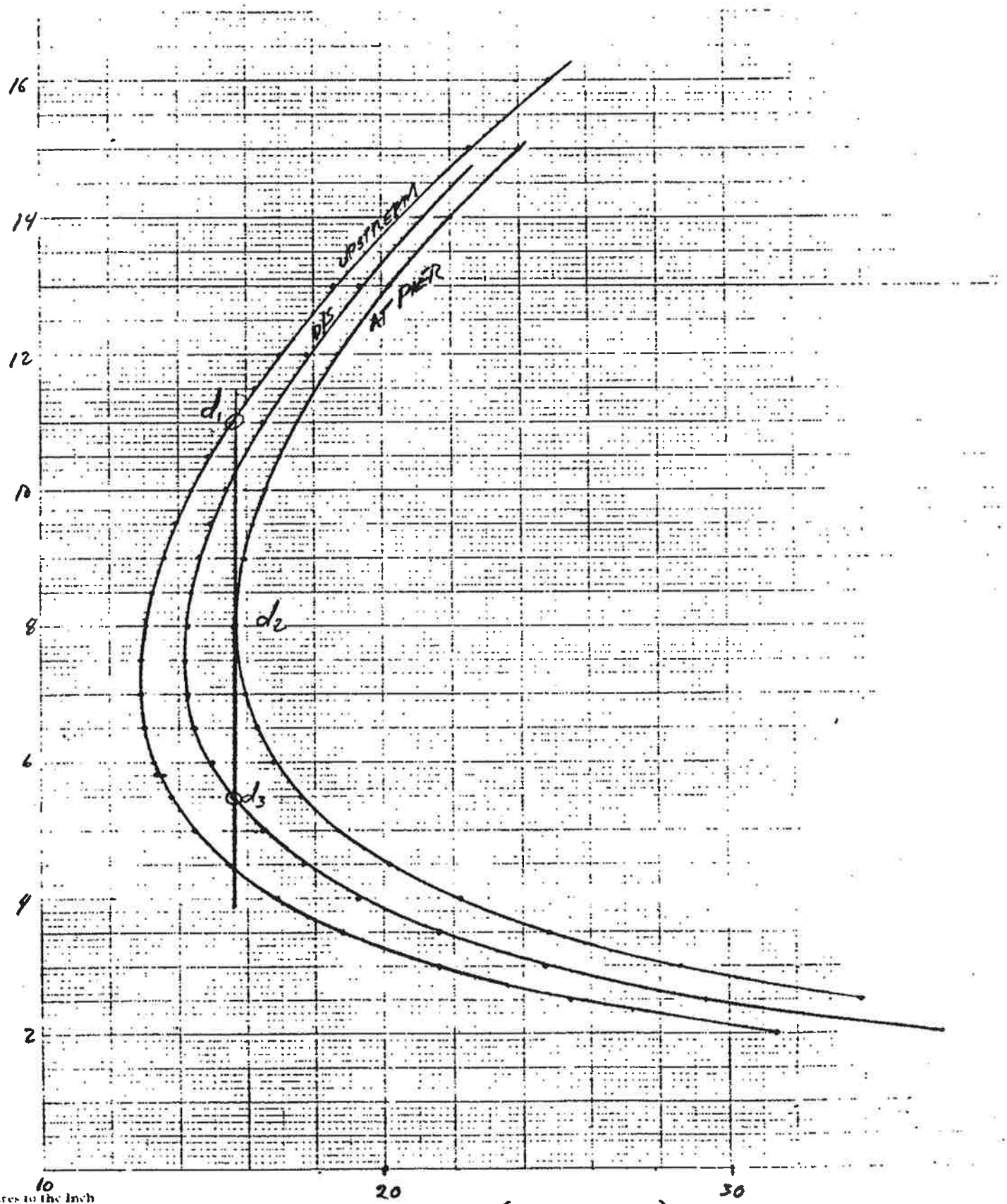
JUMP OCCURS @ 55' U/S OF RR. CROSSING

S_1 d	S_1 x	S_2 x	S_2 d
11.2	0	0	5.8
11.0	5.5	104'	5.5
10.5	13.43	70	5.0
10.0	12.86		
9.5	12.13		
9.0	11.16		
8.5	9.84		
8.0	7.95		
	Σ 62.8'		

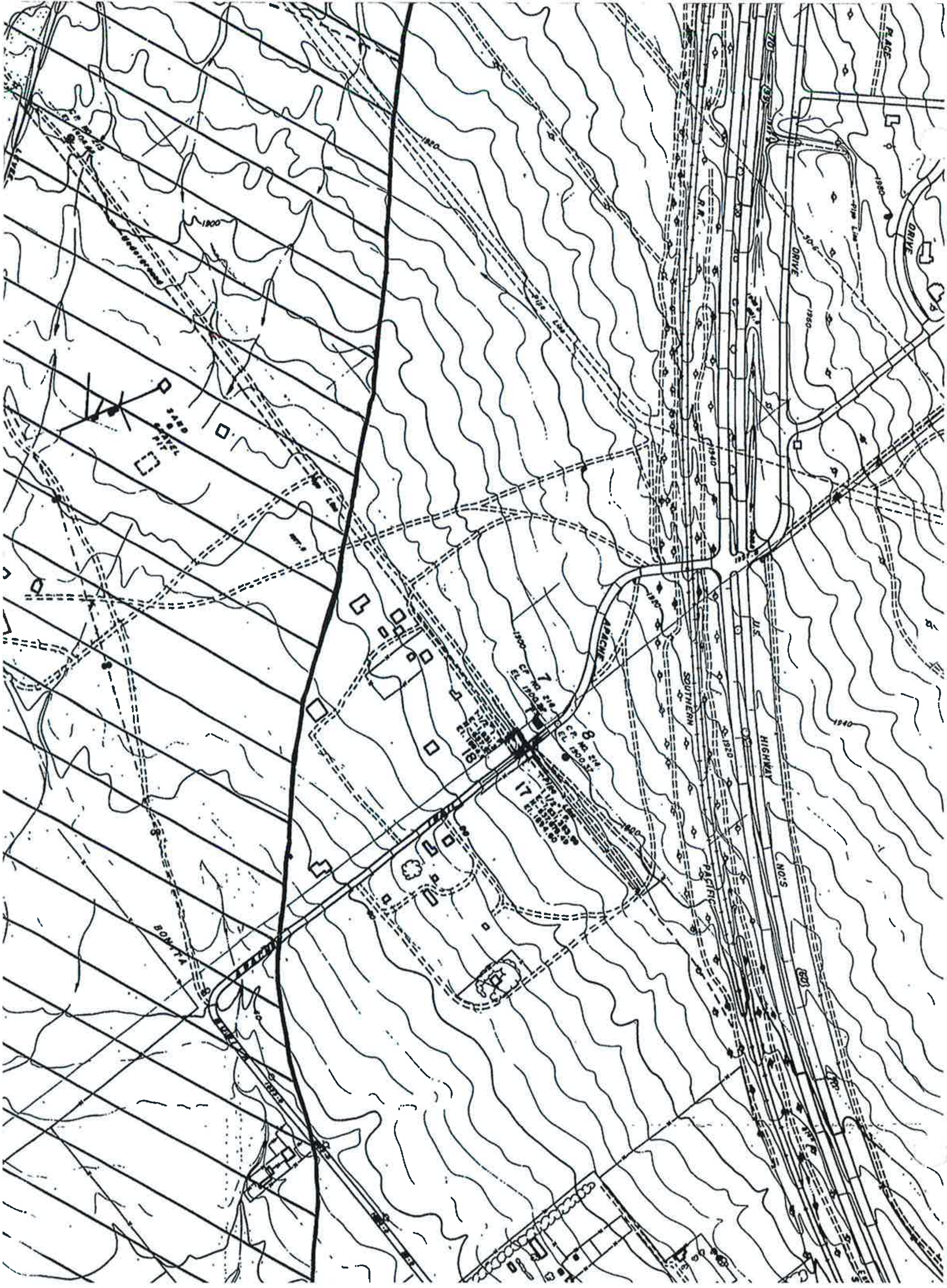
9.31

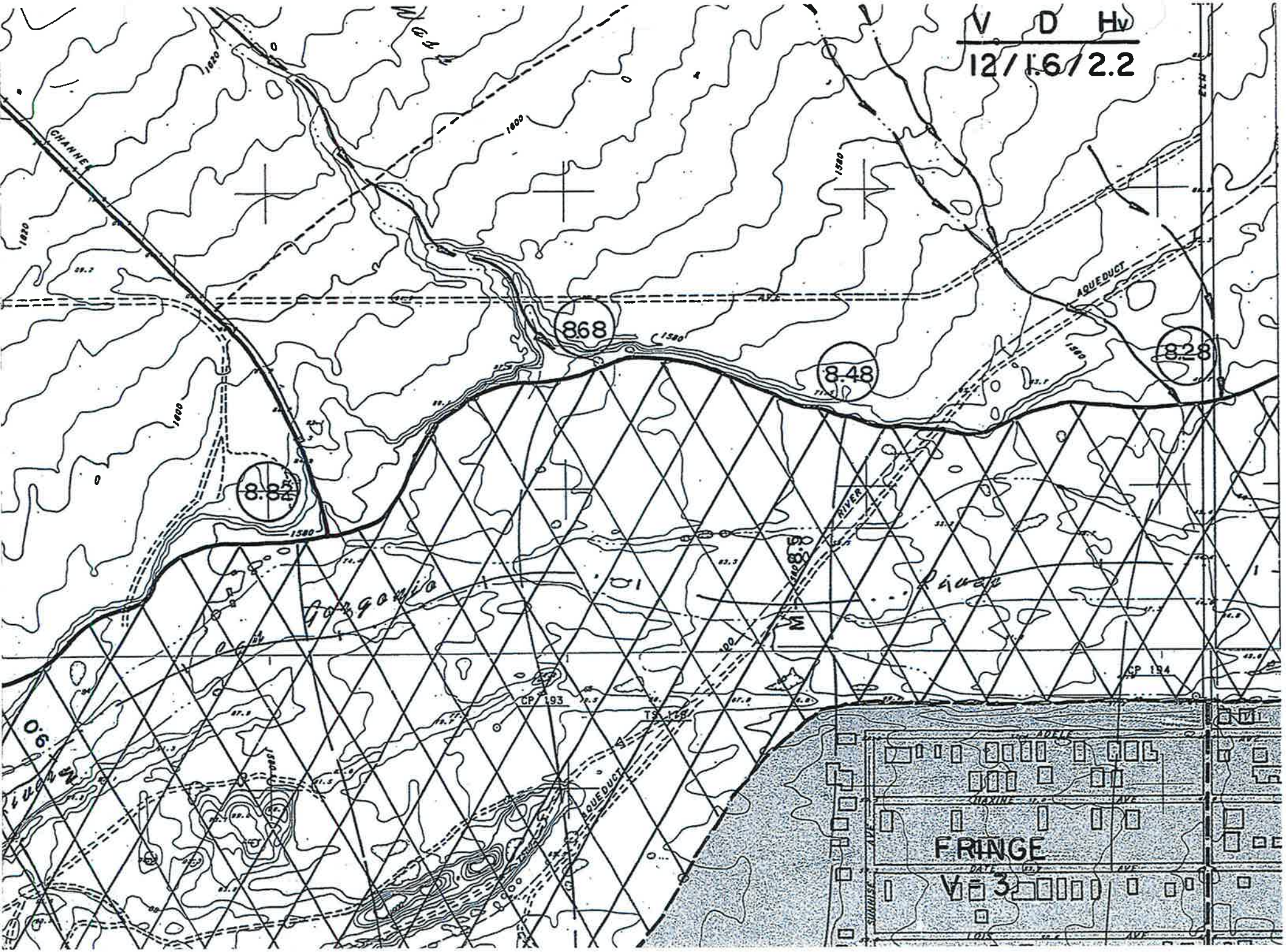


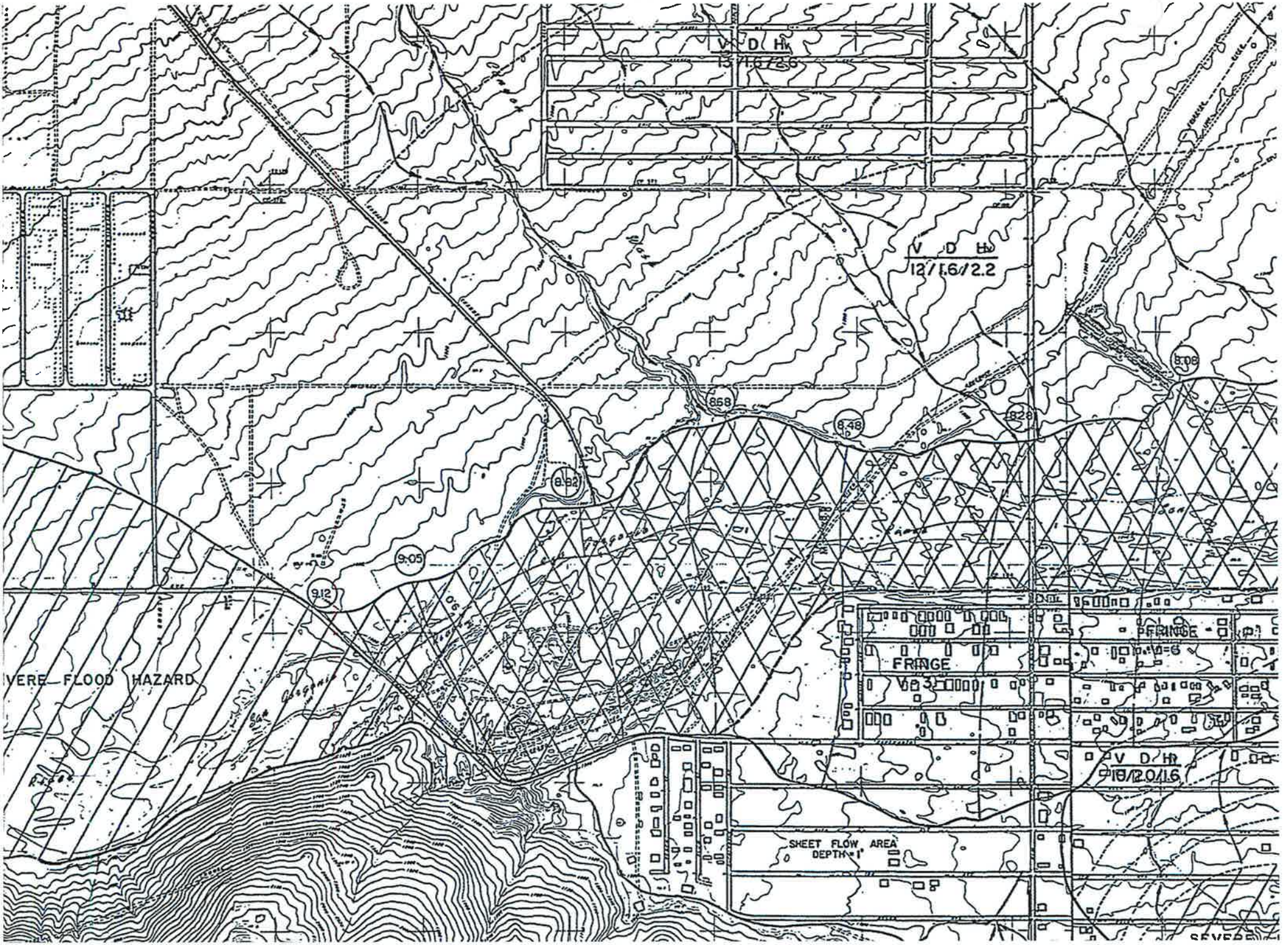
MOMENTUM CURVES FOR RAILROAD CROSSING



2× squares to the inch


SOUTHERN
PACIFIC
R.R.
U.S.
HIGHWAY
APACHE
DRIVE
PLACE
SAND & GRAVEL PIT
BONITA
TRAIL
7
8
17
18
1900
1920
1940
1960


V D Hv
12/1.6/2.2
868
8.48
8.28
8.82
AQUEDUCT
RIVER
CP 193
CP 194
FRINGE
V = 3


V D Hw
12/15.6/12.2
8.68
8.48
8.28
8.08
8.82
9.05
9.12
FRINGE
FRINGE
V D Hw
10/12.0/1.6
SHEET FLOW AREA
DEPTH=1'
VERE FLOOD HAZARD

EXHIBITS

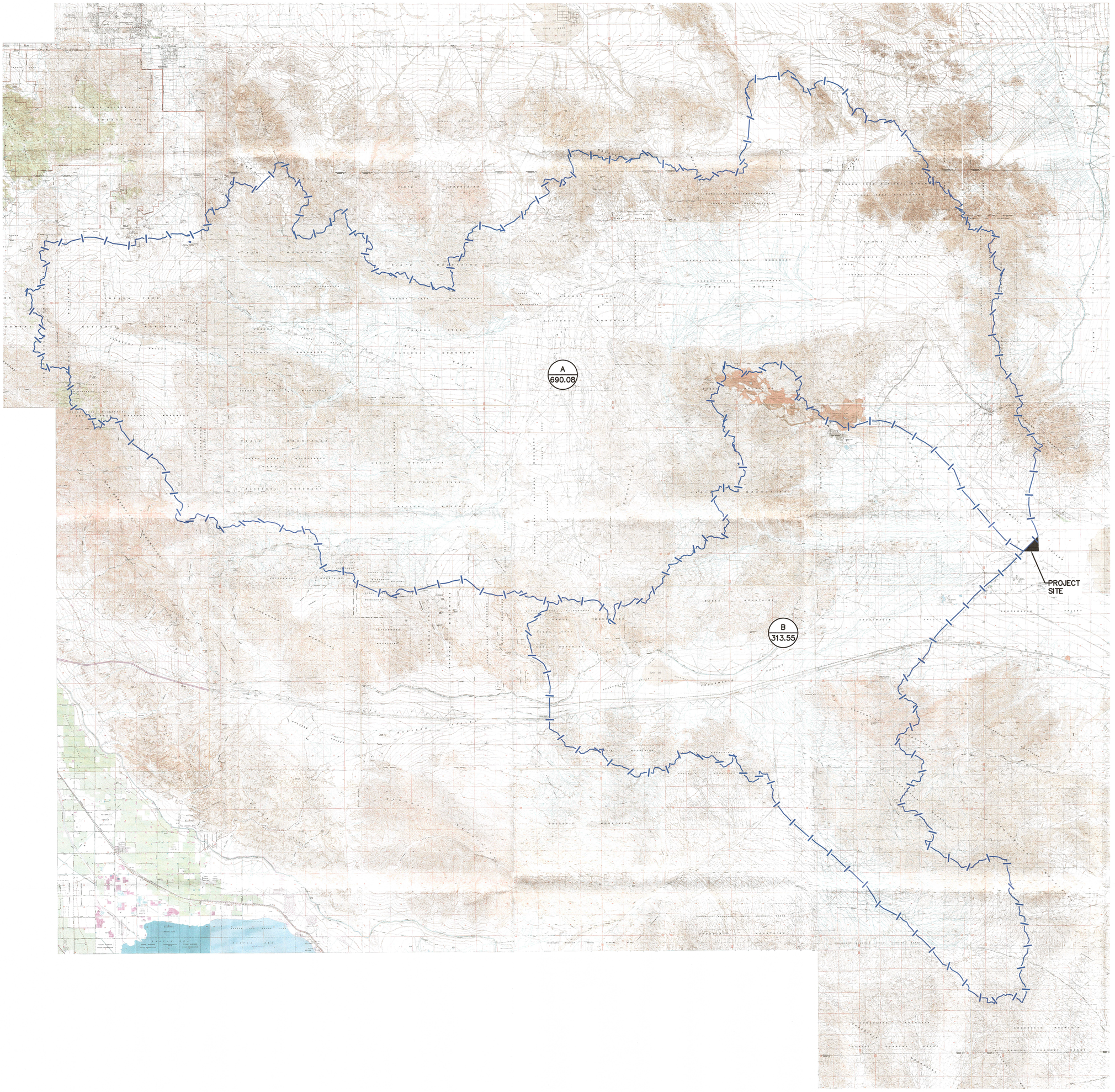
EXHIBIT A: TRIBUTARY WATERSHED MAP

EXHIBIT B: PROJECT IMPROVEMENT PLANS

PLS # 298145

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

EXISTING CONDITION WATERSHED MAP



LEGEND:

XXX / X.X — SUB AREA SQ. MI.

WATERSHED BOUNDARY

N

GRAPHIC SCALE
10,000' 0 5,000' 10,000' 20,000'
1" = 10,000'

JLC Engineering & Consulting, Inc.
36263 CALLE DE LOBO
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

EXHIBIT "A"

PLS # 298145

EXISTING CONDITION WATERSHED MAP

Appendix H.2

Onsite Drainage Report

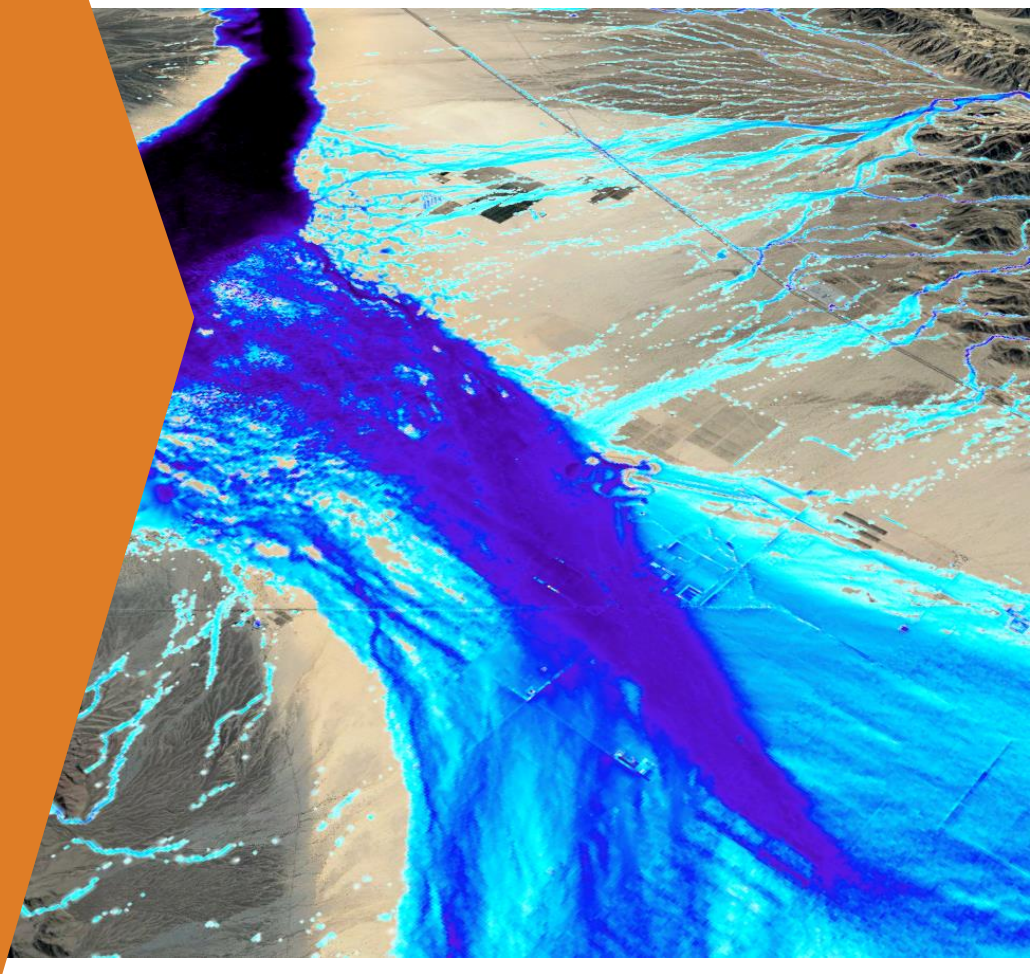
Westwood

Preliminary Onsite Drainage Study

Athos Solar Project

Riverside County, California

January 2019



Prepared For:

Intersect Power

Westwood

Preliminary Onsite Drainage Study for

Athos Solar Project

Prepared for:
Intersect Power, Inc.
2 Embarcadero Center, 7th Floor
San Francisco, CA 94111

Prepared by:
Tom Miller
Westwood Professional Services
12701 Whitewater Drive, Suite 300
Minnetonka, MN 55343

Project Number: 0013768.00
Date: 01/15/2019

CONTENTS

EXHIBITS

APPENDICES

INTRODUCTION

The purpose of this preliminary onsite drainage study is to describe the hydrology of the proposed Athos Solar Project ("the project") and determine the impact to flow rates from the site due to development of the project. This report was created to support the client with California Fish and Wildlife permitting and streambed alteration agreements. The project premises encompasses approximately 5.04 square miles of land in Riverside County, California and consists of 10 parcels that were modeled.

EXISTING CONDITIONS

The project boundary consists of approximately 5.04 square miles of undeveloped agricultural fields and poor desert shrubland. The majority of the parcels drain to the northeast with one parcel draining to the southeast. The project is on a mild slope with offsite drainage entering the site and flowing adjacent to the site, this offsite drainage is not modeled in this study and was modeled in a different hydrology report.

PROPOSED CONDITIONS

The proposed use of the site will be a solar facility. The solar facility will consist of solar modules mounted above grade on a racking system, gravel access roads and transformers, and a perimeter security fence. The solar modules are located above the ground and the finished ground conditions will be completely pervious.

PEAK RUNOFF RATES

Each parcel was divided into different drainage areas to analyze the peak discharge rates. Based on the topography, there were numerous onsite drainage areas. HydroCAD modeling software was used to complete the hydrologic and hydraulic modeling. Atlas-14 precipitation data was downloaded and used as input for the analysis (Appendix A).

To calculate existing peak discharge rates, hydrologic soil groups were determined for the site area. USDA-NRCS SSURGO soils data provided a general idea of the soils in the area but did not cover the entire area. Soil types were estimated based on landcover and SSURGO data and were hand edited after being approved by Riverside County. Soils in the area are primarily classified as hydrologic group C and D in the watershed area and A soils in the project boundary (Exhibit 3). For the pre-development peak discharge, a curve number of 77 was selected based on the existing agricultural disturbed areas and soils belonging to HSG A and 91 if belonging to HSG C, a curve number of 63 was selected based on the existing poor desert shrubland areas and soils belonging to HSG A and 85 if belonging to HSG C.

For the post-development calculations, a curve number of curve number of 77 was selected based on the barren disturbed areas and soils belonging to HSG A and 91 if belonging to HSG C. Impervious areas were also added to the project with the assumed impervious areas such as gravel access roads and inverters being 5% of the parcel area. The lag-curve number method was used to calculate the time of concentration for each proposed area as well. The existing and proposed conditions peak discharge rates for the project are presented in Table 1 - 20 and Appendix B. Basins were input into the model where necessary to reduce the flow rates of the proposed conditions to less than existing. The 10-year flood event was modeled for all parcels.

Table 1. Parcel 1 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	A	77	129.98	15.68
DA-2	Undeveloped Ag.	A	77	238.47	21.28
DA-3	Undeveloped Ag.	A	77	388.35	30.2
DA-4	Undeveloped Ag.	A	77	214.31	22.89
Total				**971.11**	**90.05**

Table 2. Parcel 1 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	123.48			
	Impervious Area	A	96	6.5			
	DA-1 Total	A	78	129.98	15.64	17.71	1.40
DA-2	Barren Soil	A	77	226.55			
	Impervious Area	A	96	11.92			
	DA-2 Total	A	78	238.47	20.67	23.88	2.94
DA-3	Barren Soil	A	77	368.94			
	Impervious Area	A	96	19.41			
	DA-3 Total	A	78	388.35	30.16	34.02	5.03
DA-4	Barren Soil	A	77	203.59			
	Impervious Area	A	96	10.72			
	DA-4 Total	A	78	214.31	22.21	25.59	2.45
Total				**971.11**	**88.68**	**101.2**	**11.82**

Table 3. Parcel 2 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Desert Shrubland	A	63	58.94	0.89
DA-2	Desert Shrubland	A	63	108.10	1.55
Total				**167.04**	**2.44**

Table 4. Parcel 2 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	55.99			
	Impervious Area	A	96	2.95			
	DA-1 Total	A	78	58.94	0.82	8.06	2.67
DA-2	Barren Soil	A	77	102.69			
	Impervious Area	A	96	5.41			
	DA-2 Total	A	78	108.10	1.49	13.38	4.83
Total				**167.04**	**2.31**	**21.44**	**7.5**

Table 5. Parcel 3 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	A	77	162.08	23.29
DA-2	Undeveloped Ag.	A	77	324.34	33.14
DA-3	Undeveloped Ag.	A	77	322.45	28.82
Total				**808.87**	**85.25**

Table 6. Parcel 3 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	153.98			
	Impervious Area	A	96	8.10			
	DA-1 Total	A	78	162.08	22.26	26.07	1.56
DA-2	Barren Soil	A	77	308.12			
	Impervious Area	A	96	16.22			
	DA-2 Total	A	78	324.34	32.51	37.07	3.64
DA-3	Barren Soil	A	77	306.33			
	Impervious Area	A	96	16.12			
	DA-3 Total	A	78	322.45	28.39	31.99	3.78
Total				**808.87**	**83.16**	**95.13**	**8.98**

Table 7. Parcel 4 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Desert Shrubland	A	63	52.61	1.03
DA-2	Desert Shrubland	A	63	58.00	1.14
Total				**110.61**	**2.17**

Table 8. Parcel 4 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	49.98			
	Impervious Area	A	96	2.63			
	DA-1 Total	A	78	52.61	1.02	11.76	2.13
DA-2	Barren Soil	A	77	55.10			
	Impervious Area	A	96	2.90			
	DA-2 Total	A	78	58.00	1.10	13.14	2.34
Total				**110.61**	**2.12**	**24.9**	**4.47**

Table 9. Parcel 5 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Desert Shrubland	C	85	105.01	47.42
DA-2	Desert Shrubland	C	85	143.02	63.99
DA-3	Desert Shrubland	C	85	33.01	19.18
Total				**281.04**	**130.59**

Table 10. Parcel 5 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	C	91	99.76			
	Impervious Area	C	96	5.25			
	DA-1 Total	C	91	105.01	46.83	78.52	4.26
DA-2	Barren Soil	C	91	135.87			
	Impervious Area	C	96	7.15			
	DA-2 Total	C	91	143.02	61.71	106.23	5.88
DA-3	Barren Soil	C	91	31.36			
	Impervious Area	C	96	1.65			
	DA-3 Total	C	91	33.01	17.90	31.46	1.28
Total				**281.04**	**126.44**	**216.21**	**11.42**

Table 11. Parcel 6 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	A	77	16.11	5.17
DA-2	Undeveloped Ag.	A	77	8.23	3.90
Total				**24.34**	**9.07**

Table 12. Parcel 6 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	15.30			
	Impervious Area	A	96	0.81			
	DA-1 Total	A	78	16.11	5.09	5.79	0.11
DA-2	Barren Soil	A	77	7.82			
	Impervious Area	A	96	0.41			
	DA-2 Total	A	78	8.23	3.79	4.35	0.03
Total				**24.34**	**8.88**	**10.14**	**0.14**

Table 13. Parcel 7 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	A	77	15.58	4.31
DA-2	Undeveloped Ag.	A	77	105.97	16.22
DA-3	Undeveloped Ag.	A	77	108.63	18.78
DA-4	Undeveloped Ag.	C	91	24.10	17.52
Total				**254.28**	**56.83**

Table 14. Parcel 7 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	14.80			
	Impervious Area	A	96	0.78			
	DA-1 Total	A	78	15.58	4.28	4.87	0.12
DA-2	Barren Soil	A	77	100.68			
	Impervious Area	A	96	5.29			
	DA-2 Total	A	78	105.97	16.03	18.24	1.05
DA-3	Barren Soil	A	77	103.20			
	Impervious Area	A	96	5.43			
	DA-3 Total	A	78	108.63	18.73	21.08	1.00
DA-4	Barren Soil	C	91	22.89			
	Impervious Area	C	96	1.21			
	DA-4 Total	C	91	24.10	16.85	17.52	0.14
Total				**254.28**	**55.89**	**61.71**	**2.31**

Table 15. Parcel 8 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	C	91	39.99	38.63
Total				**39.99**	**38.63**

Table 16. Parcel 8 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	C	91	38.00			
	Impervious Area	C	96	1.99			
	DA-1 Total	C	91	39.99	35.03	38.63	0.32
Total				**39.99**	**35.03**	**38.63**	**0.32**

Table 17. Parcel 9 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	A	77	137.25	18.58
DA-2	Undeveloped Ag.	A	77	32.09	6.54
Total				**169.34**	**25.12**

Table 18. Parcel 9 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	130.39			
	Impervious Area	A	96	6.86			
	DA-1 Total	A	78	137.25	18.36	20.74	1.44
DA-2	Barren Soil	A	77	30.49			
	Impervious Area	A	96	1.60			
	DA-2 Total	A	78	32.09	6.49	7.35	0.29
Total				**169.34**	**24.85**	**28.09**	**1.73**

Table 19. Parcel 10 Existing Condition HydroCAD peak flow rates

Existing Conditions					
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate (cfs)**
					10-year
DA-1	Undeveloped Ag.	A	77	52.64	10.37
DA-2	Undeveloped Ag.	A	77	158.91	23.58
DA-3	Undeveloped Ag.	A	77	36.45	8.23
DA-4	Undeveloped Ag.	A	77	152.53	23.64
Total				**400.53**	**65.82**

Table 20. Parcel 10 Post-Development Conditions HydroCAD peak flow rates

Proposed Conditions							
Drainage Area	**Land Cover**	**HSG**	**CN**	**Area (Acres)**	**Peak Discharge Rate w/ basin (cfs)**	**Peak Discharge Rate w/o basin (cfs)**	**Basin Volume (Ac-Ft)**
					10-year	**10-Year**	
DA-1	Barren Soil	A	77	50.01			
	Impervious Area	A	96	2.63			
	DA-1 Total	A	78	52.64	10.26	11.59	0.48
DA-2	Barren Soil	A	77	150.96			
	Impervious Area	A	96	7.95			
	DA-2 Total	A	78	158.91	23.31	26.46	1.59
DA-3	Barren Soil	A	77	34.63			
	Impervious Area	A	96	1.82			
	DA-3 Total	A	78	36.45	8.05	9.21	0.33
DA-4	Barren Soil	A	77	144.9			
	Impervious Area	A	96	7.63			
	DA-4 Total	A	78	152.53	23.52	26.47	1.45
Total				**400.53**	**64.14**	**62.14**	**3.85**

As shown in Tables 1-20, the change from undeveloped agricultural land and poor desert shrubland to a solar facility with infiltration basins creates post-development discharge rates lower than the pre-development conditions. This modeling should be updated when final plans and layouts have been completed for the project area.

SUMMARY

This analysis shows that runoff rates from the site increase marginally with creation of the solar facility. These increases are unlikely to impact downstream properties but if required, these increases can be mitigated by constructing detention basins of the sizes provided. This sizing is based on preliminary concepts and needs to be refined for construction. Additional stormwater management may be required to protect the site from flooding but flood control design was outside the scope of this study.

REFERENCES

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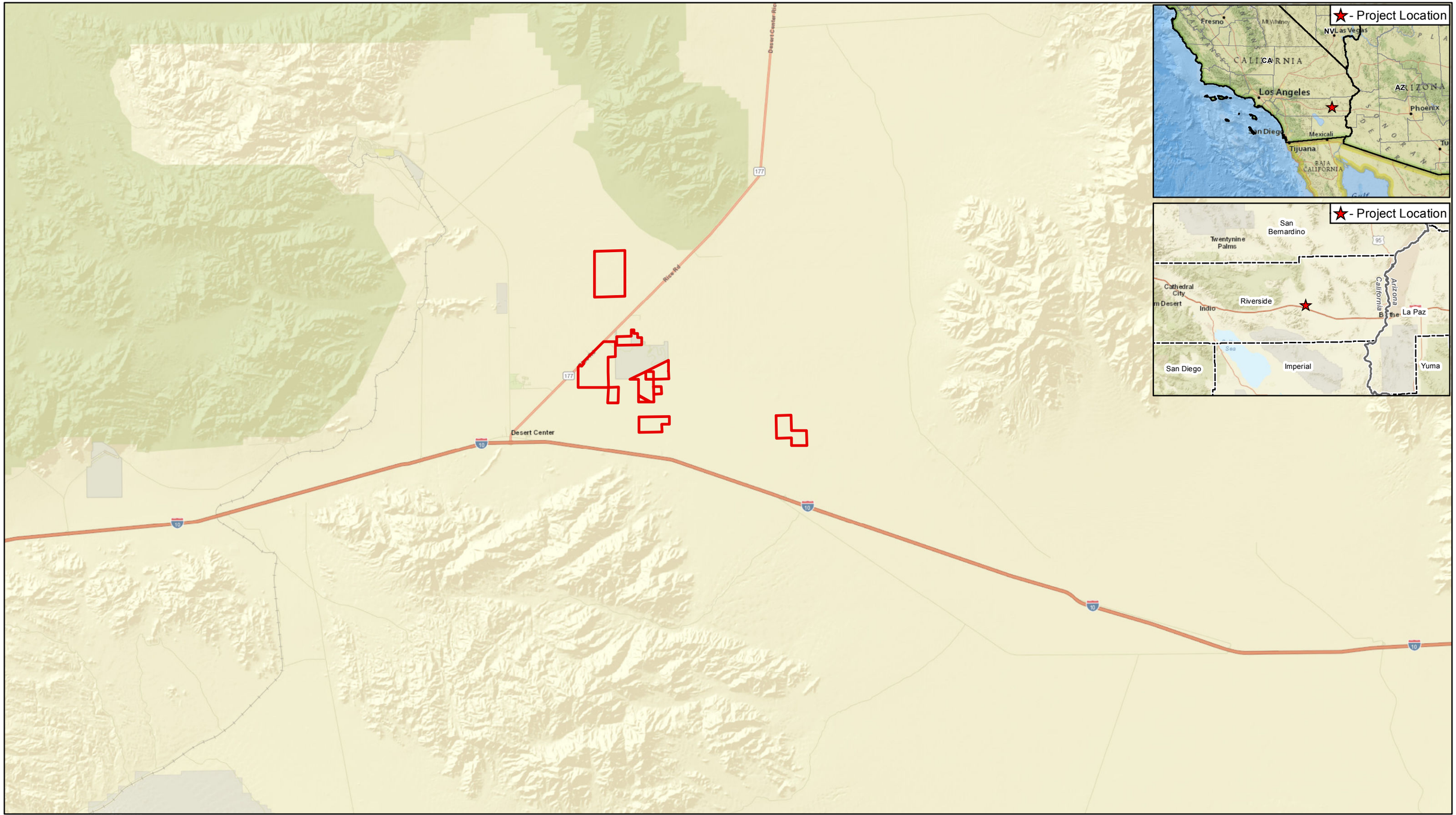
Exhibits



Data Source(s): Westwood (2019); ESRI WMS World Streets Basemap Imagery (Accessed 2019).

Legend

- Project Boundary
- County Boundary

N

0 3 Miles

Athos Solar Project

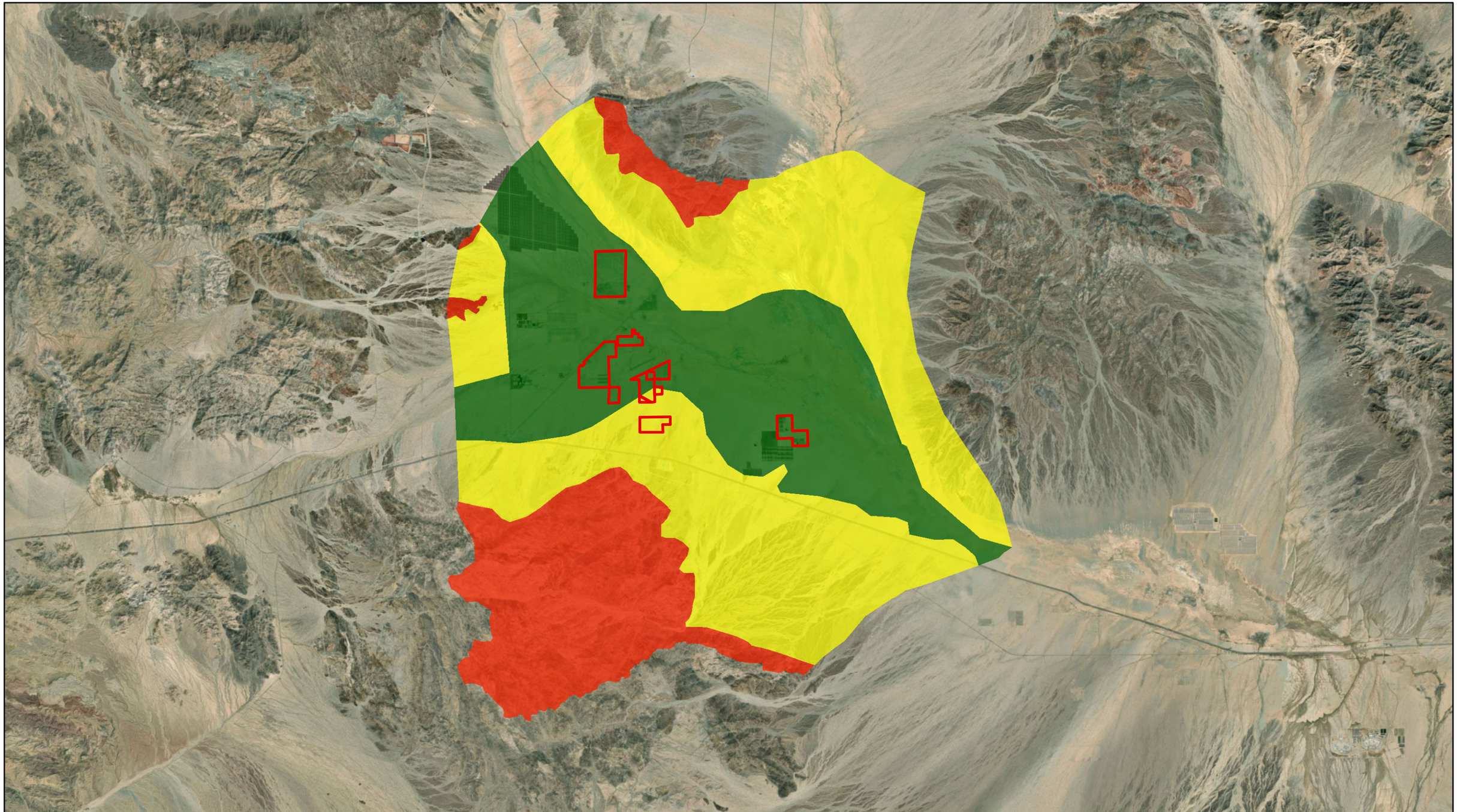
Riverside County, California

Exhibit 1: Location Map

January 14, 2019

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\00013768.00\GIS\Hydro Exhibits\2019-11-14 Exhibits\2019-01-14_Athos_EX1LocationMap.mxd 1/14/2019 3:25:42 PM



Data Source(s): Westwood (2019); ESRI WMS World Streets Basemap Imagery (Accessed 2019).

Legend

Project Boundary

County Boundary

Hydrologic Soils Group

A

C

D

N

0 3 Miles

Athos Solar Project

Riverside County, California

Exhibit 2: Soils Map

January 14, 2019

Westwood

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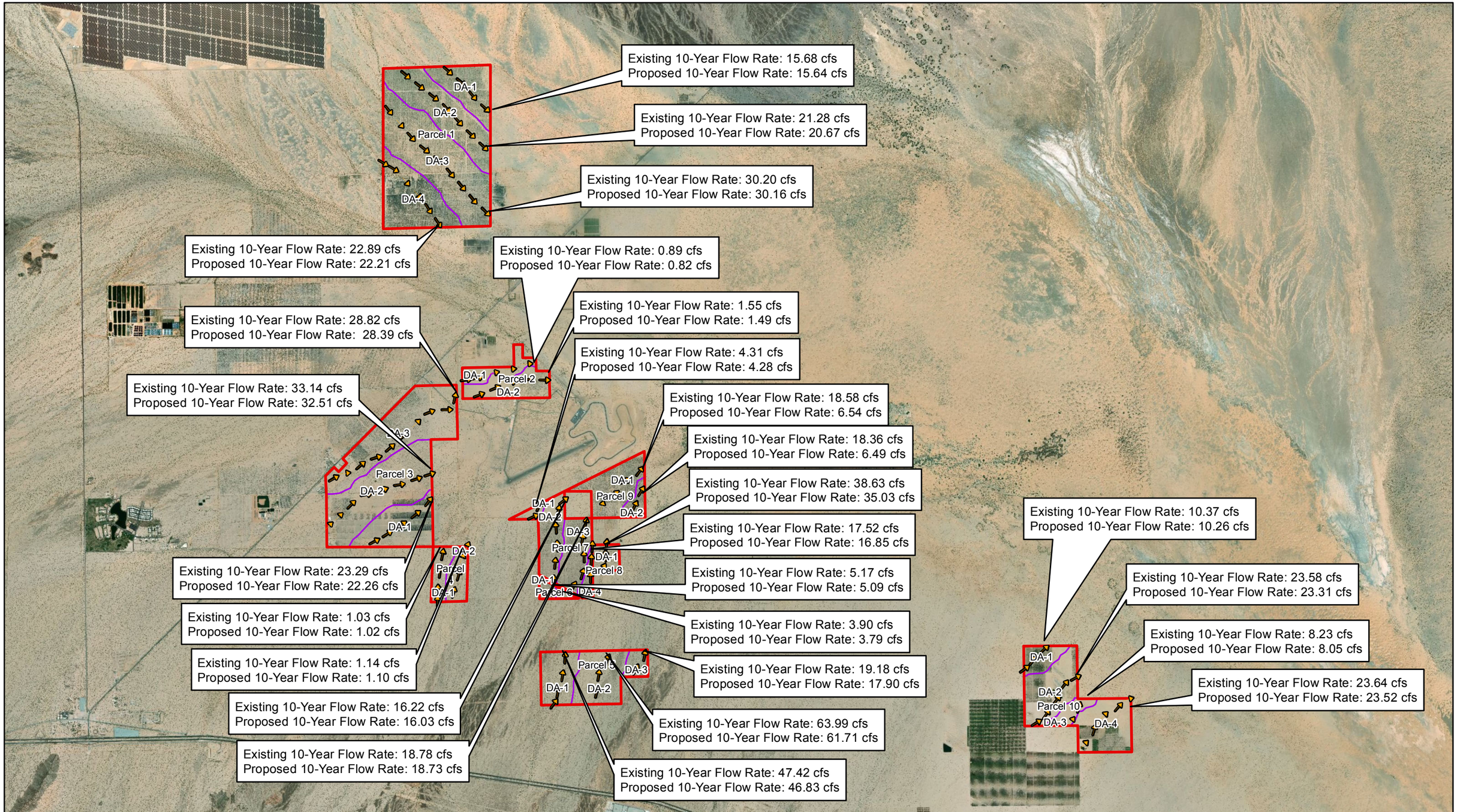
Westwood Professional Services, Inc.

Map Document: N:\0013788.00\GIS\Hydro Exhibits\2019-11-14 Exhibits\2019-01-14_Athos_EX3SoilsMap.mxd 1/14/2019 3:26:18 PM



Data Source(s): Westwood (2019); ESRI WMS World Streets Basemap Imagery (Accessed 2019).

Legend

Project Boundary

Onsite Drainage Area

County Boundary

Onsite Flow Path

N

0 4,500 Feet

Athos Solar Project

Riverside County, California

Exhibit 3: Preliminary Drainage Map

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Map Document: N:\0013788.00\GIS\Hydro Exhibits\2019-11-14 Exhibits\2019-01-14_Athos_PreliminaryDrainageMap.mxd 1/14/2019 3:06:12 PM

Appendix A

NOAA Atlas 14 Rainfall Data

NOAA Atlas 14, Volume 6, Version 2
Location name: Desert Center, California, USA*
Latitude: 33.7518°, Longitude: -115.3673°
Elevation: 625.2 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	**0.081** (0.067-0.098)	**0.127** (0.106-0.154)	**0.192** (0.159-0.234)	**0.248** (0.204-0.304)	**0.329** (0.262-0.418)	**0.396** (0.309-0.514)	**0.468** (0.356-0.622)	**0.548** (0.405-0.748)	**0.663** (0.470-0.945)	**0.760** (0.521-1.12)
10-min	**0.116** (0.097-0.140)	**0.182** (0.152-0.221)	**0.275** (0.228-0.335)	**0.355** (0.293-0.436)	**0.472** (0.376-0.599)	**0.568** (0.443-0.736)	**0.671** (0.510-0.892)	**0.785** (0.580-1.07)	**0.951** (0.674-1.36)	**1.09** (0.746-1.61)
15-min	**0.140** (0.117-0.170)	**0.221** (0.184-0.268)	**0.333** (0.276-0.405)	**0.430** (0.354-0.528)	**0.571** (0.454-0.724)	**0.687** (0.535-0.890)	**0.812** (0.617-1.08)	**0.949** (0.702-1.30)	**1.15** (0.815-1.64)	**1.32** (0.902-1.95)
30-min	**0.195** (0.163-0.237)	**0.307** (0.256-0.373)	**0.464** (0.385-0.564)	**0.599** (0.493-0.735)	**0.795** (0.633-1.01)	**0.957** (0.745-1.24)	**1.13** (0.860-1.50)	**1.32** (0.977-1.81)	**1.60** (1.14-2.28)	**1.84** (1.26-2.71)
60-min	**0.264** (0.220-0.320)	**0.415** (0.345-0.504)	**0.626** (0.520-0.762)	**0.809** (0.666-0.992)	**1.07** (0.854-1.36)	**1.29** (1.01-1.68)	**1.53** (1.16-2.03)	**1.79** (1.32-2.44)	**2.16** (1.53-3.08)	**2.48** (1.70-3.66)
2-hr	**0.347** (0.289-0.421)	**0.526** (0.438-0.638)	**0.779** (0.646-0.948)	**1.00** (0.823-1.23)	**1.33** (1.06-1.68)	**1.60** (1.25-2.07)	**1.89** (1.44-2.52)	**2.22** (1.64-3.04)	**2.71** (1.92-3.86)	**3.12** (2.13-4.60)
3-hr	**0.397** (0.331-0.481)	**0.594** (0.494-0.721)	**0.874** (0.725-1.06)	**1.12** (0.922-1.38)	**1.49** (1.18-1.89)	**1.79** (1.40-2.32)	**2.13** (1.62-2.83)	**2.50** (1.85-3.42)	**3.06** (2.17-4.36)	**3.53** (2.42-5.21)
6-hr	**0.484** (0.403-0.587)	**0.719** (0.598-0.873)	**1.06** (0.875-1.28)	**1.35** (1.11-1.66)	**1.79** (1.43-2.27)	**2.16** (1.69-2.80)	**2.57** (1.96-3.42)	**3.03** (2.24-4.14)	**3.71** (2.63-5.29)	**4.30** (2.94-6.34)
12-hr	**0.564** (0.470-0.683)	**0.851** (0.708-1.03)	**1.26** (1.05-1.53)	**1.62** (1.33-1.99)	**2.15** (1.71-2.73)	**2.59** (2.02-3.36)	**3.08** (2.34-4.09)	**3.62** (2.68-4.95)	**4.42** (3.14-6.30)	**5.11** (3.50-7.53)
24-hr	**0.723** (0.640-0.834)	**1.11** (0.984-1.29)	**1.67** (1.47-1.93)	**2.15** (1.88-2.51)	**2.86** (2.42-3.44)	**3.45** (2.86-4.23)	**4.09** (3.32-5.13)	**4.79** (3.79-6.18)	**5.83** (4.43-7.82)	**6.70** (4.93-9.29)
2-day	**0.838** (0.741-0.966)	**1.30** (1.15-1.51)	**1.96** (1.73-2.27)	**2.53** (2.22-2.95)	**3.37** (2.86-4.05)	**4.06** (3.38-4.99)	**4.81** (3.91-6.04)	**5.63** (4.46-7.27)	**6.84** (5.20-9.17)	**7.84** (5.77-10.9)
3-day	**0.890** (0.788-1.03)	**1.39** (1.23-1.60)	**2.09** (1.84-2.42)	**2.70** (2.37-3.15)	**3.60** (3.05-4.33)	**4.34** (3.60-5.32)	**5.13** (4.17-6.45)	**6.01** (4.75-7.76)	**7.29** (5.54-9.78)	**8.36** (6.15-11.6)
4-day	**0.943** (0.835-1.09)	**1.47** (1.30-1.70)	**2.21** (1.95-2.56)	**2.86** (2.50-3.33)	**3.80** (3.22-4.57)	**4.58** (3.81-5.62)	**5.43** (4.41-6.82)	**6.36** (5.03-8.20)	**7.71** (5.86-10.4)	**8.85** (6.51-12.3)
7-day	**0.994** (0.880-1.15)	**1.53** (1.35-1.77)	**2.29** (2.02-2.65)	**2.96** (2.59-3.45)	**3.94** (3.34-4.74)	**4.75** (3.95-5.83)	**5.63** (4.58-7.08)	**6.61** (5.23-8.53)	**8.04** (6.11-10.8)	**9.24** (6.80-12.8)
10-day	**1.02** (0.905-1.18)	**1.57** (1.38-1.81)	**2.34** (2.06-2.71)	**3.02** (2.64-3.52)	**4.02** (3.40-4.83)	**4.85** (4.03-5.95)	**5.75** (4.67-7.23)	**6.75** (5.34-8.71)	**8.22** (6.25-11.0)	**9.45** (6.95-13.1)
20-day	**1.11** (0.984-1.28)	**1.71** (1.51-1.97)	**2.55** (2.25-2.95)	**3.28** (2.87-3.83)	**4.37** (3.70-5.26)	**5.27** (4.38-6.46)	**6.24** (5.07-7.84)	**7.31** (5.78-9.43)	**8.87** (6.75-11.9)	**10.2** (7.49-14.1)
30-day	**1.18** (1.05-1.36)	**1.83** (1.62-2.11)	**2.75** (2.42-3.18)	**3.55** (3.11-4.14)	**4.72** (4.00-5.68)	**5.69** (4.73-6.98)	**6.73** (5.46-8.45)	**7.86** (6.22-10.1)	**9.50** (7.22-12.7)	**10.9** (7.99-15.1)
45-day	**1.25** (1.11-1.44)	**1.98** (1.75-2.28)	**3.00** (2.65-3.48)	**3.89** (3.41-4.54)	**5.19** (4.40-6.25)	**6.25** (5.20-7.68)	**7.38** (6.00-9.28)	**8.60** (6.80-11.1)	**10.3** (7.87-13.9)	**11.8** (8.66-16.3)
60-day	**1.35** (1.19-1.55)	**2.16** (1.91-2.49)	**3.30** (2.91-3.82)	**4.28** (3.75-5.00)	**5.71** (4.84-6.87)	**6.87** (5.71-8.43)	**8.10** (6.58-10.2)	**9.42** (7.45-12.1)	**11.3** (8.58-15.1)	**12.8** (9.41-17.7)

[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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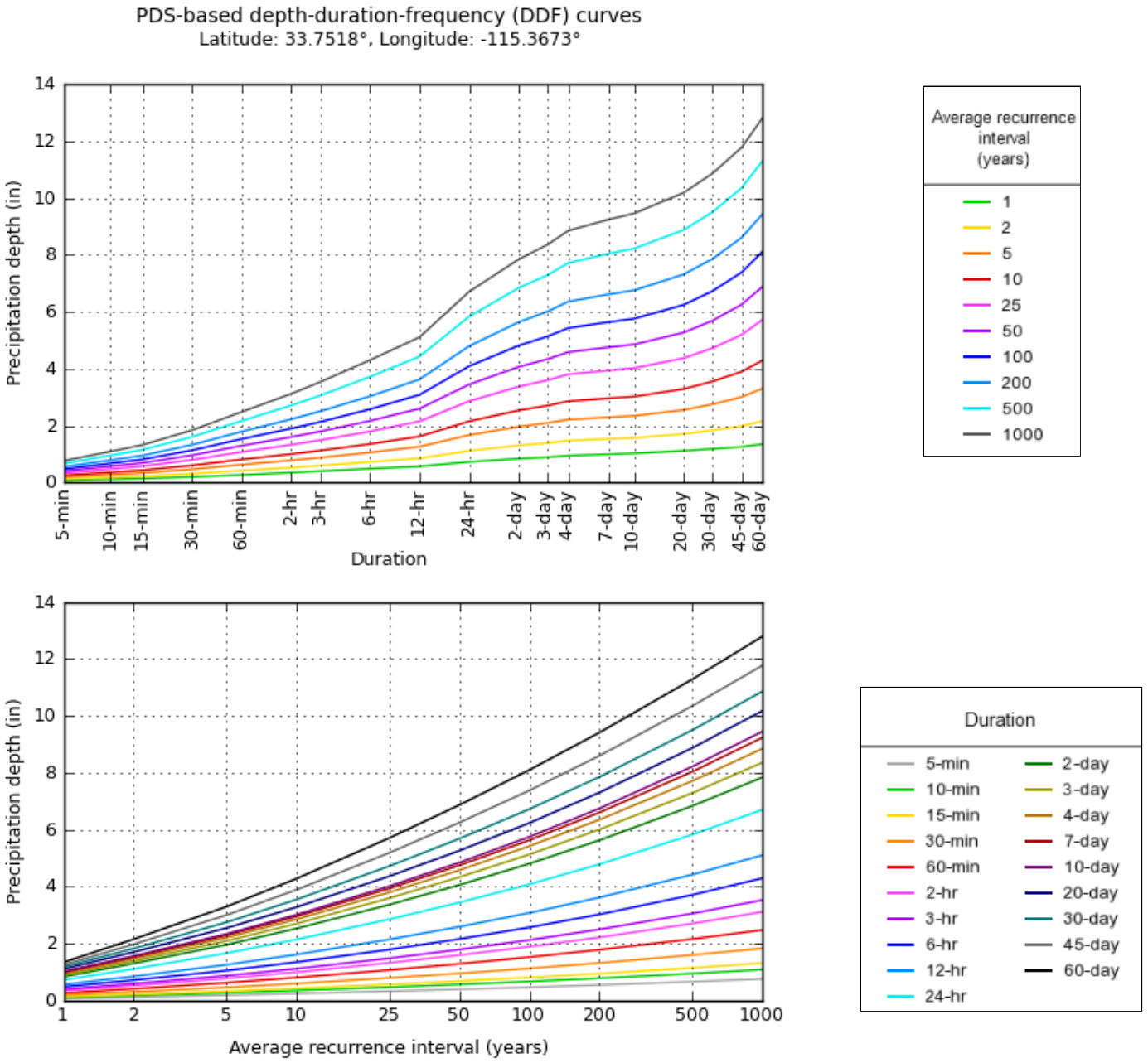
PF graphical



NOAA Atlas 14, Volume 6, Version 2

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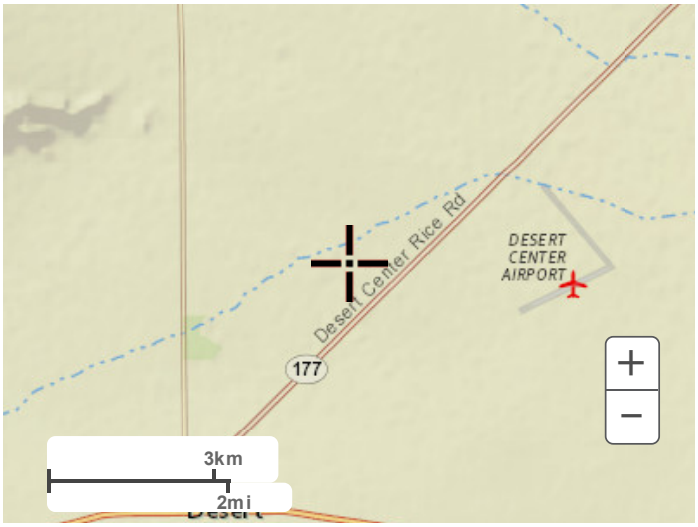
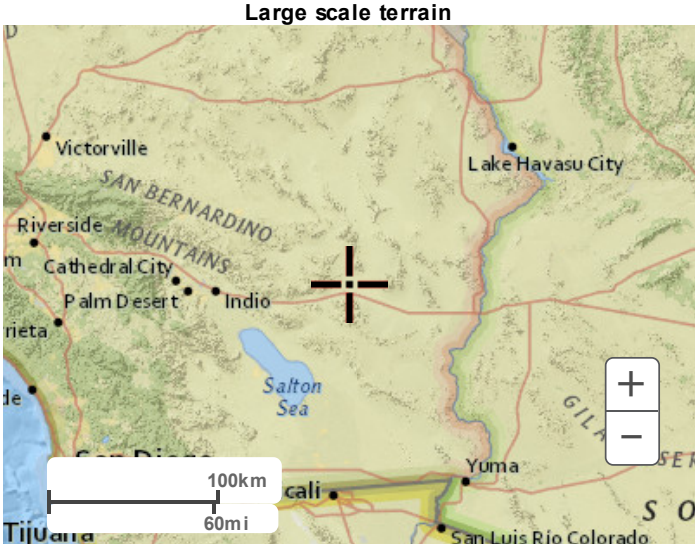
Maps & aerials

Small scale terrain



Large scale terrain



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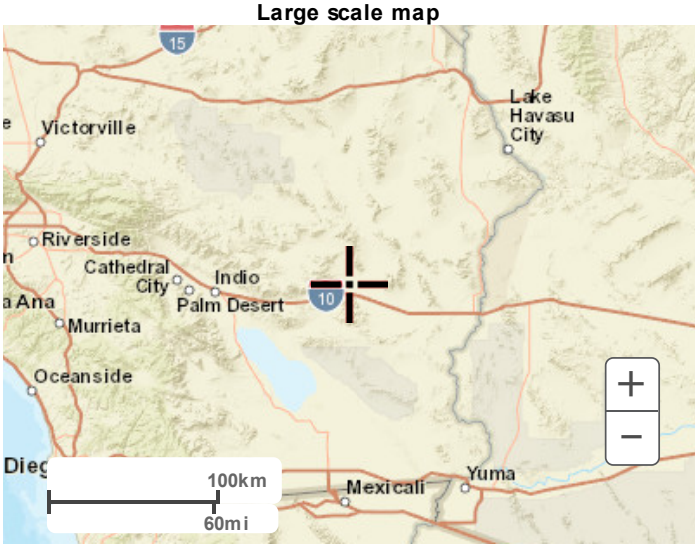

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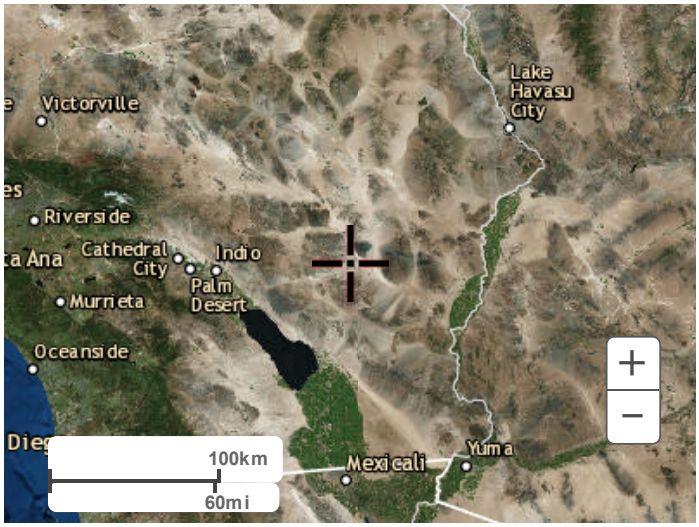

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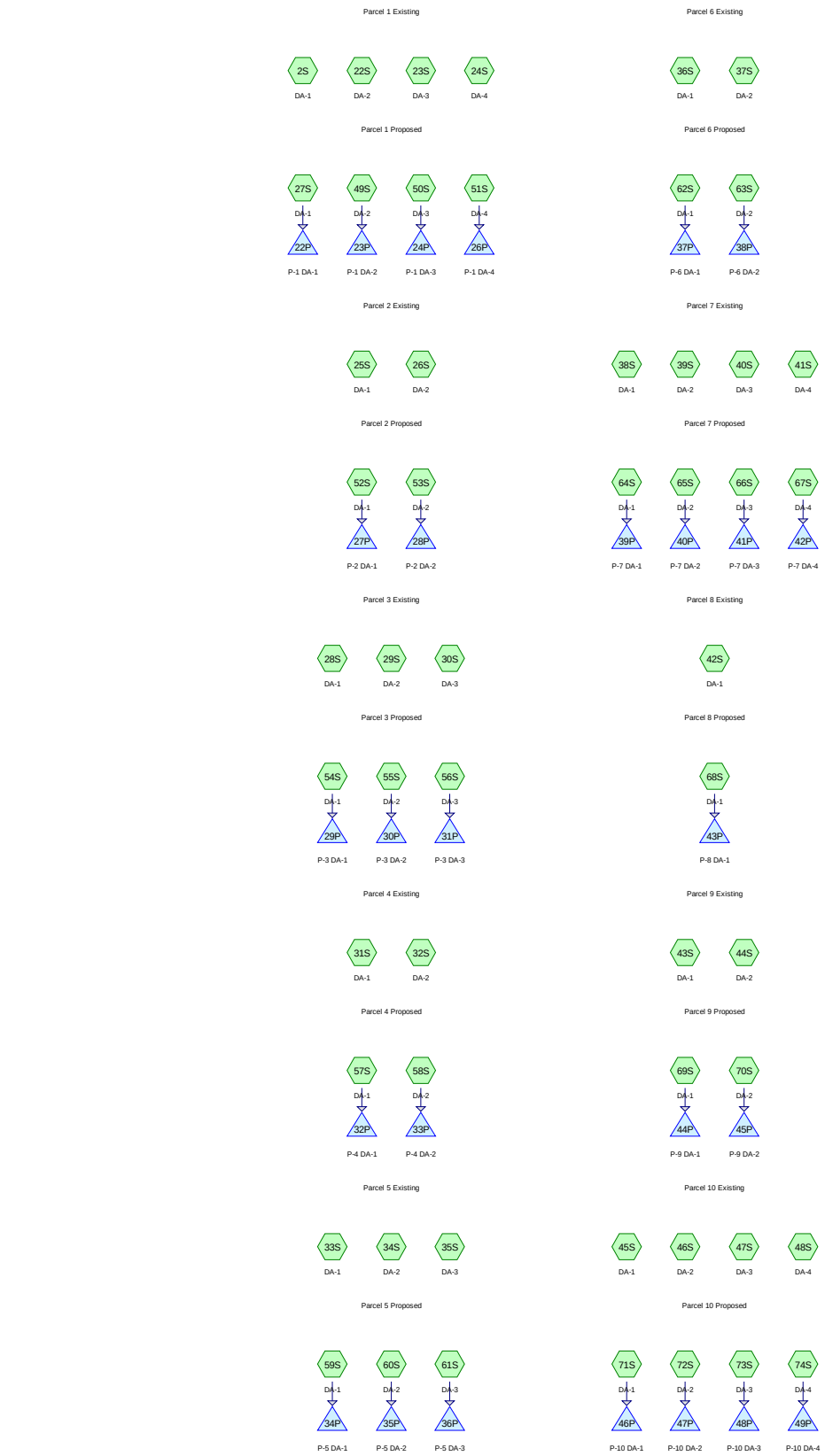
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Appendix B

HydroCAD Reports



Routing Diagram for 2019-01-11_PrePost

Prepared by Westwood Professional Services, Inc., Printed 1/14/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
277.650	63	Desert shrub range, Poor, HSG A (25S, 26S, 31S, 32S)
281.040	85	Desert shrub range, Poor, HSG C (33S, 34S, 35S)
5,342.300	77	Fallow, bare soil, HSG A (2S, 22S, 23S, 24S, 27S, 28S, 29S, 30S, 36S, 37S, 38S, 39S, 40S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, 50S, 51S, 52S, 53S, 54S, 55S, 56S, 57S, 58S, 62S, 63S, 64S, 65S, 66S, 69S, 70S, 71S, 72S, 73S, 74S)
391.970	91	Fallow, bare soil, HSG C (41S, 42S, 59S, 60S, 61S, 67S, 68S)
144.090	96	Gravel surface, HSG A (27S, 49S, 50S, 51S, 52S, 53S, 54S, 55S, 56S, 57S, 58S, 62S, 63S, 64S, 65S, 66S, 69S, 70S, 71S, 72S, 73S, 74S)
17.250	96	Gravel surface, HSG C (59S, 60S, 61S, 67S, 68S)
6,454.300	**78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5,764.040	HSG A	2S, 22S, 23S, 24S, 25S, 26S, 27S, 28S, 29S, 30S, 31S, 32S, 36S, 37S, 38S, 39S, 40S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, 50S, 51S, 52S, 53S, 54S, 55S, 56S, 57S, 58S, 62S, 63S, 64S, 65S, 66S, 69S, 70S, 71S, 72S, 73S, 74S
0.000	HSG B	
690.260	HSG C	33S, 34S, 35S, 41S, 42S, 59S, 60S, 61S, 67S, 68S
0.000	HSG D	
0.000	Other	
6,454.300		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
277.650	0.000	281.040	0.000	0.000	558.690	Desert shrub range, Poor	25S, 26S, 31S, 32S, 33S, 34S, 35S
5,342.300	0.000	391.970	0.000	0.000	5,734.270	Fallow, bare soil	2S, 22S, 23S, 24S, 27S, 28S, 29S, 30S, 36S, 37S, 38S, 39S, 40S, 41S, 42S, 43S, 44S, 45S, 46S, 47S, 48S, 49S, 50S, 51S, 52S, 53S, 54S, 55S, 56S, 57S, 58S, 59S, 60S, 61S, 62S, 63S, 64S, 65S, 66S, 67S, 68S, 69S, 70S, 71S, 72S, 73S, 74S
144.090	0.000	17.250	0.000	0.000	161.340	Gravel surface	27S, 49S, 50S, 51S, 52S, 53S, 54S, 55S, 56S, 57S, 58S, 59S, 60S, 61S, 62S, 63S, 64S, 65S, 66S, 67S, 68S, 69S, 70S, 71S, 72S, 73S, 74S
5,764.040	**0.000**	**690.260**	**0.000**	**0.000**	**6,454.300**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: DA-1 Runoff Area=129.980 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=3,625' Slope=0.0060 '/' Tc=125.9 min CN=77 Runoff=15.68 cfs 5.752 af

Subcatchment 22S: DA-2 Runoff Area=238.470 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=6,625' Slope=0.0066 '/' Tc=194.5 min CN=77 Runoff=21.28 cfs 10.552 af

Subcatchment 23S: DA-3 Runoff Area=388.350 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=7,950' Slope=0.0059 '/' Tc=238.0 min CN=77 Runoff=30.20 cfs 17.185 af

Subcatchment 24S: DA-4 Runoff Area=214.310 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=4,325' Slope=0.0054 '/' Tc=152.9 min CN=77 Runoff=22.89 cfs 9.483 af

Subcatchment 25S: DA-1 Runoff Area=58.940 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=3,700' Slope=0.0063 '/' Tc=182.9 min CN=63 Runoff=0.89 cfs 0.682 af

Subcatchment 26S: DA-2 Runoff Area=108.100 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=4,300' Slope=0.0060 '/' Tc=211.3 min CN=63 Runoff=1.55 cfs 1.251 af

Subcatchment 27S: DA-1 Runoff Area=129.980 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=3,625' Slope=0.0060 '/' Tc=122.2 min CN=78 Runoff=17.71 cfs 6.182 af

Subcatchment 28S: DA-1 Runoff Area=162.080 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=3,800' Slope=0.0107 '/' Tc=97.9 min CN=77 Runoff=23.29 cfs 7.172 af

Subcatchment 29S: DA-2 Runoff Area=324.340 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=6,530' Slope=0.0095 '/' Tc=160.2 min CN=77 Runoff=33.14 cfs 14.352 af

Subcatchment 30S: DA-3 Runoff Area=322.450 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=8,000' Slope=0.0086 '/' Tc=198.1 min CN=77 Runoff=28.82 cfs 14.269 af

Subcatchment 31S: DA-1 Runoff Area=52.610 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=2,700' Slope=0.0174 '/' Tc=85.5 min CN=63 Runoff=1.03 cfs 0.609 af

Subcatchment 32S: DA-2 Runoff Area=58.000 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=2,750' Slope=0.0185 '/' Tc=84.2 min CN=63 Runoff=1.14 cfs 0.671 af

Subcatchment 33S: DA-1 Runoff Area=105.010 ac 0.00% Impervious Runoff Depth=0.91"
Flow Length=2,700' Slope=0.0181 '/' Tc=44.3 min CN=85 Runoff=47.42 cfs 7.934 af

Subcatchment 34S: DA-2 Runoff Area=143.020 ac 0.00% Impervious Runoff Depth=0.91"
Flow Length=2,700' Slope=0.0177 '/' Tc=44.8 min CN=85 Runoff=63.99 cfs 10.806 af

Subcatchment 35S: DA-3 Runoff Area=33.010 ac 0.00% Impervious Runoff Depth=0.91"
Flow Length=1,350' Slope=0.0154 '/' Tc=27.6 min CN=85 Runoff=19.18 cfs 2.494 af

Subcatchment 36S: DA-1 Runoff Area=16.110 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=850' Slope=0.0167 '/' Tc=23.7 min CN=77 Runoff=5.17 cfs 0.713 af

Subcatchment 37S: DA-2 Runoff Area=8.230 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=400' Slope=0.0285 '/' Tc=9.9 min CN=77 Runoff=3.90 cfs 0.364 af

Subcatchment 38S: DA-1 Runoff Area=15.580 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=950' Slope=0.0112 '/' Tc=31.6 min CN=77 Runoff=4.31 cfs 0.689 af

Subcatchment 39S: DA-2 Runoff Area=105.970 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=4,150' Slope=0.0150 '/' Tc=88.7 min CN=77 Runoff=16.22 cfs 4.689 af

Subcatchment 40S: DA-3 Runoff Area=108.630 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=3,500' Slope=0.0165 '/' Tc=73.8 min CN=77 Runoff=18.78 cfs 4.807 af

Subcatchment 41S: DA-4 Runoff Area=24.100 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=2,600' Slope=0.0154 '/' Tc=37.0 min CN=91 Runoff=17.52 cfs 2.602 af

Subcatchment 42S: DA-1 Runoff Area=39.990 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=1,300' Slope=0.0153 '/' Tc=21.3 min CN=91 Runoff=38.63 cfs 4.318 af

Subcatchment 43S: DA-1 Runoff Area=137.250 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=3,800' Slope=0.0089 '/' Tc=107.4 min CN=77 Runoff=18.58 cfs 6.073 af

Subcatchment 44S: DA-2 Runoff Area=32.090 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=1,900' Slope=0.0107 '/' Tc=56.2 min CN=77 Runoff=6.54 cfs 1.420 af

Subcatchment 45S: DA-1 Runoff Area=52.640 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=2,050' Slope=0.0107 '/' Tc=59.8 min CN=77 Runoff=10.37 cfs 2.329 af

Subcatchment 46S: DA-2 Runoff Area=158.910 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=4,200' Slope=0.0137 '/' Tc=93.7 min CN=77 Runoff=23.58 cfs 7.032 af

Subcatchment 47S: DA-3 Runoff Area=36.450 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=1,800' Slope=0.0140 '/' Tc=47.1 min CN=77 Runoff=8.23 cfs 1.613 af

Subcatchment 48S: DA-4 Runoff Area=152.530 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=3,700' Slope=0.0127 '/' Tc=88.0 min CN=77 Runoff=23.64 cfs 6.750 af

Subcatchment 49S: DA-2 Runoff Area=238.470 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=6,625' Slope=0.0066 '/' Tc=188.8 min CN=78 Runoff=23.88 cfs 11.343 af

Subcatchment 50S: DA-3 Runoff Area=388.350 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=7,950' Slope=0.0059 '/' Tc=231.0 min CN=78 Runoff=34.02 cfs 18.472 af

Subcatchment 51S: DA-4 Runoff Area=214.310 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=4,325' Slope=0.0054 '/' Tc=148.4 min CN=78 Runoff=25.59 cfs 10.194 af

Subcatchment 52S: DA-1 Runoff Area=58.940 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=3,700' Slope=0.0063 '/' Tc=121.2 min CN=78 Runoff=8.06 cfs 2.803 af

Subcatchment 53S: DA-2 Runoff Area=108.100 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=4,300' Slope=0.0060 '/' Tc=140.1 min CN=78 Runoff=13.38 cfs 5.142 af

Subcatchment 54S: DA-1 Runoff Area=162.080 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=3,800' Slope=0.0107 '/' Tc=95.0 min CN=78 Runoff=26.07 cfs 7.709 af

Subcatchment 55S: DA-2 Runoff Area=324.340 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=6,530' Slope=0.0095 '/' Tc=155.5 min CN=78 Runoff=37.07 cfs 15.427 af

Subcatchment 56S: DA-3 Runoff Area=322.450 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=8,000' Slope=0.0086 '/' Tc=192.3 min CN=78 Runoff=31.99 cfs 15.337 af

Subcatchment 57S: DA-1 Runoff Area=52.610 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=2,700' Slope=0.0174 '/' Tc=56.7 min CN=78 Runoff=11.76 cfs 2.502 af

Subcatchment 58S: DA-2 Runoff Area=58.000 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=2,750' Slope=0.0185 '/' Tc=55.8 min CN=78 Runoff=13.14 cfs 2.759 af

Subcatchment 59S: DA-1 Runoff Area=105.010 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=2,700' Slope=0.0181 '/' Tc=35.2 min CN=91 Runoff=78.52 cfs 11.339 af

Subcatchment 60S: DA-2 Runoff Area=143.020 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=2,700' Slope=0.0177 '/' Tc=35.6 min CN=91 Runoff=106.23 cfs 15.443 af

Subcatchment 61S: DA-3 Runoff Area=33.010 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=1,350' Slope=0.0154 '/' Tc=21.9 min CN=91 Runoff=31.46 cfs 3.564 af

Subcatchment 62S: DA-1 Runoff Area=16.110 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=850' Slope=0.0167 '/' Tc=23.0 min CN=78 Runoff=5.79 cfs 0.766 af

Subcatchment 63S: DA-2 Runoff Area=8.230 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=400' Slope=0.0285 '/' Tc=9.6 min CN=78 Runoff=4.35 cfs 0.391 af

Subcatchment 64S: DA-1 Runoff Area=15.580 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=950' Slope=0.0112 '/' Tc=30.6 min CN=78 Runoff=4.87 cfs 0.741 af

Subcatchment 65S: DA-2 Runoff Area=105.970 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=4,150' Slope=0.0150 '/' Tc=86.1 min CN=78 Runoff=18.24 cfs 5.040 af

Subcatchment 66S: DA-3 Runoff Area=108.630 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=3,500' Slope=0.0165 '/' Tc=71.7 min CN=78 Runoff=21.08 cfs 5.167 af

Subcatchment 67S: DA-4 Runoff Area=24.100 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=2,600' Slope=0.0154 '/' Tc=37.0 min CN=91 Runoff=17.52 cfs 2.602 af

Subcatchment 68S: DA-1 Runoff Area=39.990 ac 0.00% Impervious Runoff Depth=1.30"
Flow Length=1,300' Slope=0.0153 '/' Tc=21.3 min CN=91 Runoff=38.63 cfs 4.318 af

Subcatchment 69S: DA-1 Runoff Area=137.250 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=3,800' Slope=0.0089 '/' Tc=104.2 min CN=78 Runoff=20.74 cfs 6.528 af

Subcatchment 70S: DA-2 Runoff Area=32.090 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=1,900' Slope=0.0107 '/' Tc=54.6 min CN=78 Runoff=7.35 cfs 1.526 af

Subcatchment 71S: DA-1 Runoff Area=52.640 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=2,050' Slope=0.0107 '/' Tc=58.0 min CN=78 Runoff=11.59 cfs 2.504 af

Subcatchment 72S: DA-2 Runoff Area=158.910 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=4,200' Slope=0.0137 '/' Tc=91.0 min CN=78 Runoff=26.46 cfs 7.558 af

Subcatchment 73S: DA-3 Runoff Area=36.450 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=1,800' Slope=0.0140 '/' Tc=45.7 min CN=78 Runoff=9.21 cfs 1.734 af

Subcatchment 74S: DA-4 Runoff Area=152.530 ac 0.00% Impervious Runoff Depth=0.57"
Flow Length=3,700' Slope=0.0127 '/' Tc=85.4 min CN=78 Runoff=26.47 cfs 7.255 af

Pond 22P: P-1 DA-1 Peak Elev=574.41' Storage=1.398 af Inflow=17.71 cfs 6.182 af
Outflow=15.64 cfs 5.132 af

Pond 23P: P-1 DA-2 Peak Elev=574.49' Storage=2.935 af Inflow=23.88 cfs 11.343 af
Outflow=20.67 cfs 9.243 af

Pond 24P: P-1 DA-3 Peak Elev=574.62' Storage=5.034 af Inflow=34.02 cfs 18.472 af
Outflow=30.16 cfs 14.722 af

Pond 26P: P-1 DA-4 Peak Elev=574.51' Storage=2.446 af Inflow=25.59 cfs 10.194 af
Outflow=22.21 cfs 8.394 af

Pond 27P: P-2 DA-1 Peak Elev=574.06' Storage=2.670 af Inflow=8.06 cfs 2.803 af
Outflow=0.82 cfs 0.203 af

Pond 28P: P-2 DA-2 Peak Elev=574.09' Storage=4.827 af Inflow=13.38 cfs 5.142 af
Outflow=1.49 cfs 0.517 af

Pond 29P: P-3 DA-1 Peak Elev=574.51' Storage=1.564 af Inflow=26.07 cfs 7.709 af
Outflow=22.26 cfs 6.634 af

Pond 30P: P-3 DA-2 Peak Elev=574.65' Storage=3.641 af Inflow=37.07 cfs 15.427 af
Outflow=32.51 cfs 12.802 af

Pond 31P: P-3 DA-3 Peak Elev=574.60' Storage=3.779 af Inflow=31.99 cfs 15.337 af
Outflow=28.39 cfs 12.587 af

Pond 32P: P-4 DA-1 Peak Elev=574.07' Storage=2.128 af Inflow=11.76 cfs 2.502 af
Outflow=1.02 cfs 0.452 af

Pond 33P: P-4 DA-2 Peak Elev=574.07' Storage=2.337 af Inflow=13.14 cfs 2.759 af
Outflow=1.10 cfs 0.534 af

Pond 34P: P-5 DA-1 Peak Elev=574.80' Storage=4.261 af Inflow=78.52 cfs 11.339 af
Outflow=46.83 cfs 8.589 af

Pond 35P: P-5 DA-2 Peak Elev=574.95' Storage=5.883 af Inflow=106.23 cfs 15.443 af
Outflow=61.71 cfs 11.693 af

Pond 36P: P-5 DA-3 Peak Elev=574.45' Storage=1.278 af Inflow=31.46 cfs 3.564 af
Outflow=17.90 cfs 2.714 af

Pond 37P: P-6 DA-1 Peak Elev=574.20' Storage=0.110 af Inflow=5.79 cfs 0.766 af
Outflow=5.09 cfs 0.686 af

Pond 38P: P-6 DA-2 Peak Elev=574.17' Storage=0.034 af Inflow=4.35 cfs 0.391 af
Outflow=3.79 cfs 0.374 af

Pond 39P: P-7 DA-1 Peak Elev=574.18' Storage=0.121 af Inflow=4.87 cfs 0.741 af
Outflow=4.28 cfs 0.646 af

Pond 40P: P-7 DA-2 Peak Elev=574.42' Storage=1.054 af Inflow=18.24 cfs 5.040 af
Outflow=16.03 cfs 4.240 af

Pond 41P: P-7 DA-3 Peak Elev=574.46' Storage=0.999 af Inflow=21.08 cfs 5.167 af
Outflow=18.73 cfs 4.417 af

Pond 42P: P-7 DA-4 Peak Elev=574.43' Storage=0.144 af Inflow=17.52 cfs 2.602 af
Outflow=16.85 cfs 2.562 af

Pond 43P: P-8 DA-1 Peak Elev=574.67' Storage=0.320 af Inflow=38.63 cfs 4.318 af
Outflow=35.03 cfs 4.243 af

Pond 44P: P-9 DA-1 Peak Elev=574.46' Storage=1.441 af Inflow=20.74 cfs 6.528 af
Outflow=18.36 cfs 5.403 af

Pond 45P: P-9 DA-2 Peak Elev=574.24' Storage=0.294 af Inflow=7.35 cfs 1.526 af
Outflow=6.49 cfs 1.291 af

Pond 46P: P-10 DA-1 Peak Elev=574.32' Storage=0.479 af Inflow=11.59 cfs 2.504 af
Outflow=10.26 cfs 2.129 af

Pond 47P: P-10 DA-2 Peak Elev=574.53' Storage=1.588 af Inflow=26.46 cfs 7.558 af
Outflow=23.31 cfs 6.383 af

Pond 48P: P-10 DA-3 Peak Elev=574.27' Storage=0.330 af Inflow=9.21 cfs 1.734 af
Outflow=8.05 cfs 1.469 af

Pond 49P: P-10 DA-4 Peak Elev=574.53' Storage=1.446 af Inflow=26.47 cfs 7.255 af
Outflow=23.52 cfs 6.205 af

Total Runoff Area = 6,454.300 ac Runoff Volume = 320.963 af Average Runoff Depth = 0.60"
100.00% Pervious = 6,454.300 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 2S: DA-1

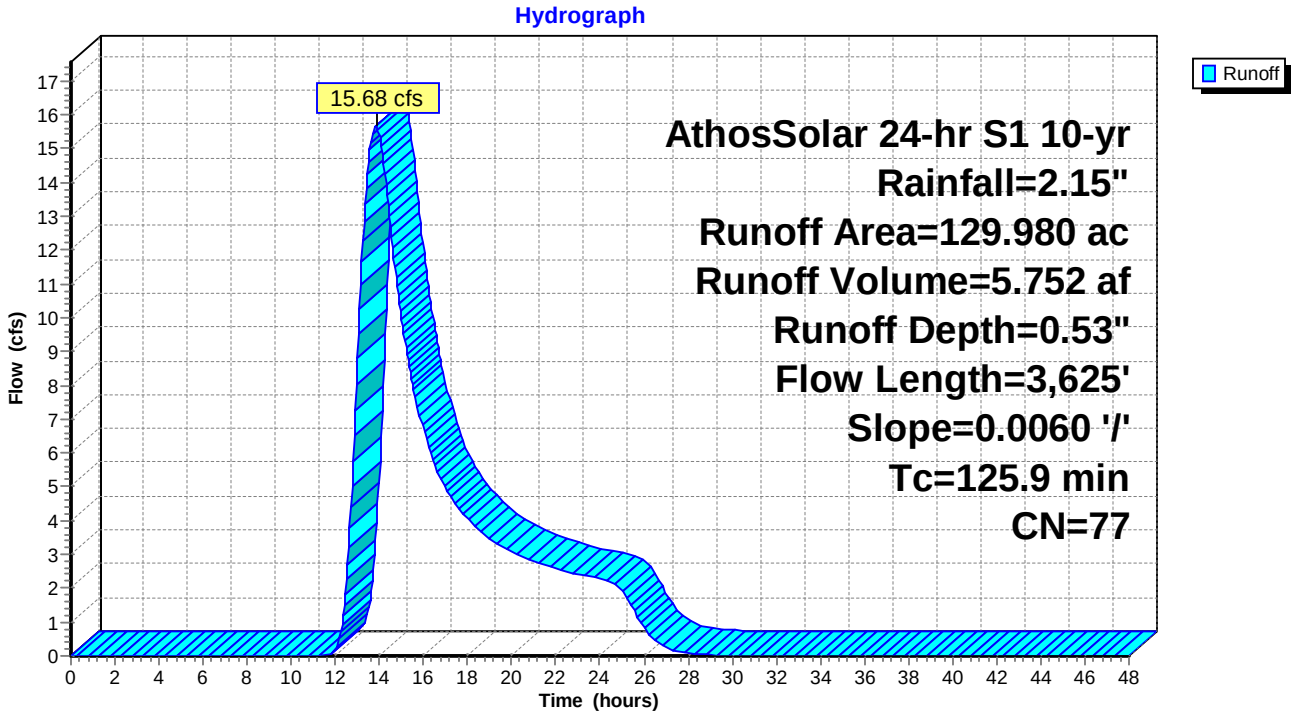
Runoff = 15.68 cfs @ 13.84 hrs, Volume= 5.752 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
129.980	77	Fallow, bare soil, HSG A
129.980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
125.9	3,625	0.0060	0.48		**Lag/CN Method,**

Subcatchment 2S: DA-1



Summary for Subcatchment 22S: DA-2

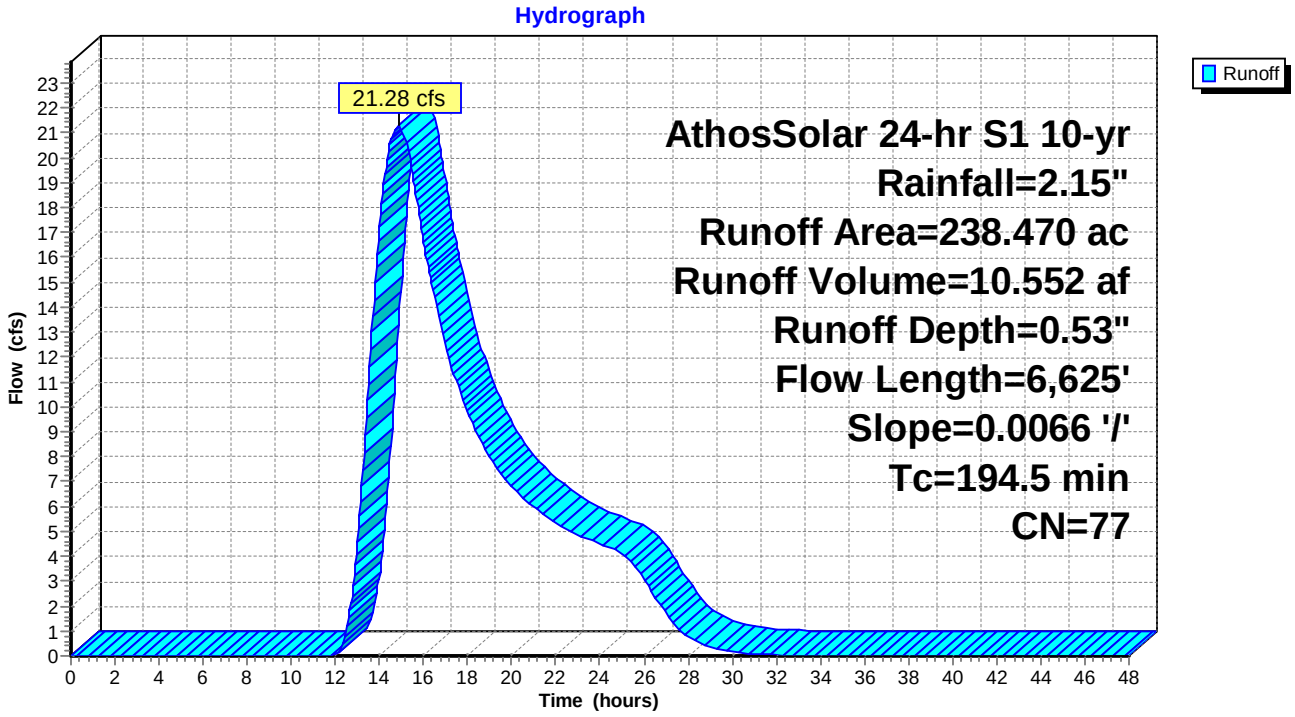
Runoff = 21.28 cfs @ 14.89 hrs, Volume= 10.552 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
238.470	77	Fallow, bare soil, HSG A
238.470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
194.5	6,625	0.0066	0.57		**Lag/CN Method,**

Subcatchment 22S: DA-2



Summary for Subcatchment 23S: DA-3

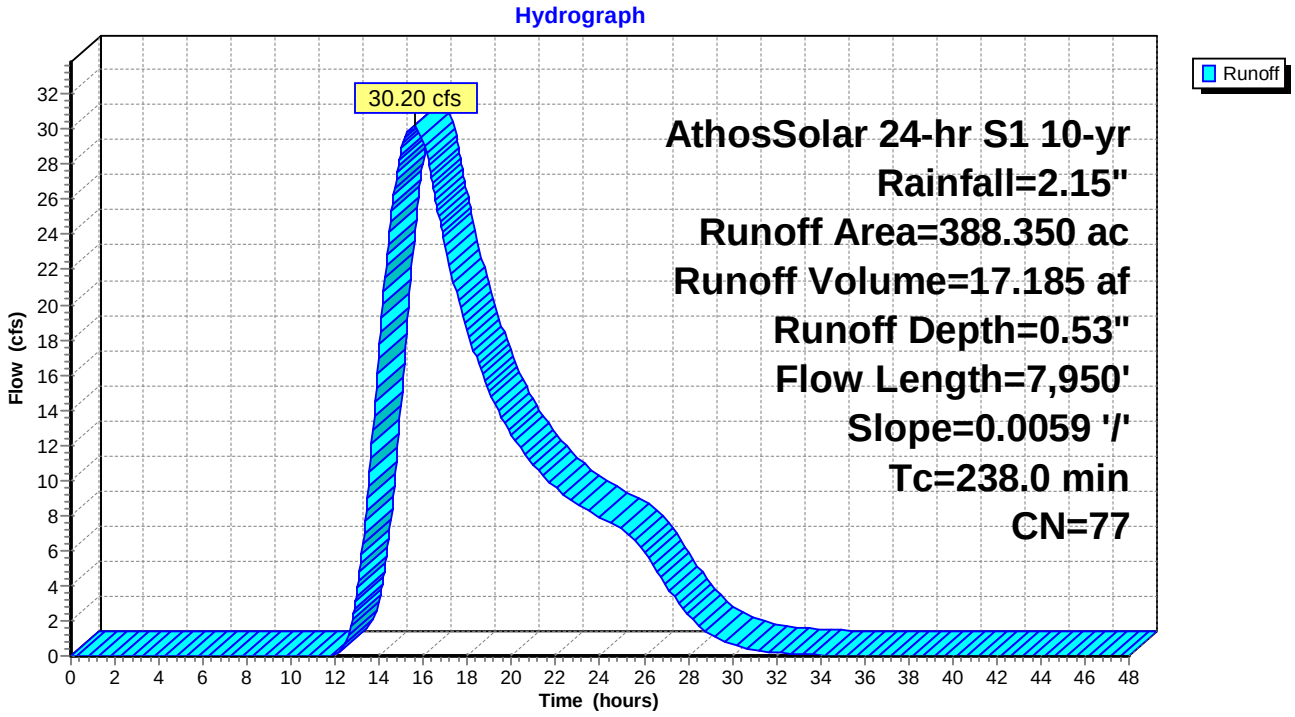
Runoff = 30.20 cfs @ 15.59 hrs, Volume= 17.185 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
388.350	77	Fallow, bare soil, HSG A
388.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
238.0	7,950	0.0059	0.56		**Lag/CN Method,**

Subcatchment 23S: DA-3



Summary for Subcatchment 24S: DA-4

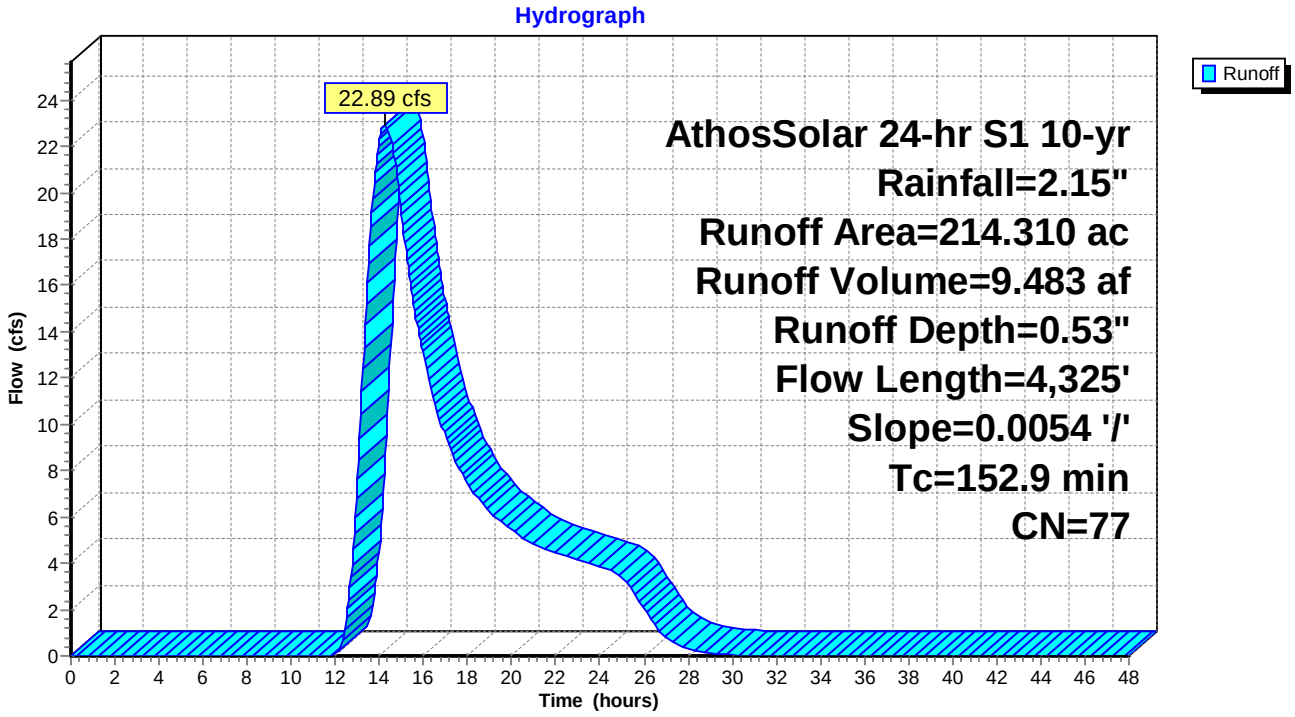
Runoff = 22.89 cfs @ 14.24 hrs, Volume= 9.483 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
214.310	77	Fallow, bare soil, HSG A
214.310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
152.9	4,325	0.0054	0.47		**Lag/CN Method,**

Subcatchment 24S: DA-4



Summary for Subcatchment 25S: DA-1

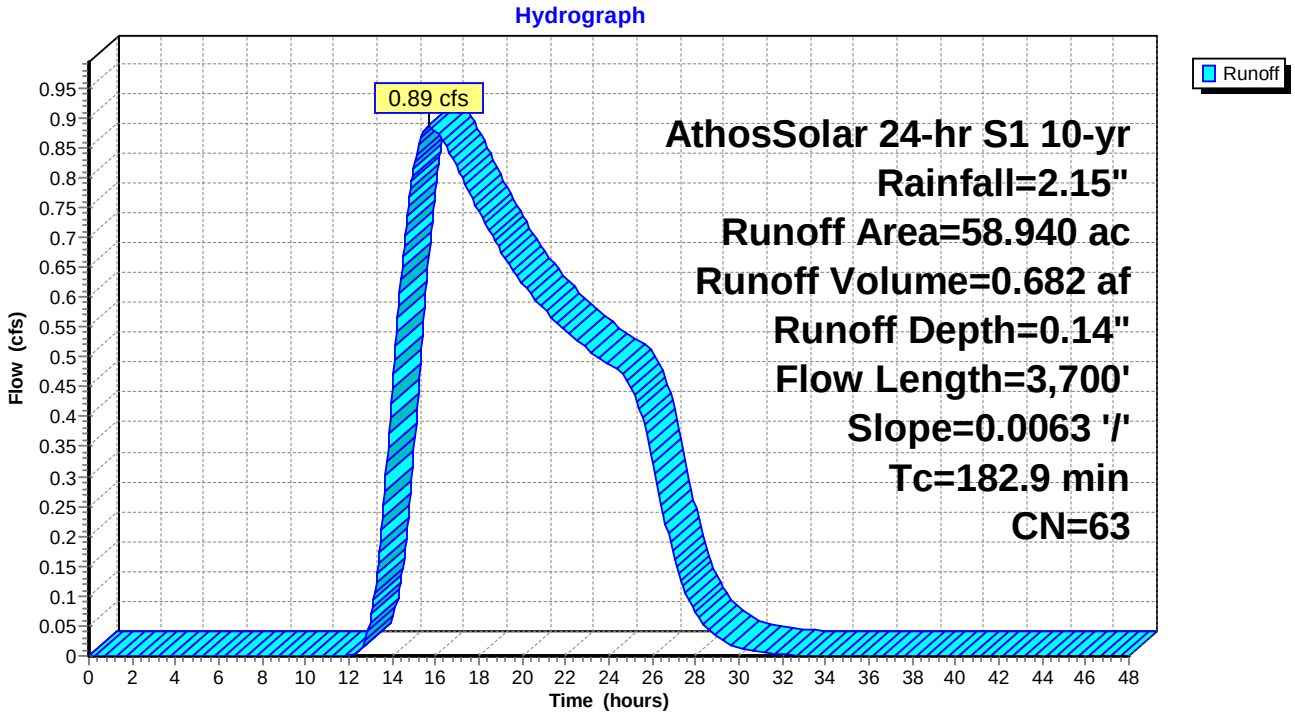
Runoff = 0.89 cfs @ 15.66 hrs, Volume= 0.682 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
58.940	63	Desert shrub range, Poor, HSG A
58.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
182.9	3,700	0.0063	0.34		**Lag/CN Method,**

Subcatchment 25S: DA-1



Summary for Subcatchment 26S: DA-2

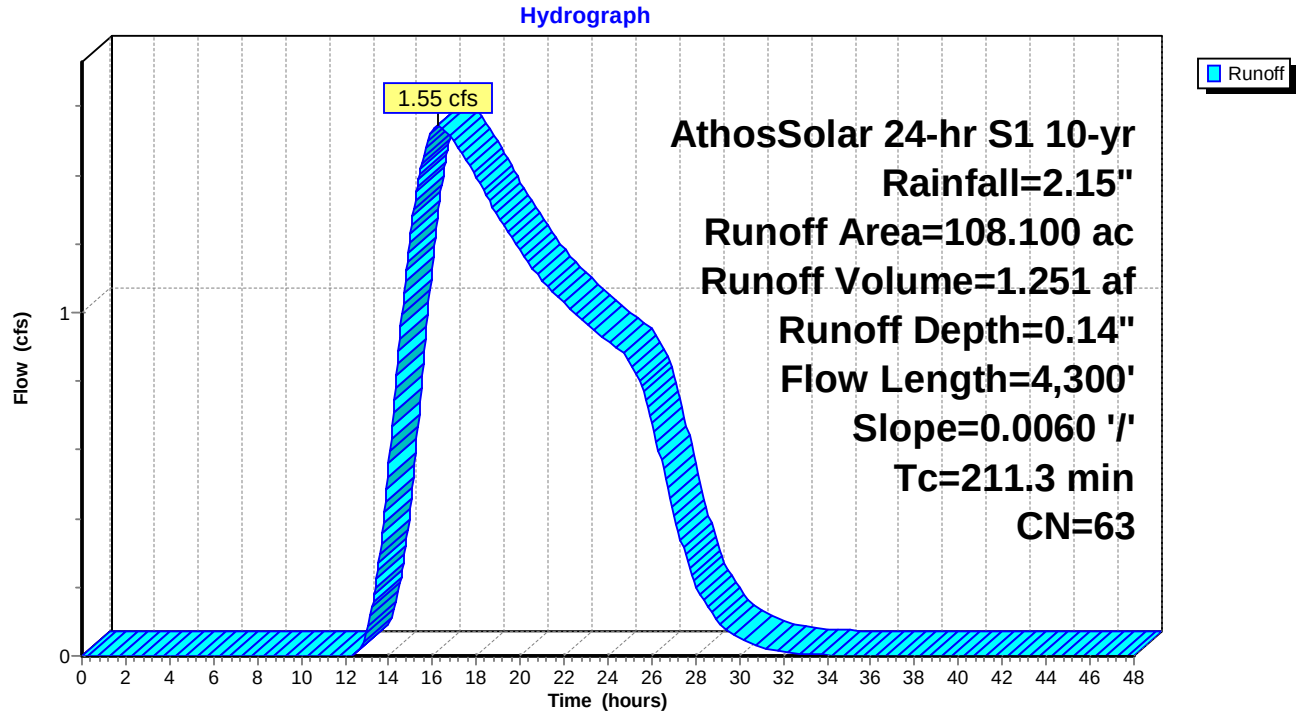
Runoff = 1.55 cfs @ 16.21 hrs, Volume= 1.251 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
108.100	63	Desert shrub range, Poor, HSG A
108.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
211.3	4,300	0.0060	0.34		**Lag/CN Method,**

Subcatchment 26S: DA-2



Summary for Subcatchment 27S: DA-1

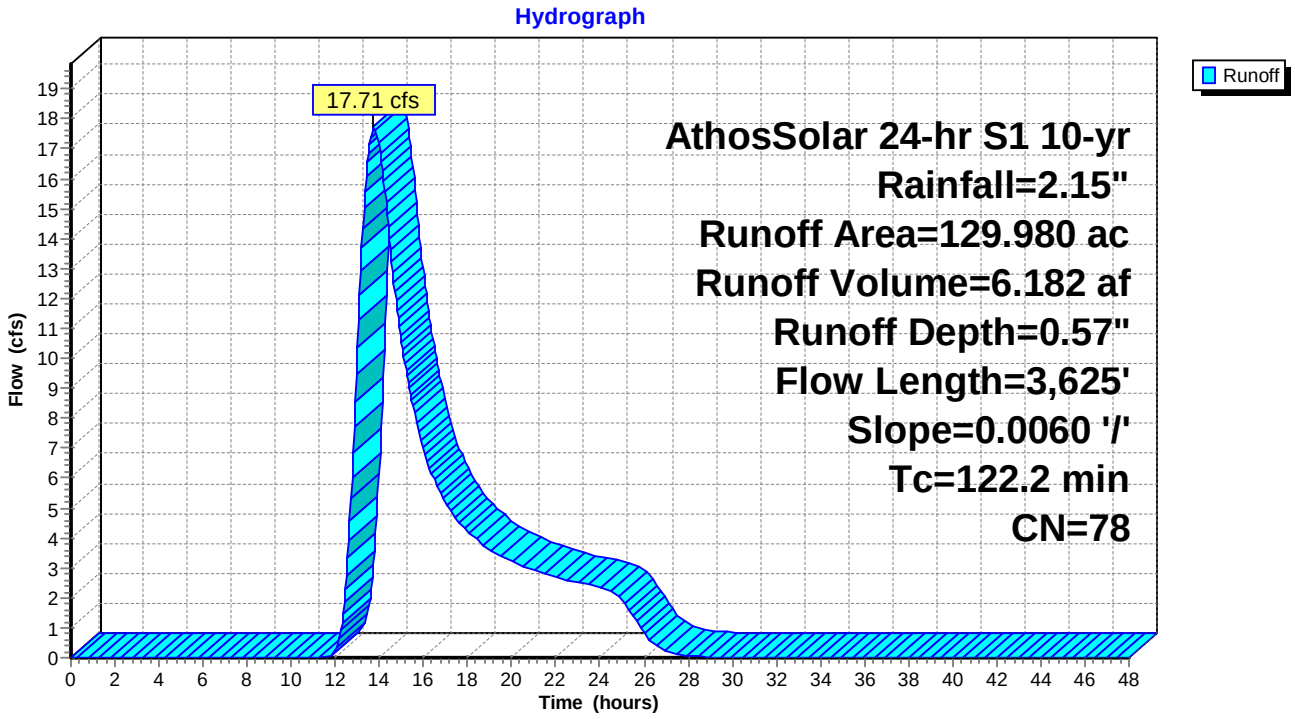
Runoff = 17.71 cfs @ 13.74 hrs, Volume= 6.182 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
123.480	77	Fallow, bare soil, HSG A
6.500	96	Gravel surface, HSG A
129.980	78	Weighted Average
129.980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
122.2	3,625	0.0060	0.49		**Lag/CN Method,**

Subcatchment 27S: DA-1



Summary for Subcatchment 28S: DA-1

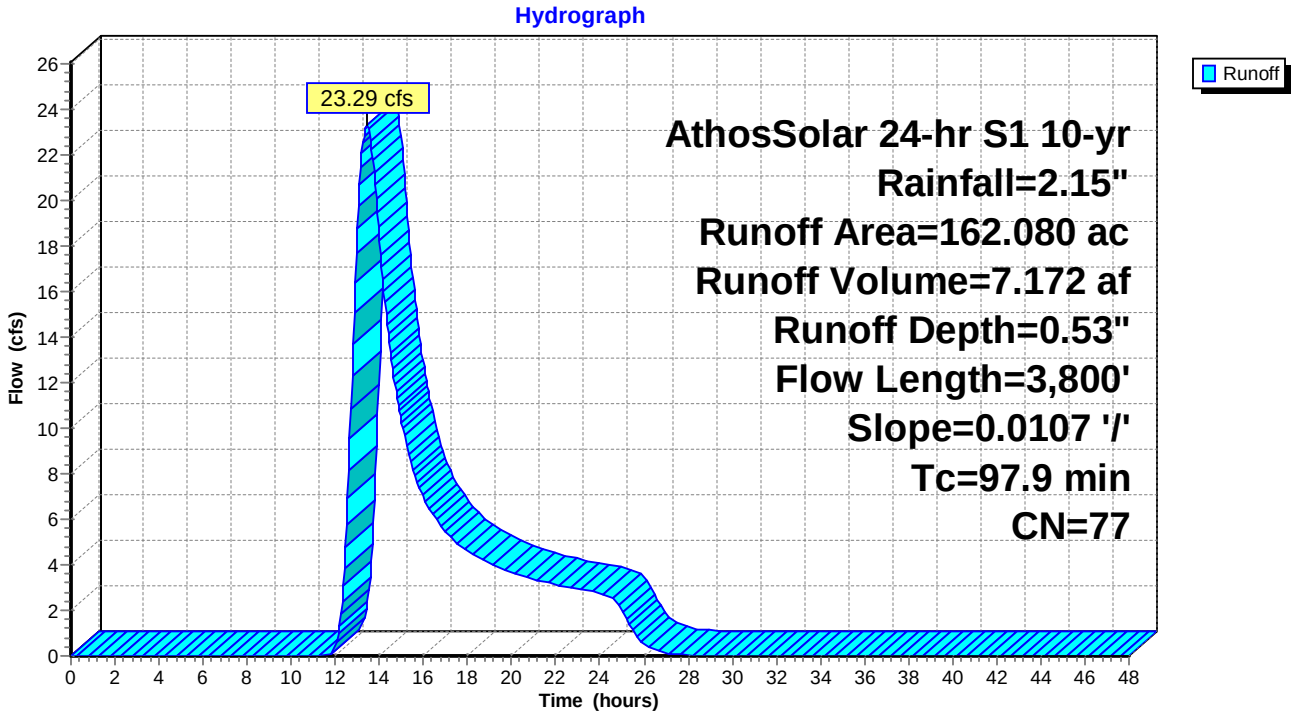
Runoff = 23.29 cfs @ 13.41 hrs, Volume= 7.172 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
162.080	77	Fallow, bare soil, HSG A
162.080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
97.9	3,800	0.0107	0.65		**Lag/CN Method,**

Subcatchment 28S: DA-1



Summary for Subcatchment 29S: DA-2

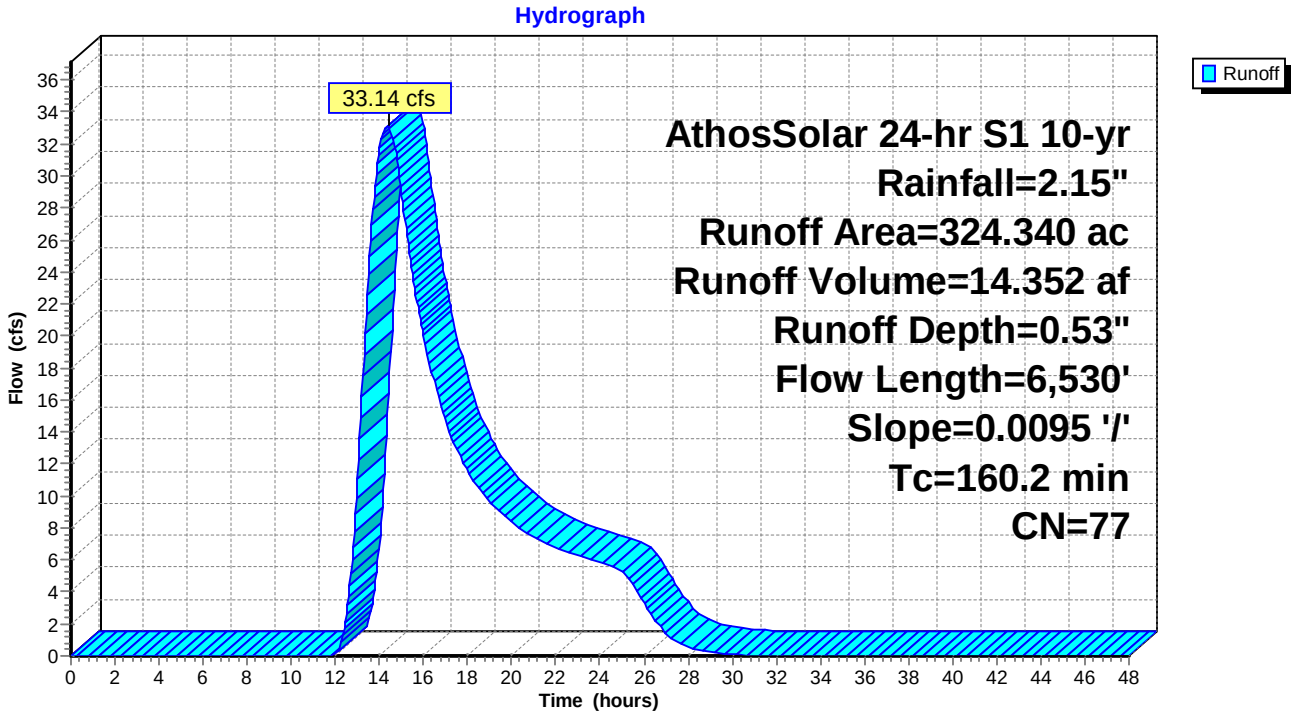
Runoff = 33.14 cfs @ 14.39 hrs, Volume= 14.352 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
324.340	77	Fallow, bare soil, HSG A
324.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
160.2	6,530	0.0095	0.68		**Lag/CN Method,**

Subcatchment 29S: DA-2



Summary for Subcatchment 30S: DA-3

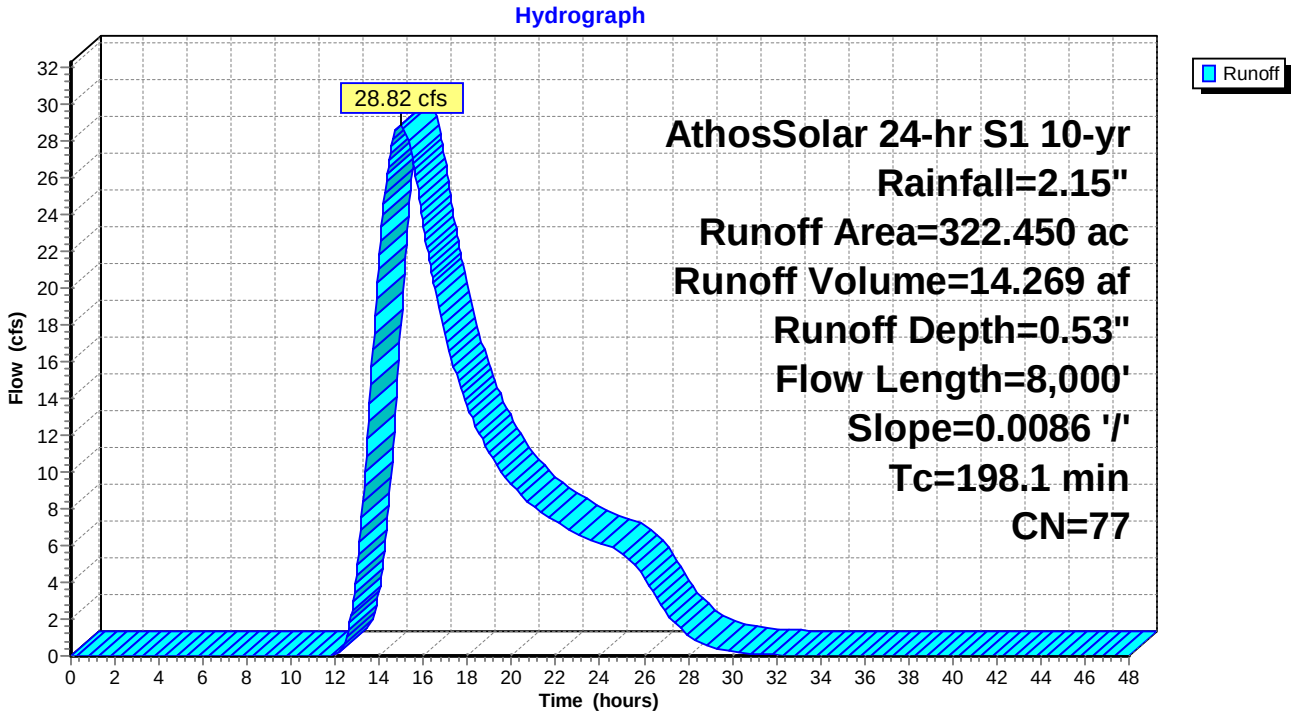
Runoff = 28.82 cfs @ 14.94 hrs, Volume= 14.269 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
322.450	77	Fallow, bare soil, HSG A
322.450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
198.1	8,000	0.0086	0.67		**Lag/CN Method,**

Subcatchment 30S: DA-3



Summary for Subcatchment 31S: DA-1

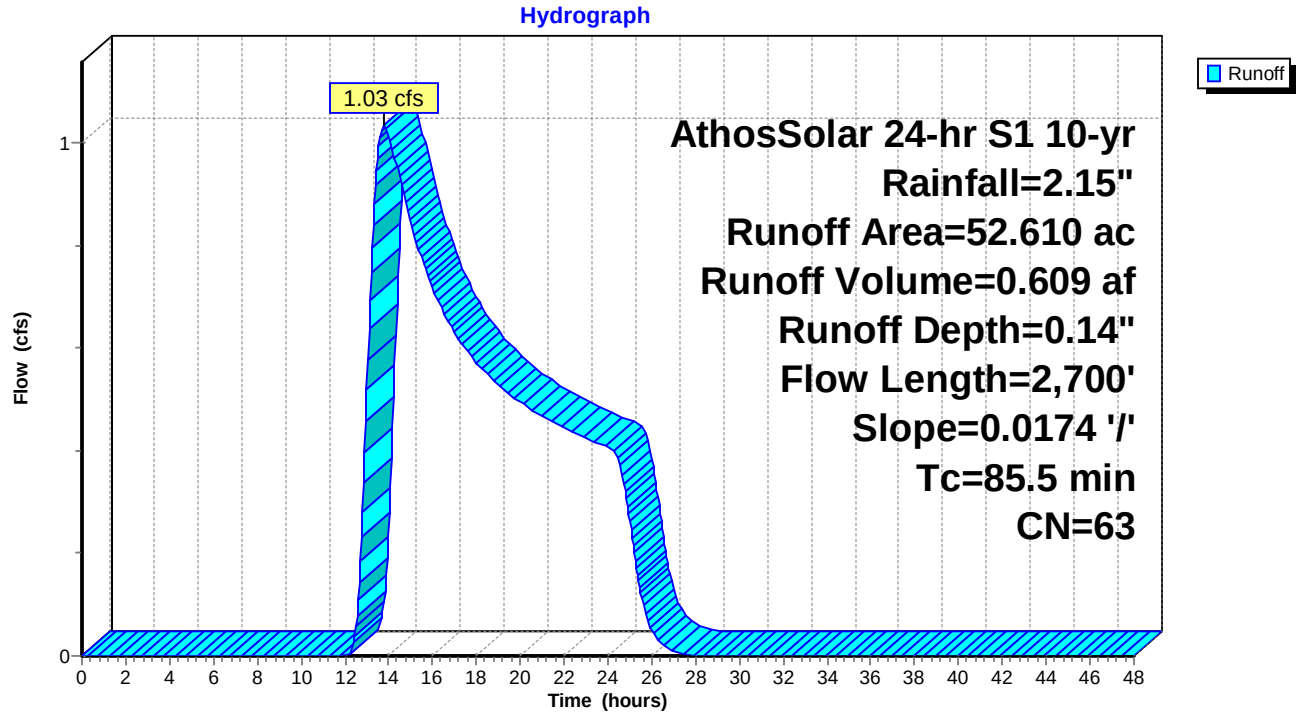
Runoff = 1.03 cfs @ 13.79 hrs, Volume= 0.609 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
52.610	63	Desert shrub range, Poor, HSG A
52.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
85.5	2,700	0.0174	0.53		**Lag/CN Method,**

Subcatchment 31S: DA-1



Summary for Subcatchment 32S: DA-2

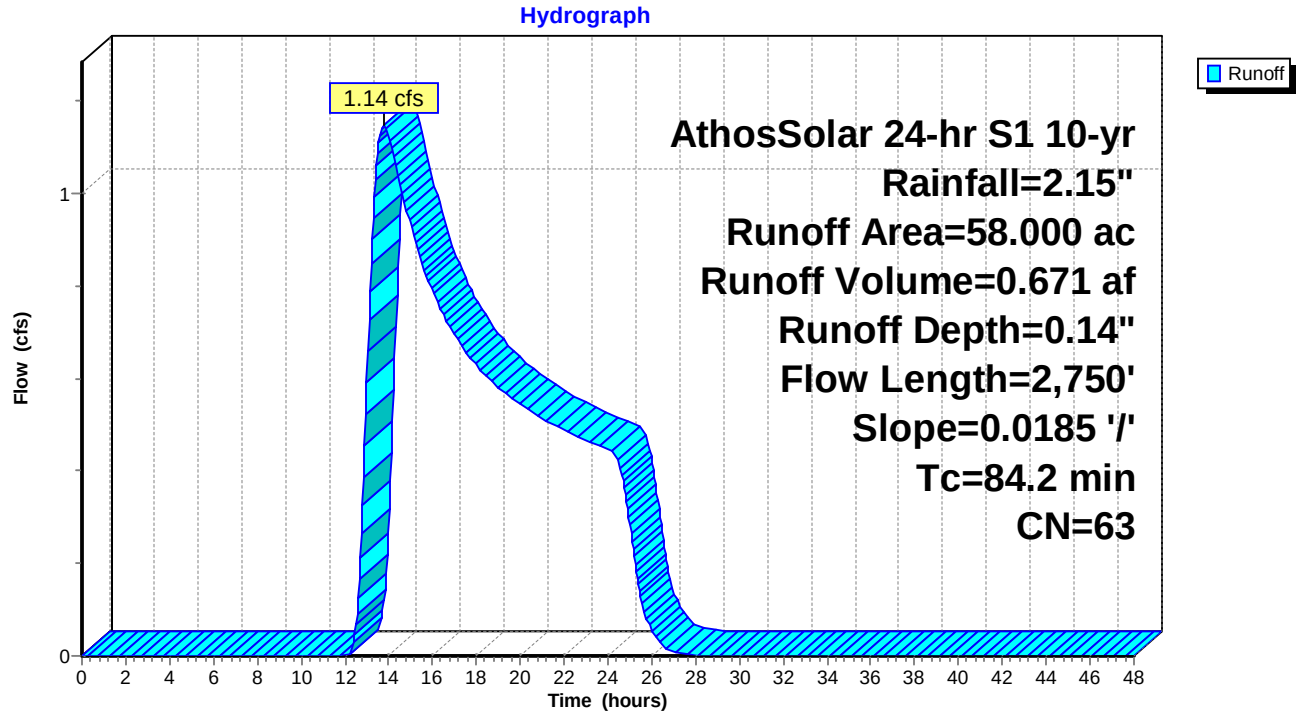
Runoff = 1.14 cfs @ 13.76 hrs, Volume= 0.671 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
58.000	63	Desert shrub range, Poor, HSG A
58.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
84.2	2,750	0.0185	0.54		**Lag/CN Method,**

Subcatchment 32S: DA-2



Summary for Subcatchment 33S: DA-1

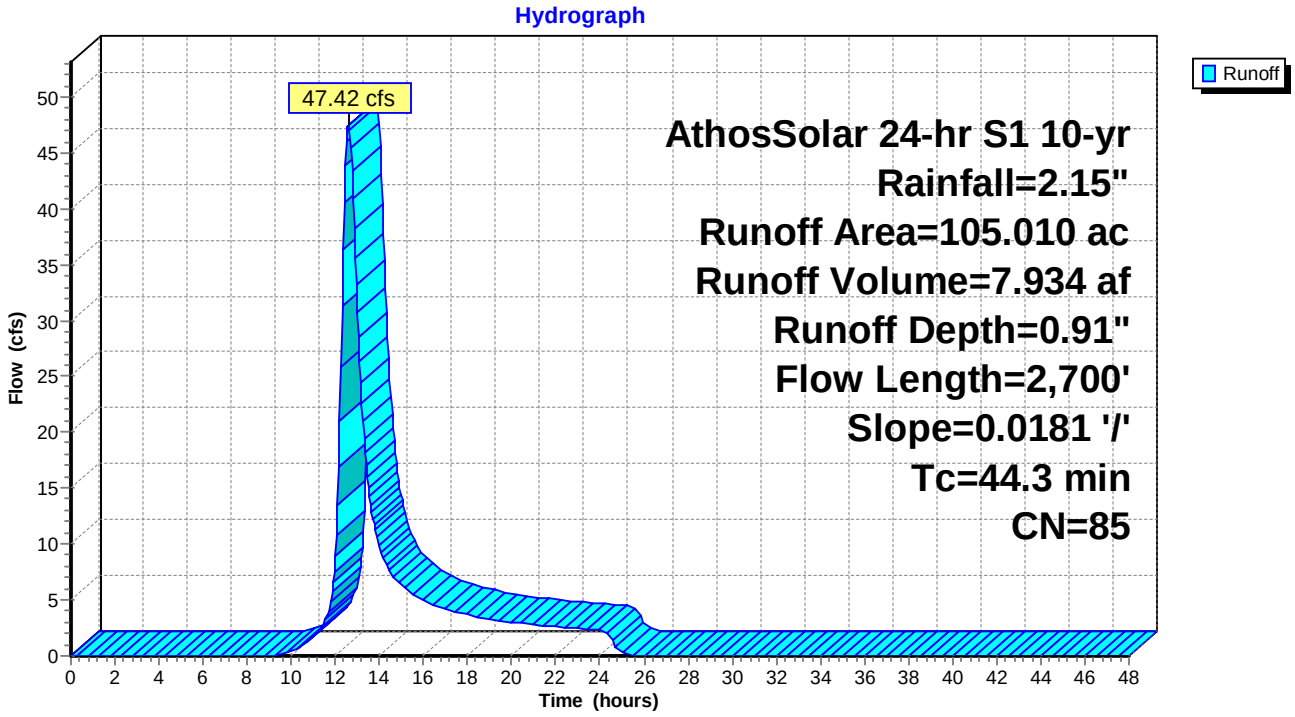
Runoff = 47.42 cfs @ 12.58 hrs, Volume= 7.934 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
105.010	85	Desert shrub range, Poor, HSG C
105.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.3	2,700	0.0181	1.02		**Lag/CN Method,**

Subcatchment 33S: DA-1



Summary for Subcatchment 34S: DA-2

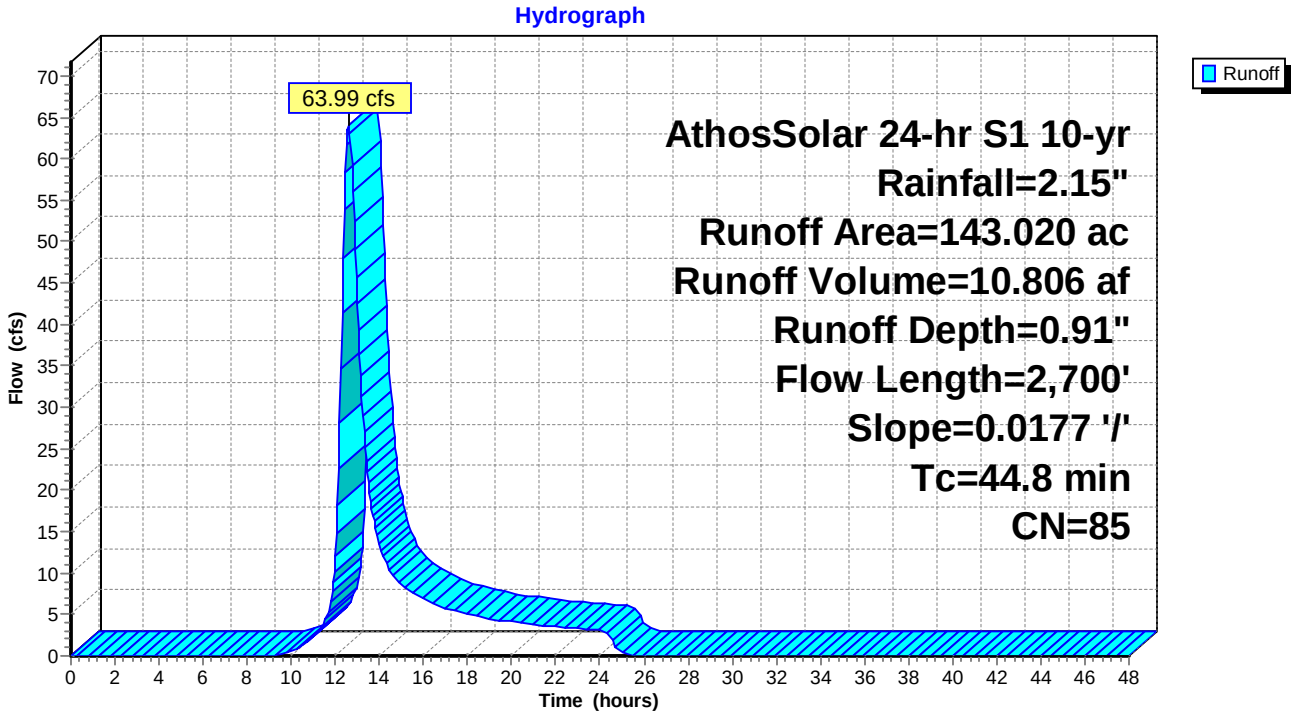
Runoff = 63.99 cfs @ 12.60 hrs, Volume= 10.806 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
143.020	85	Desert shrub range, Poor, HSG C
143.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
44.8	2,700	0.0177	1.00		**Lag/CN Method,**

Subcatchment 34S: DA-2



Summary for Subcatchment 35S: DA-3

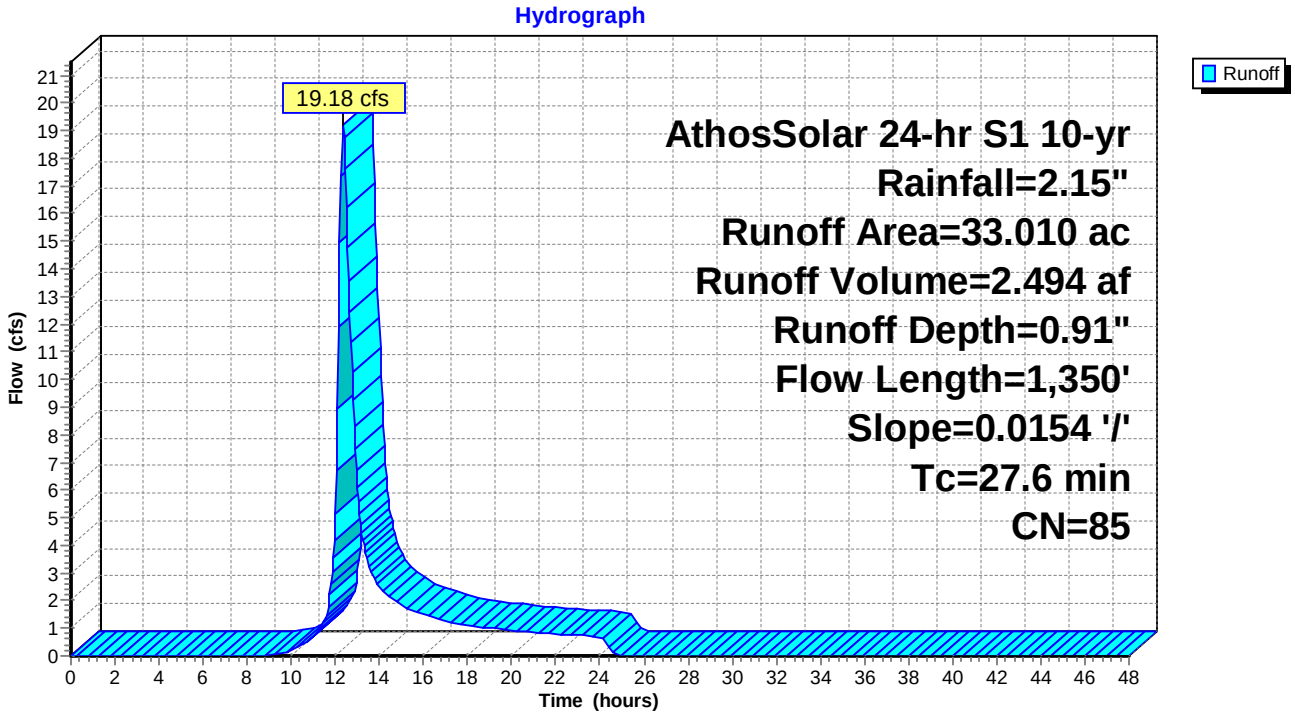
Runoff = 19.18 cfs @ 12.35 hrs, Volume= 2.494 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
33.010	85	Desert shrub range, Poor, HSG C
33.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	1,350	0.0154	0.82		**Lag/CN Method,**

Subcatchment 35S: DA-3



Summary for Subcatchment 36S: DA-1

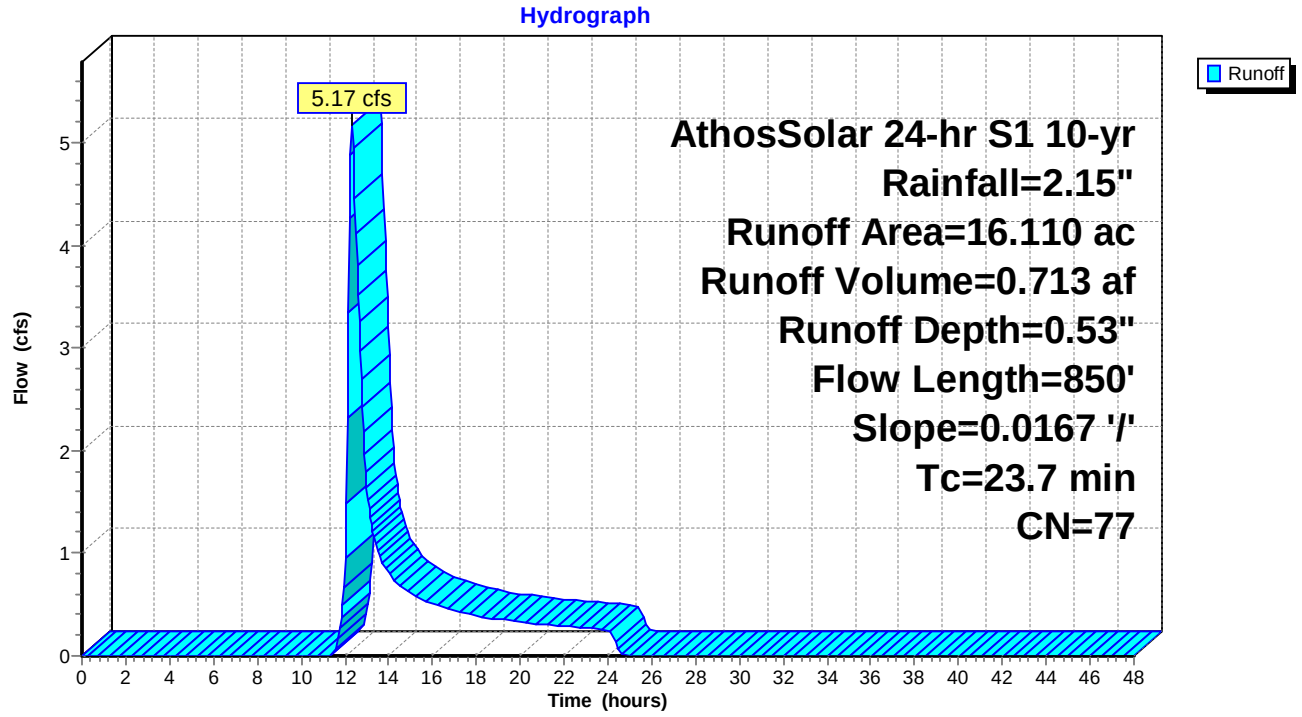
Runoff = 5.17 cfs @ 12.32 hrs, Volume= 0.713 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
16.110	77	Fallow, bare soil, HSG A
16.110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.7	850	0.0167	0.60		**Lag/CN Method,**

Subcatchment 36S: DA-1



Summary for Subcatchment 37S: DA-2

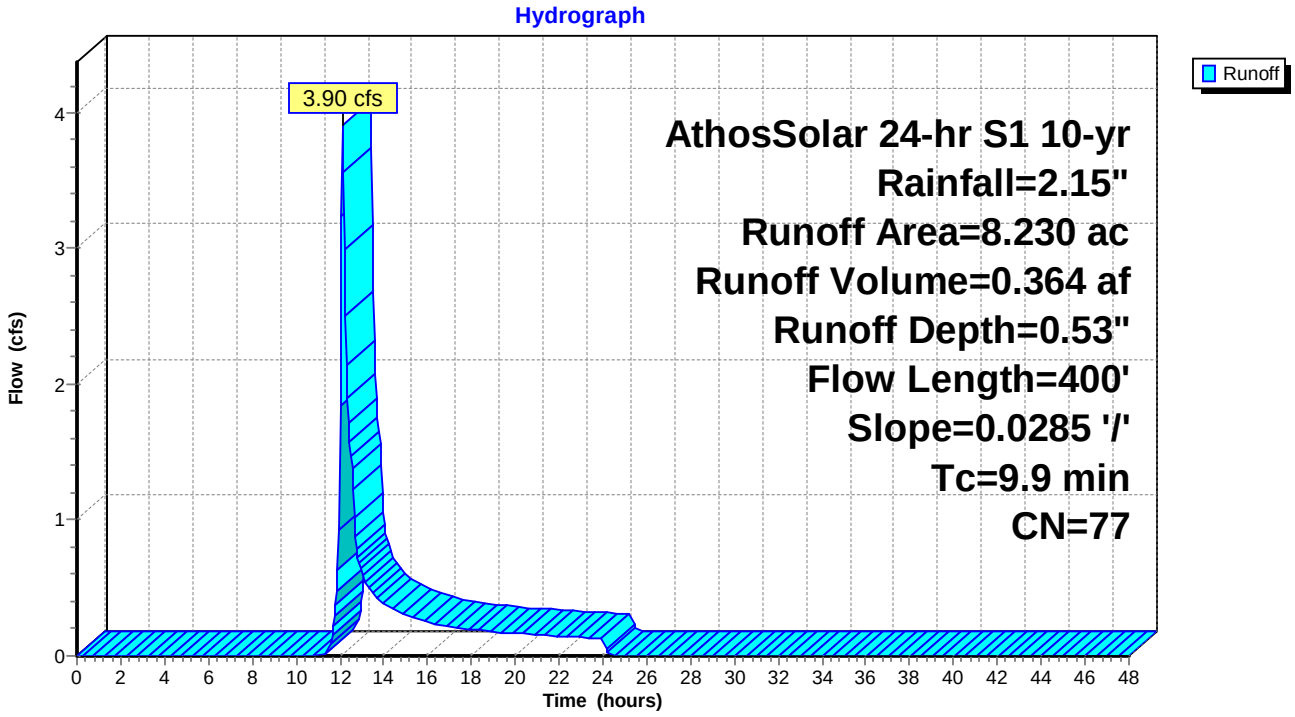
Runoff = 3.90 cfs @ 12.11 hrs, Volume= 0.364 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
8.230	77	Fallow, bare soil, HSG A
8.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	400	0.0285	0.67		**Lag/CN Method,**

Subcatchment 37S: DA-2



Summary for Subcatchment 38S: DA-1

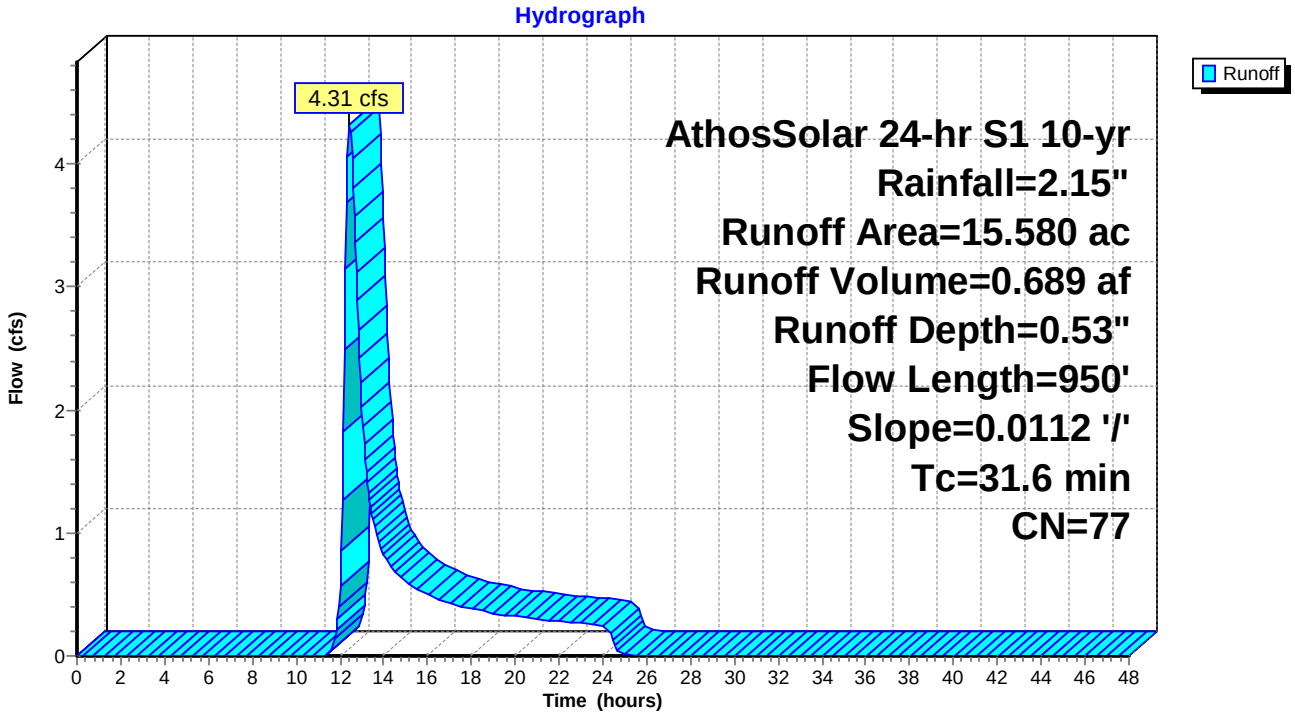
Runoff = 4.31 cfs @ 12.44 hrs, Volume= 0.689 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
15.580	77	Fallow, bare soil, HSG A
15.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.6	950	0.0112	0.50		**Lag/CN Method,**

Subcatchment 38S: DA-1



Summary for Subcatchment 39S: DA-2

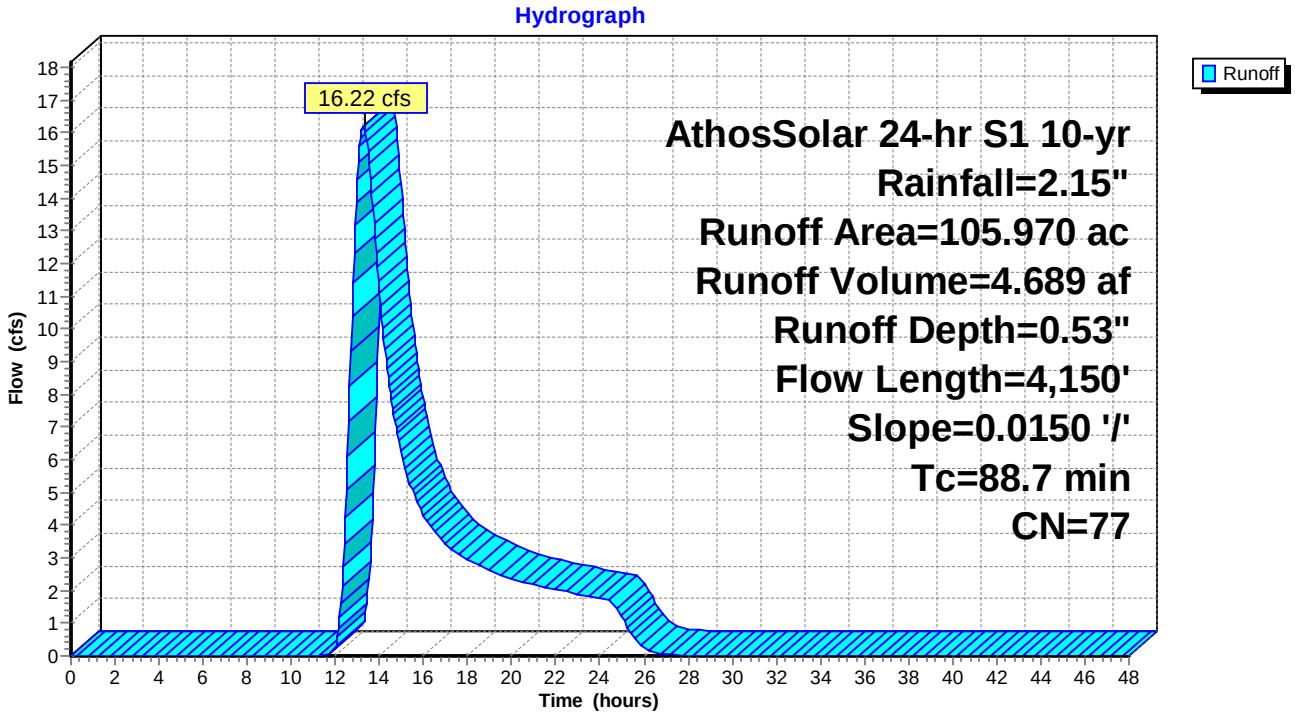
Runoff = 16.22 cfs @ 13.29 hrs, Volume= 4.689 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
105.970	77	Fallow, bare soil, HSG A
105.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
88.7	4,150	0.0150	0.78		**Lag/CN Method,**

Subcatchment 39S: DA-2



Summary for Subcatchment 40S: DA-3

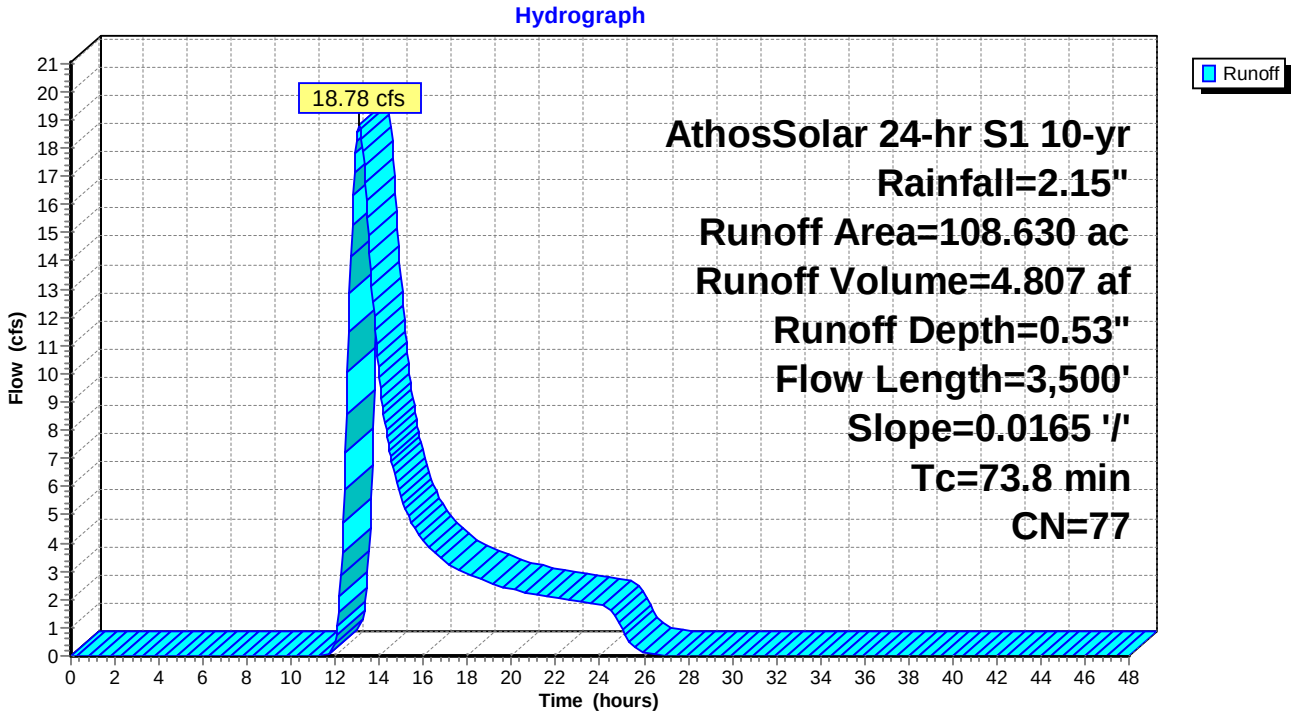
Runoff = 18.78 cfs @ 13.07 hrs, Volume= 4.807 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
108.630	77	Fallow, bare soil, HSG A
108.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
73.8	3,500	0.0165	0.79		**Lag/CN Method,**

Subcatchment 40S: DA-3



Summary for Subcatchment 41S: DA-4

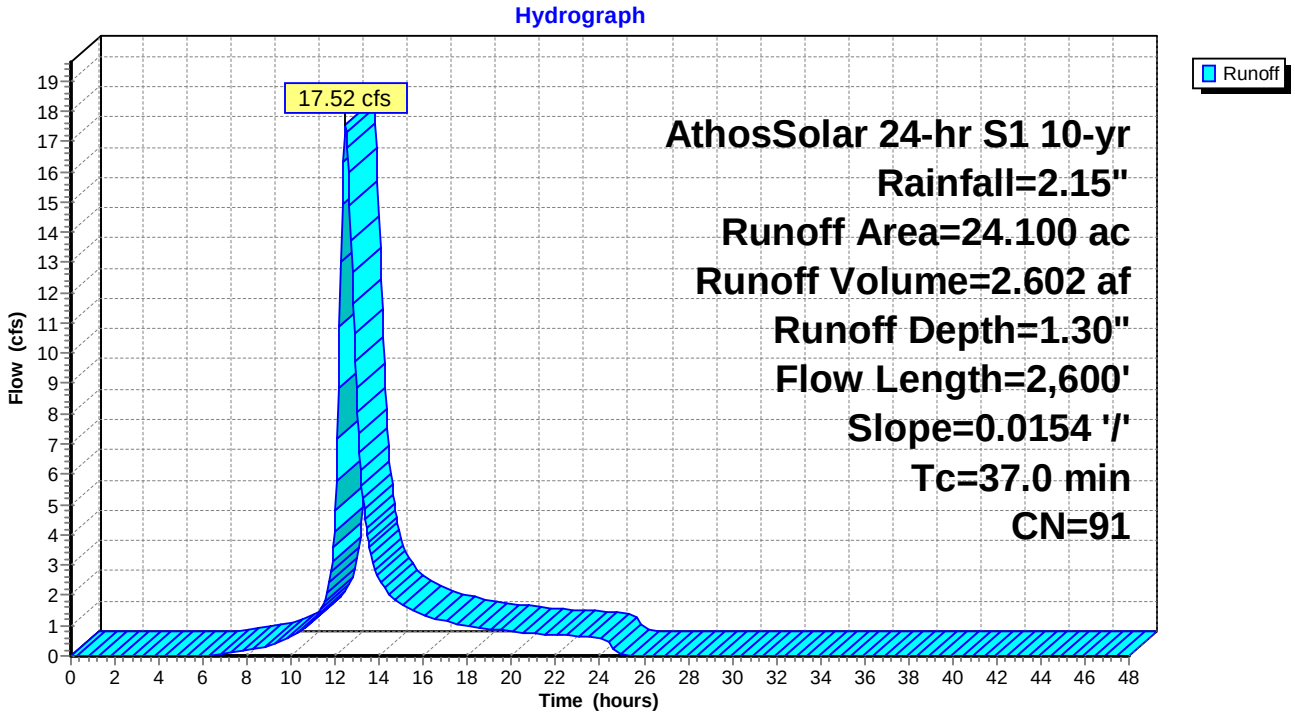
Runoff = 17.52 cfs @ 12.46 hrs, Volume= 2.602 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
24.100	91	Fallow, bare soil, HSG C
24.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.0	2,600	0.0154	1.17		**Lag/CN Method,**

Subcatchment 41S: DA-4



Summary for Subcatchment 42S: DA-1

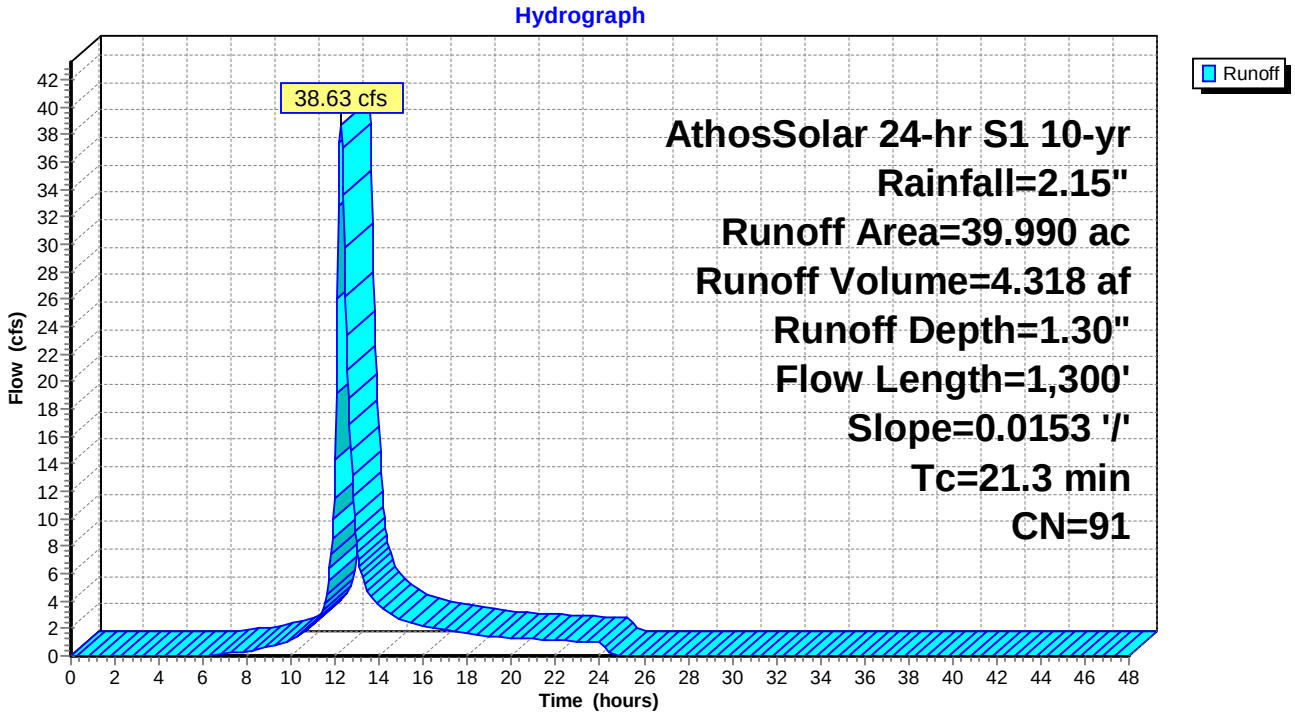
Runoff = 38.63 cfs @ 12.25 hrs, Volume= 4.318 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
39.990	91	Fallow, bare soil, HSG C
39.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	1,300	0.0153	1.02		**Lag/CN Method,**

Subcatchment 42S: DA-1



Summary for Subcatchment 43S: DA-1

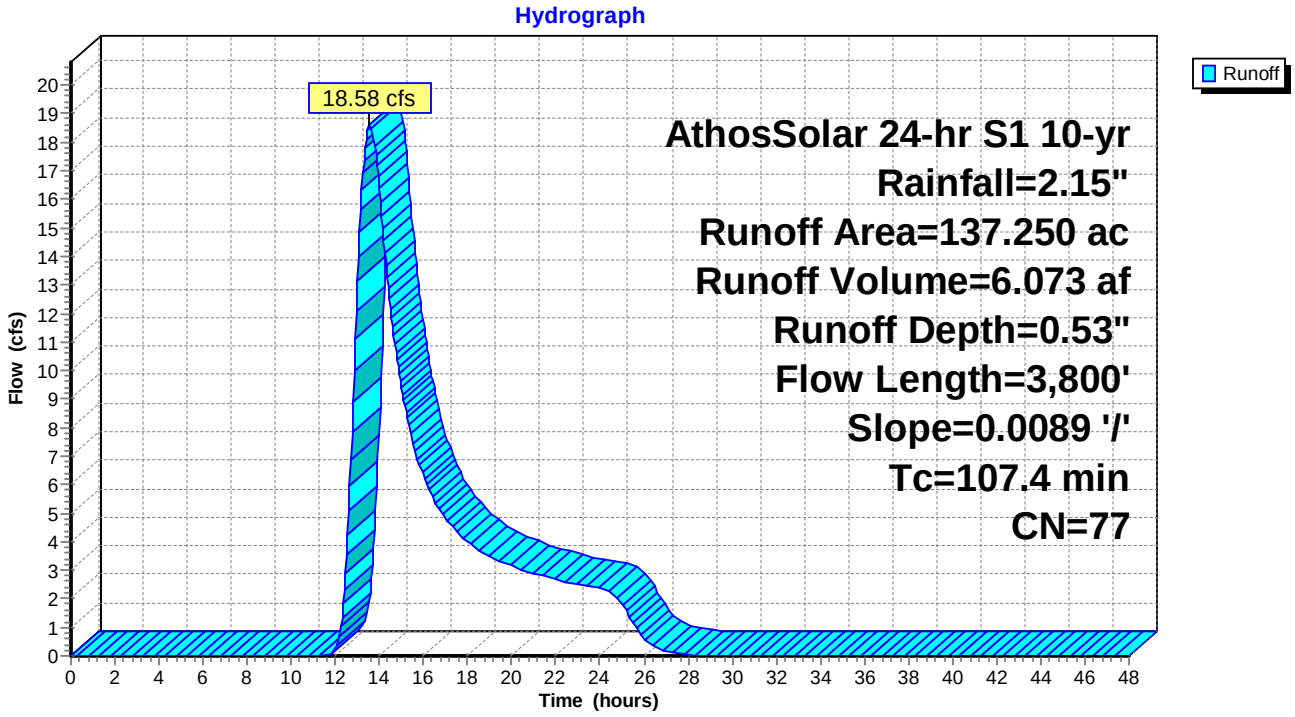
Runoff = 18.58 cfs @ 13.54 hrs, Volume= 6.073 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
137.250	77	Fallow, bare soil, HSG A
137.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
107.4	3,800	0.0089	0.59		**Lag/CN Method,**

Subcatchment 43S: DA-1



Summary for Subcatchment 44S: DA-2

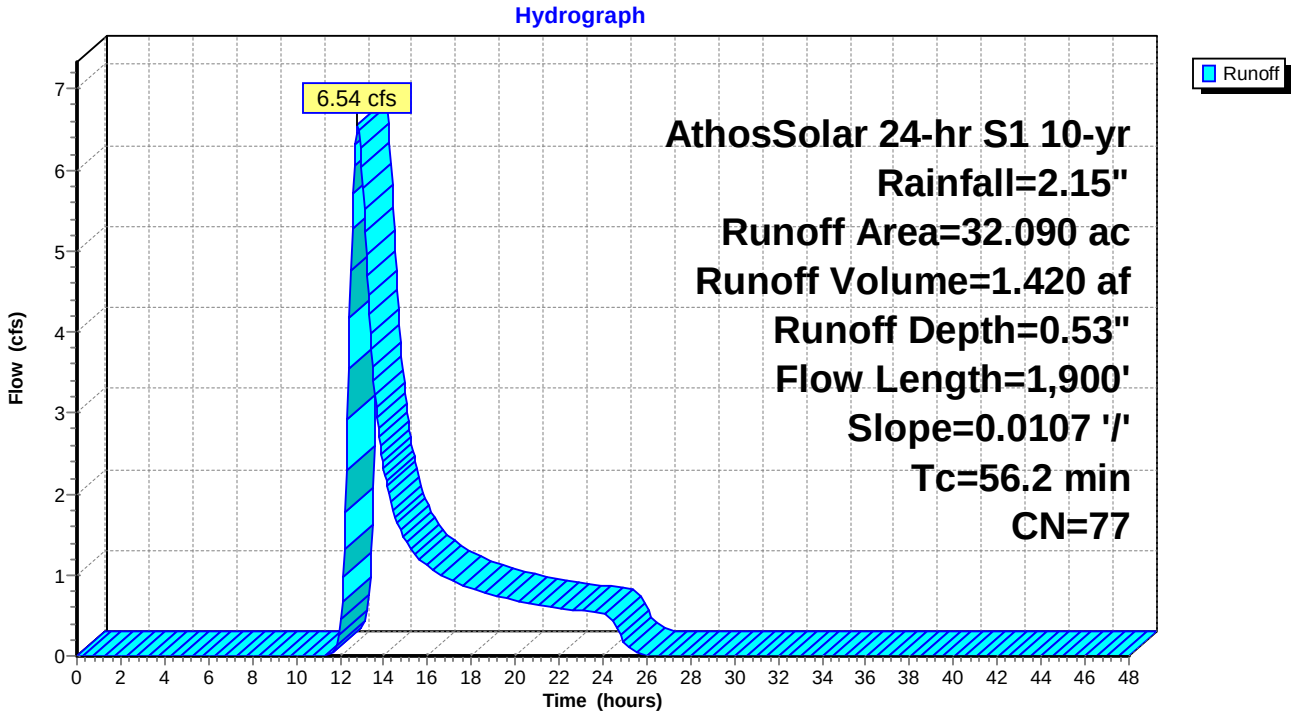
Runoff = 6.54 cfs @ 12.82 hrs, Volume= 1.420 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
32.090	77	Fallow, bare soil, HSG A
32.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.2	1,900	0.0107	0.56		**Lag/CN Method,**

Subcatchment 44S: DA-2



Summary for Subcatchment 45S: DA-1

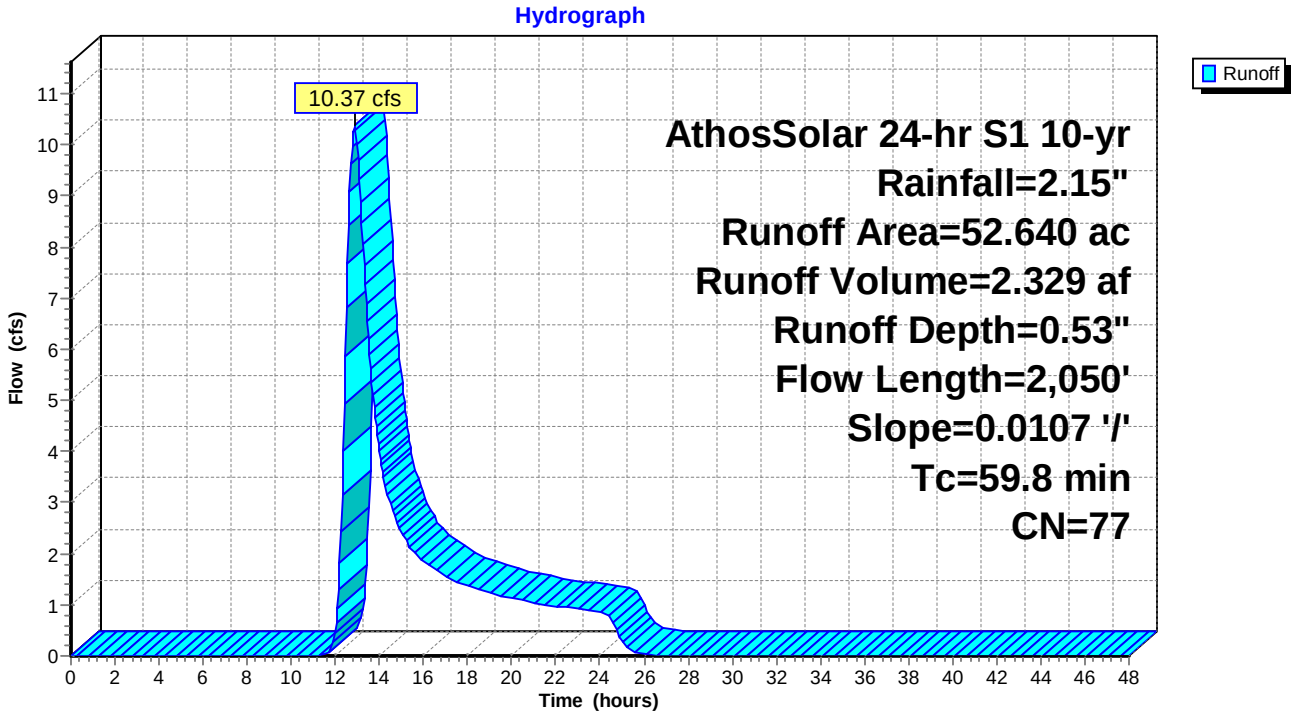
Runoff = 10.37 cfs @ 12.87 hrs, Volume= 2.329 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
52.640	77	Fallow, bare soil, HSG A
52.640		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
59.8	2,050	0.0107	0.57		**Lag/CN Method,**

Subcatchment 45S: DA-1



Summary for Subcatchment 46S: DA-2

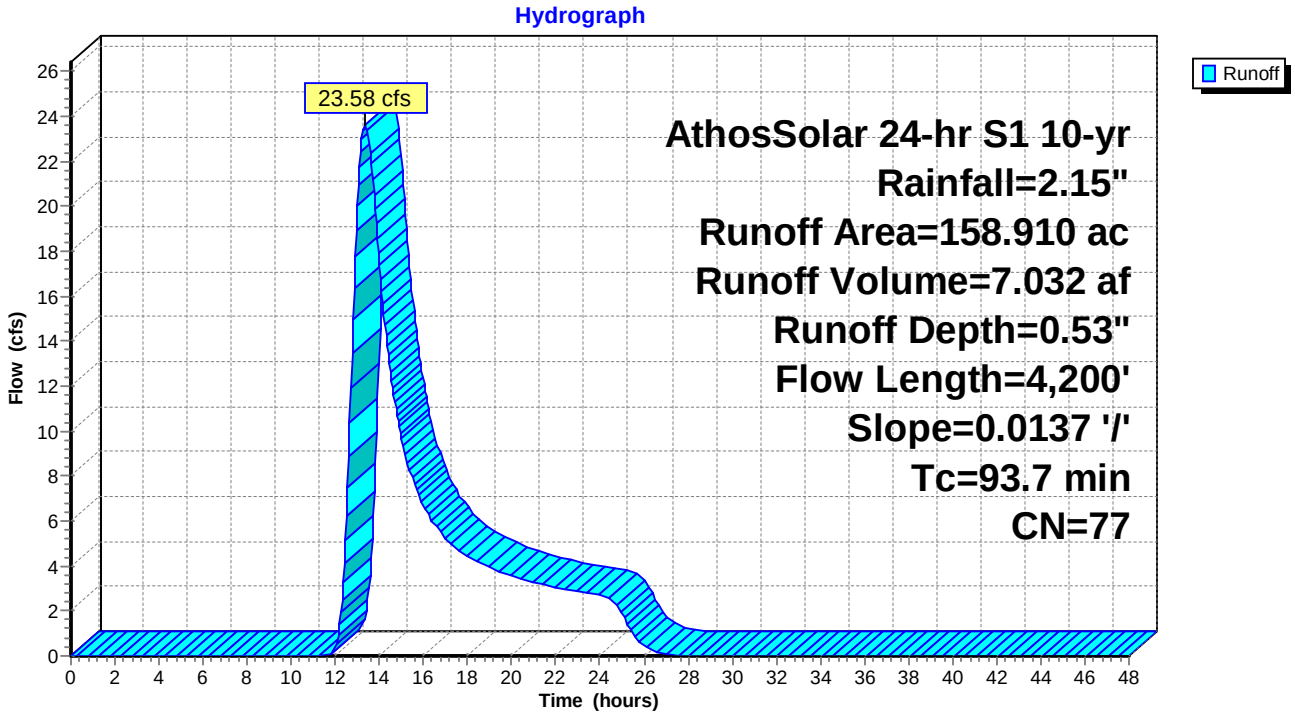
Runoff = 23.58 cfs @ 13.37 hrs, Volume= 7.032 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
158.910	77	Fallow, bare soil, HSG A
158.910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
93.7	4,200	0.0137	0.75		**Lag/CN Method,**

Subcatchment 46S: DA-2



Summary for Subcatchment 47S: DA-3

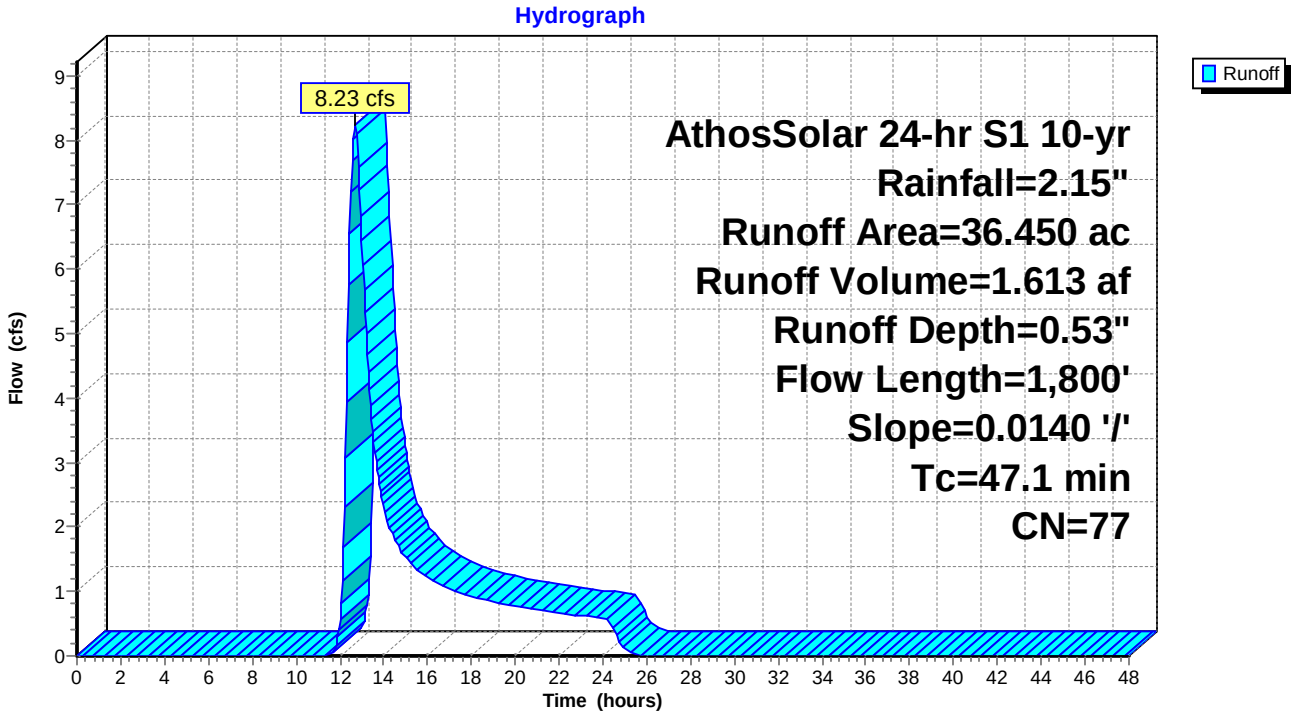
Runoff = 8.23 cfs @ 12.69 hrs, Volume= 1.613 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
36.450	77	Fallow, bare soil, HSG A
36.450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.1	1,800	0.0140	0.64		**Lag/CN Method,**

Subcatchment 47S: DA-3



Summary for Subcatchment 48S: DA-4

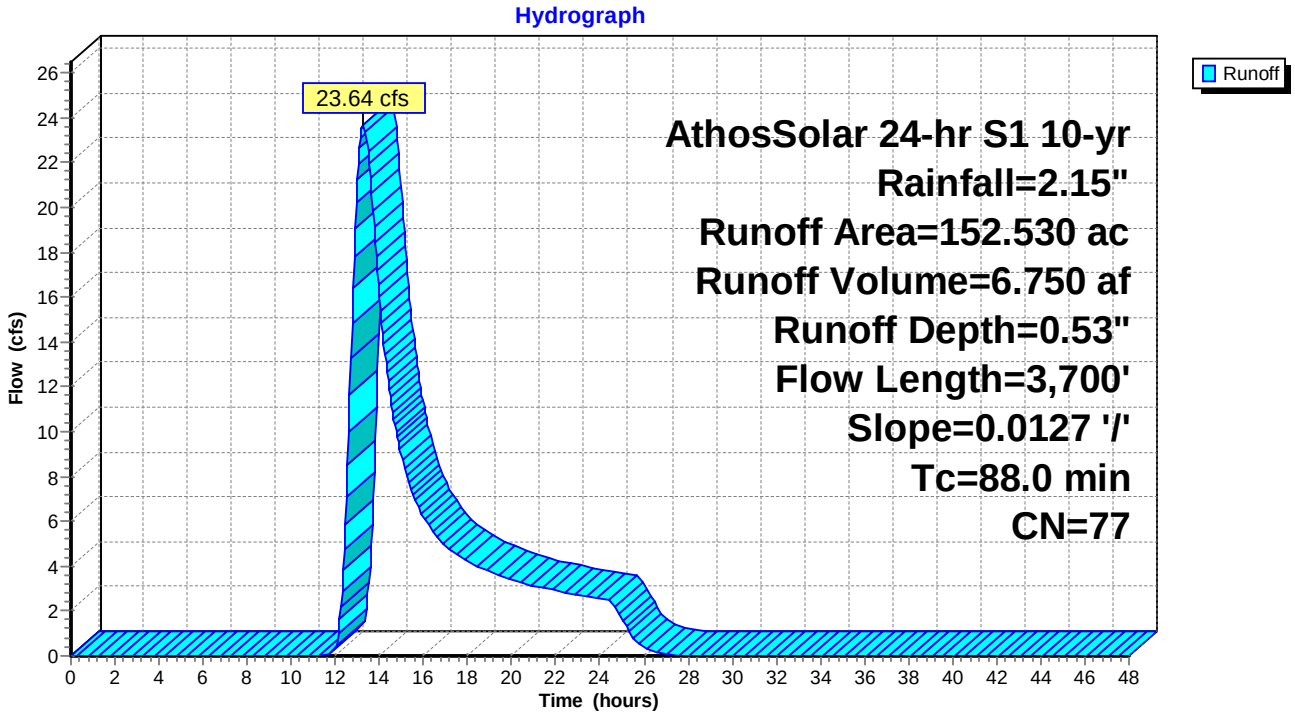
Runoff = 23.64 cfs @ 13.28 hrs, Volume= 6.750 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
152.530	77	Fallow, bare soil, HSG A
152.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
88.0	3,700	0.0127	0.70		**Lag/CN Method,**

Subcatchment 48S: DA-4



Summary for Subcatchment 49S: DA-2

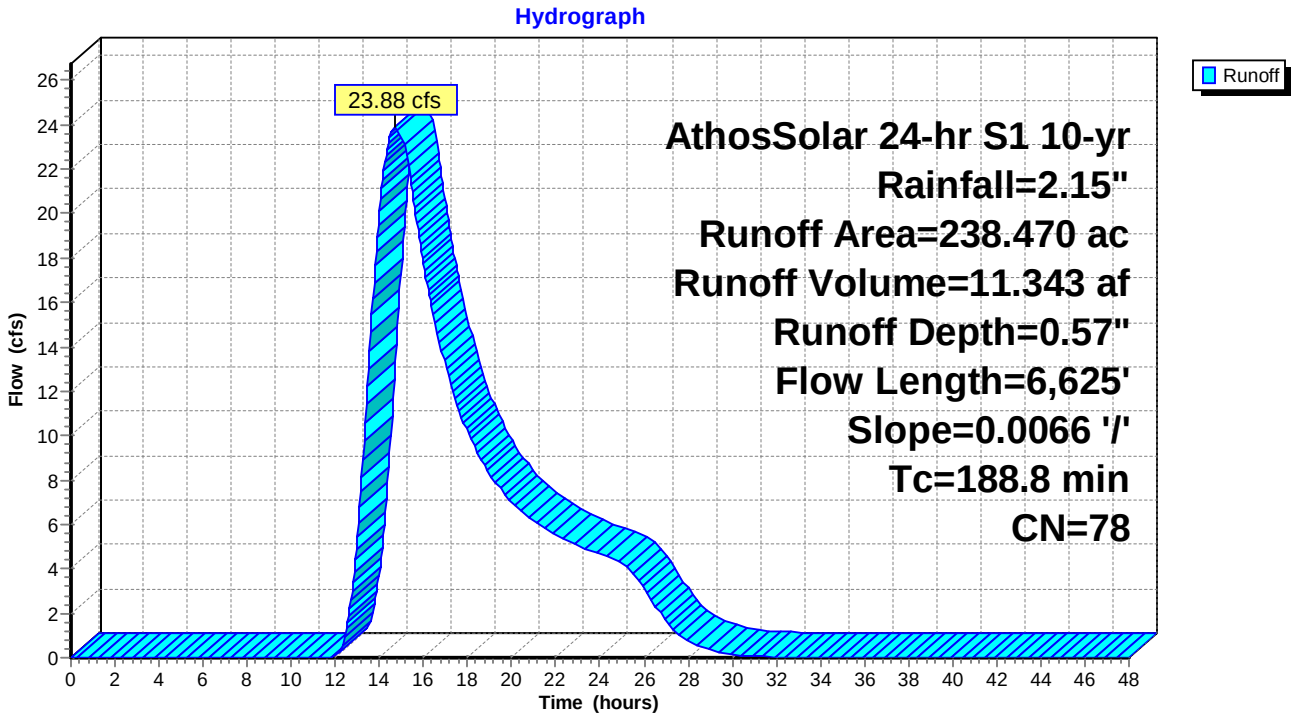
Runoff = 23.88 cfs @ 14.71 hrs, Volume= 11.343 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
226.550	77	Fallow, bare soil, HSG A
11.920	96	Gravel surface, HSG A
238.470	78	Weighted Average
238.470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
188.8	6,625	0.0066	0.58		**Lag/CN Method,**

Subcatchment 49S: DA-2



Summary for Subcatchment 50S: DA-3

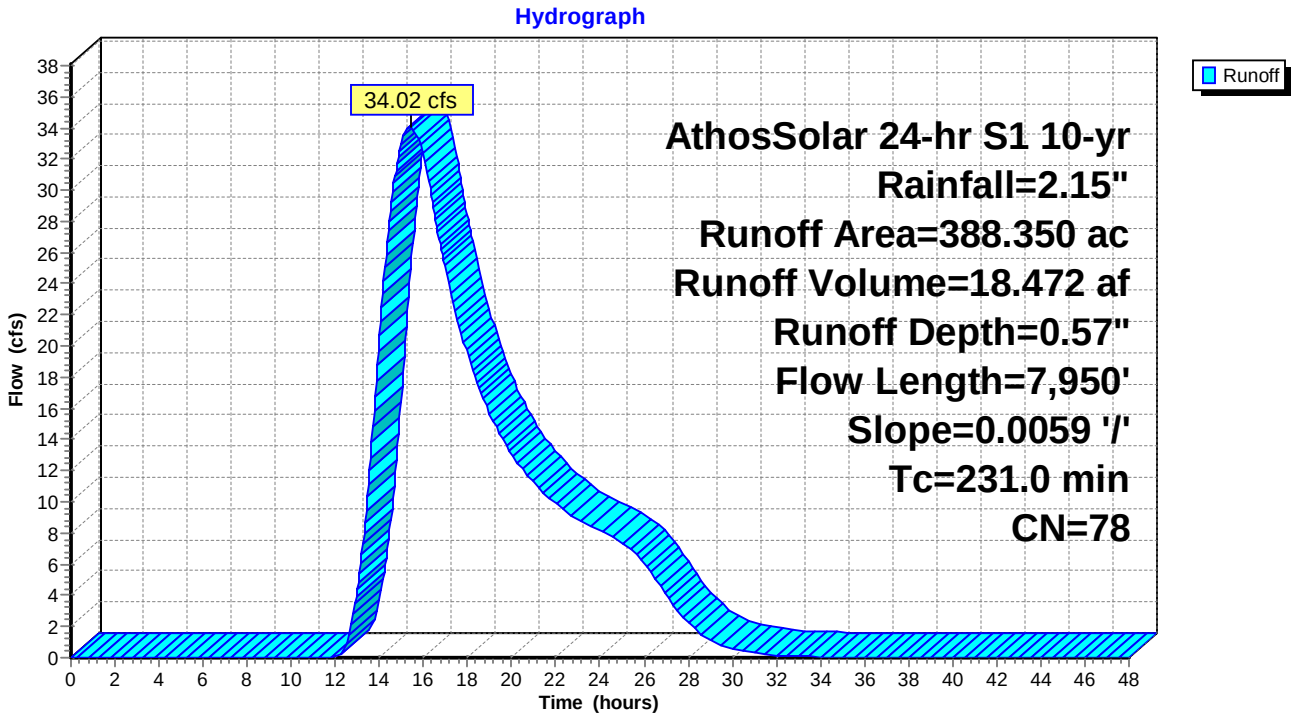
Runoff = 34.02 cfs @ 15.39 hrs, Volume= 18.472 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
368.940	77	Fallow, bare soil, HSG A
19.410	96	Gravel surface, HSG A
388.350	78	Weighted Average
388.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
231.0	7,950	0.0059	0.57		**Lag/CN Method,**

Subcatchment 50S: DA-3



Summary for Subcatchment 51S: DA-4

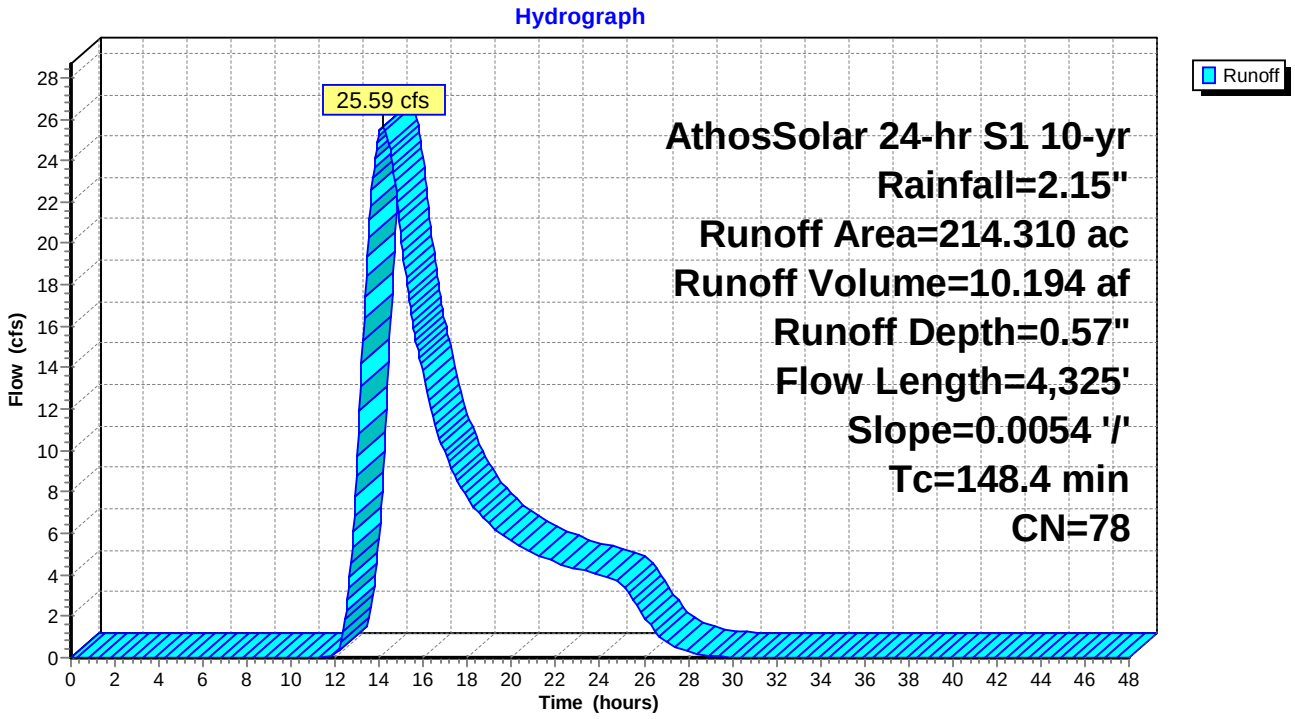
Runoff = 25.59 cfs @ 14.14 hrs, Volume= 10.194 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
203.590	77	Fallow, bare soil, HSG A
10.720	96	Gravel surface, HSG A
214.310	78	Weighted Average
214.310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
148.4	4,325	0.0054	0.49		**Lag/CN Method,**

Subcatchment 51S: DA-4



Summary for Subcatchment 52S: DA-1

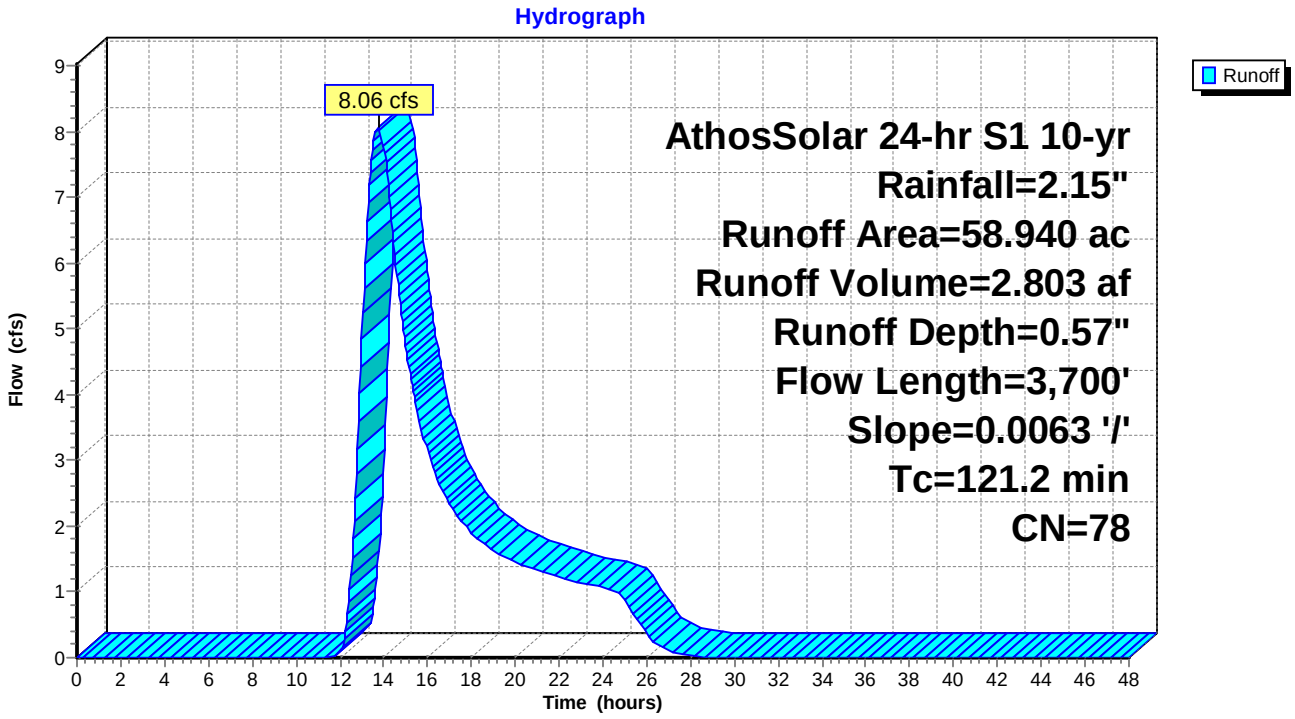
Runoff = 8.06 cfs @ 13.74 hrs, Volume= 2.803 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
55.990	77	Fallow, bare soil, HSG A
2.950	96	Gravel surface, HSG A
58.940	78	Weighted Average
58.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
121.2	3,700	0.0063	0.51		**Lag/CN Method,**

Subcatchment 52S: DA-1



Summary for Subcatchment 53S: DA-2

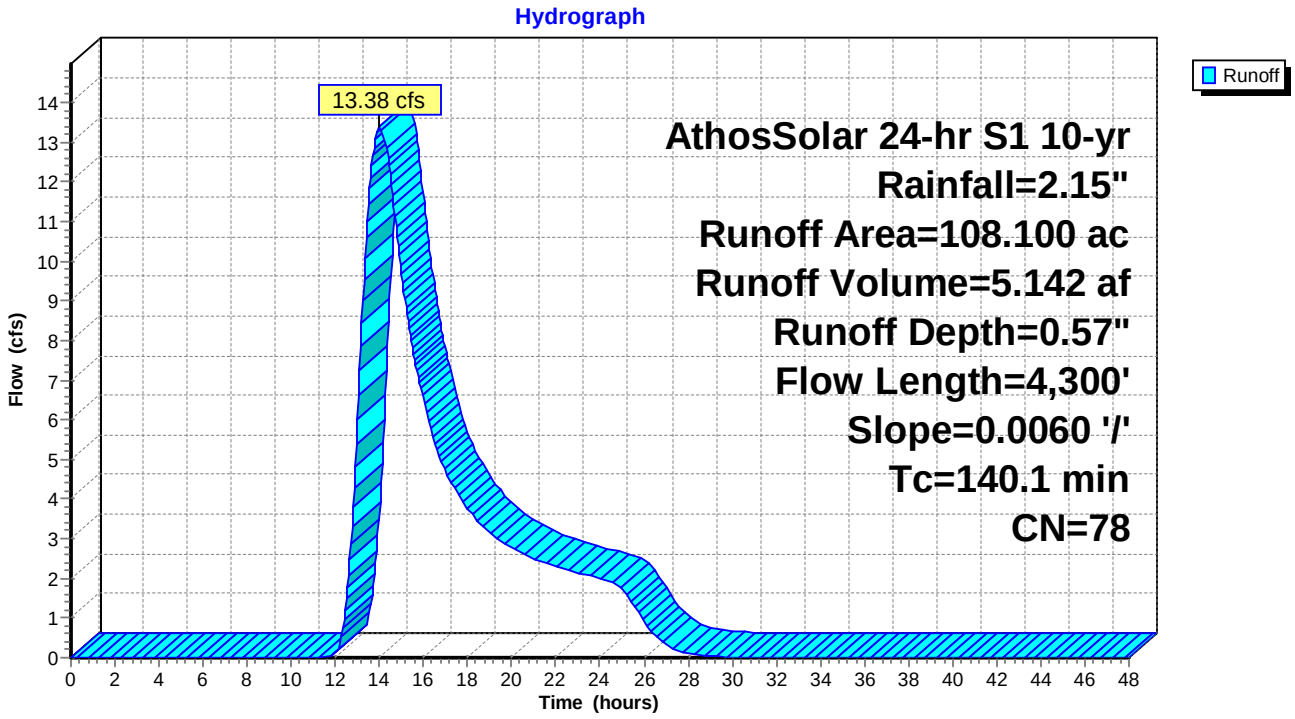
Runoff = 13.38 cfs @ 14.01 hrs, Volume= 5.142 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
102.690	77	Fallow, bare soil, HSG A
5.410	96	Gravel surface, HSG A
108.100	78	Weighted Average
108.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
140.1	4,300	0.0060	0.51		**Lag/CN Method,**

Subcatchment 53S: DA-2



Summary for Subcatchment 54S: DA-1

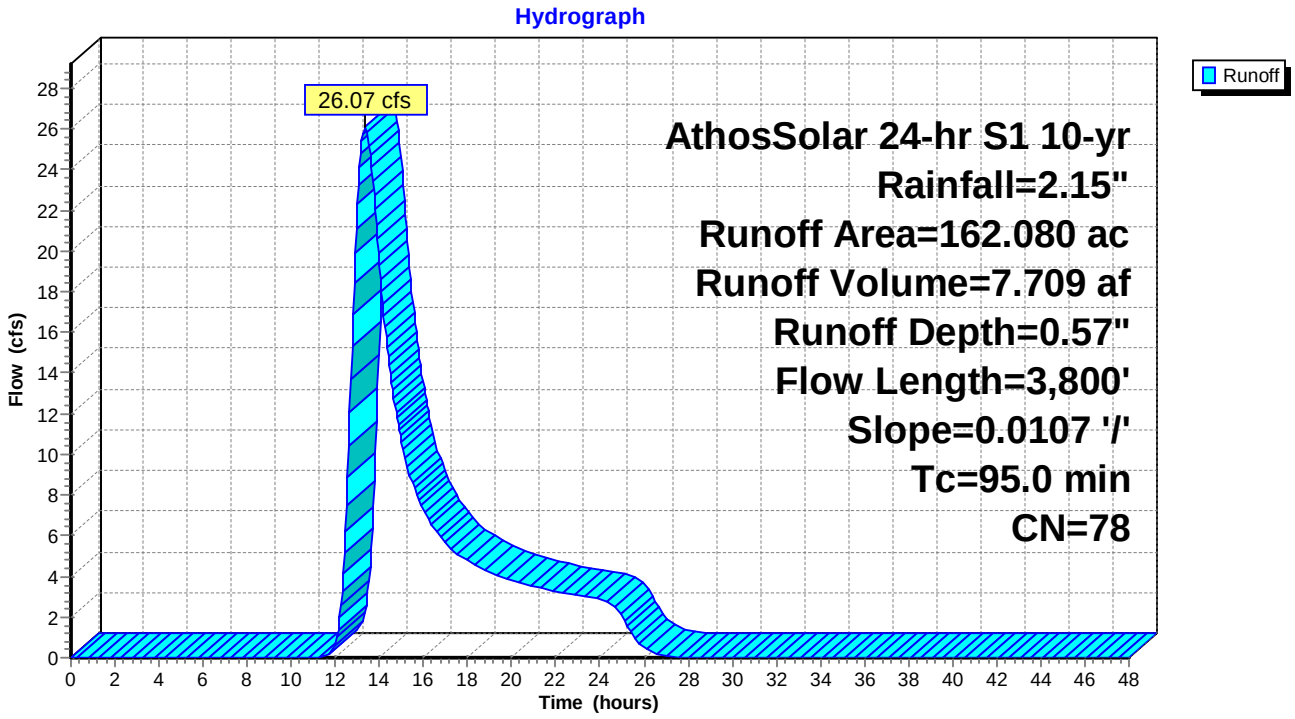
Runoff = 26.07 cfs @ 13.38 hrs, Volume= 7.709 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
153.980	77	Fallow, bare soil, HSG A
8.100	96	Gravel surface, HSG A
162.080	78	Weighted Average
162.080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
95.0	3,800	0.0107	0.67		**Lag/CN Method,**

Subcatchment 54S: DA-1



Summary for Subcatchment 55S: DA-2

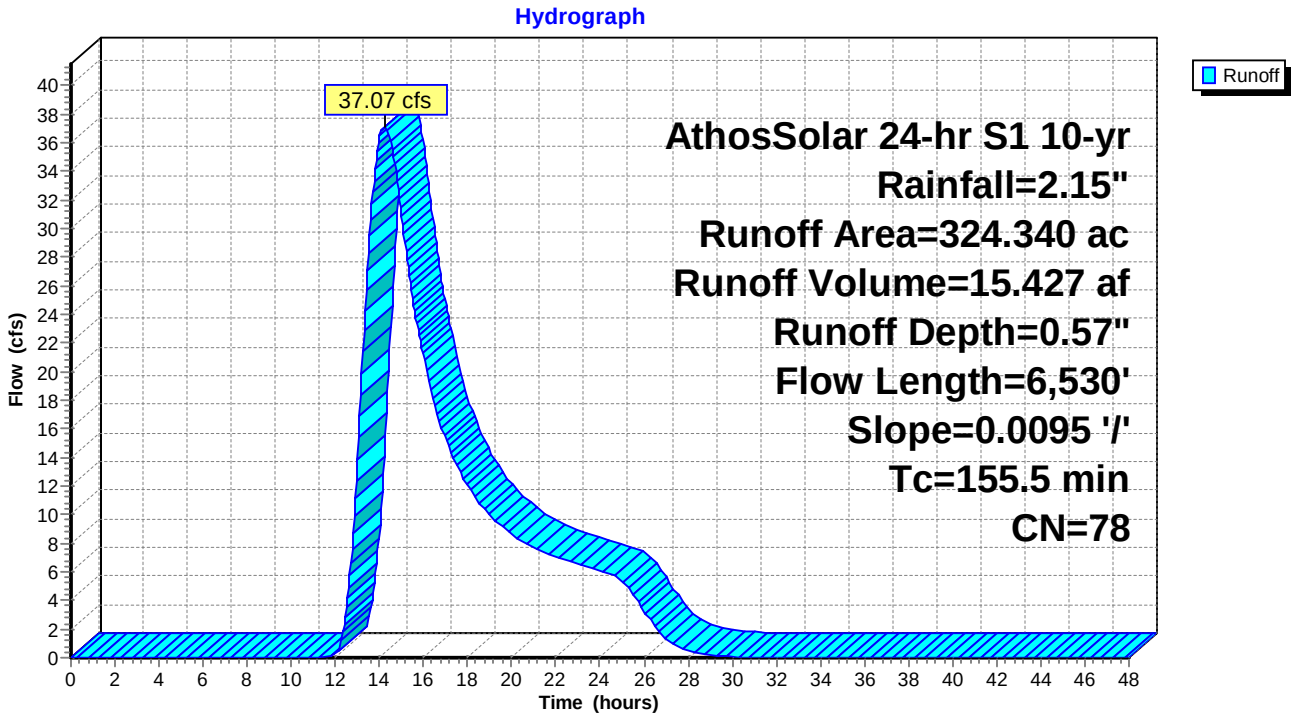
Runoff = 37.07 cfs @ 14.28 hrs, Volume= 15.427 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
308.120	77	Fallow, bare soil, HSG A
16.220	96	Gravel surface, HSG A
324.340	78	Weighted Average
324.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
155.5	6,530	0.0095	0.70		**Lag/CN Method,**

Subcatchment 55S: DA-2



Summary for Subcatchment 56S: DA-3

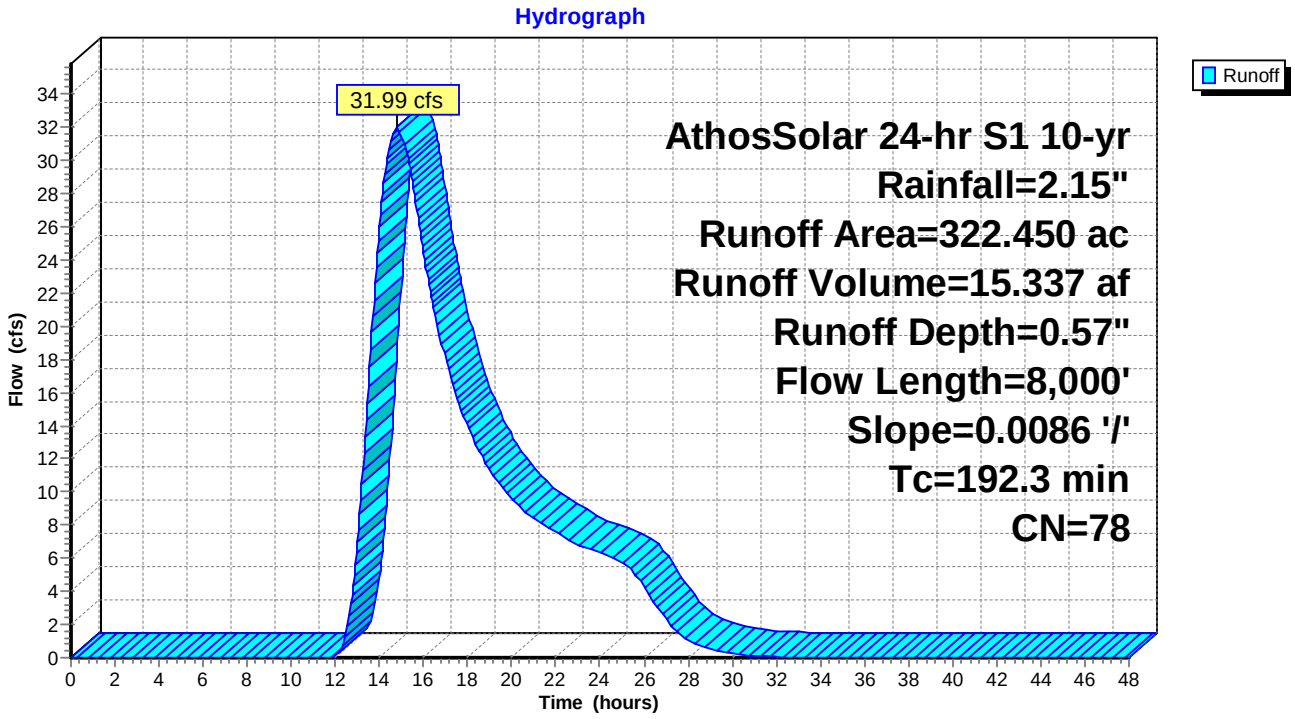
Runoff = 31.99 cfs @ 14.76 hrs, Volume= 15.337 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
306.330	77	Fallow, bare soil, HSG A
16.120	96	Gravel surface, HSG A
322.450	78	Weighted Average
322.450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
192.3	8,000	0.0086	0.69		**Lag/CN Method,**

Subcatchment 56S: DA-3



Summary for Subcatchment 57S: DA-1

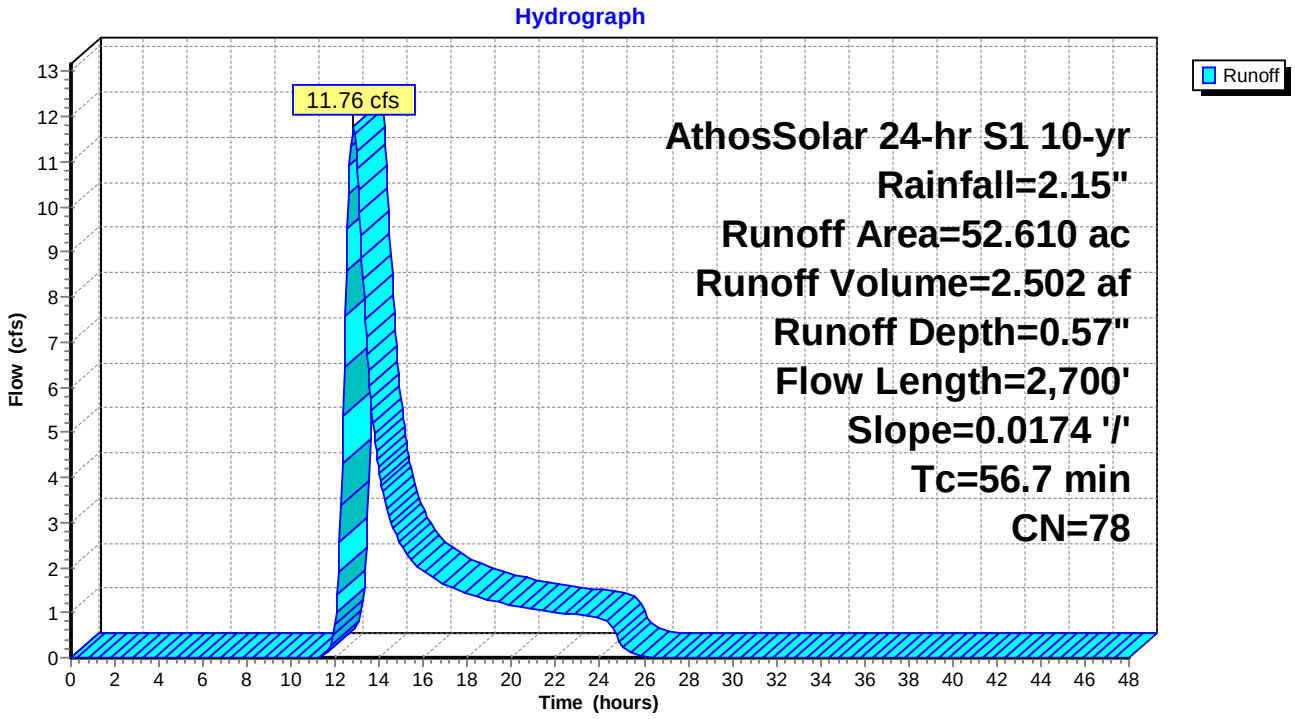
Runoff = 11.76 cfs @ 12.81 hrs, Volume= 2.502 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
49.980	77	Fallow, bare soil, HSG A
2.630	96	Gravel surface, HSG A
52.610	78	Weighted Average
52.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.7	2,700	0.0174	0.79		**Lag/CN Method,**

Subcatchment 57S: DA-1



Summary for Subcatchment 58S: DA-2

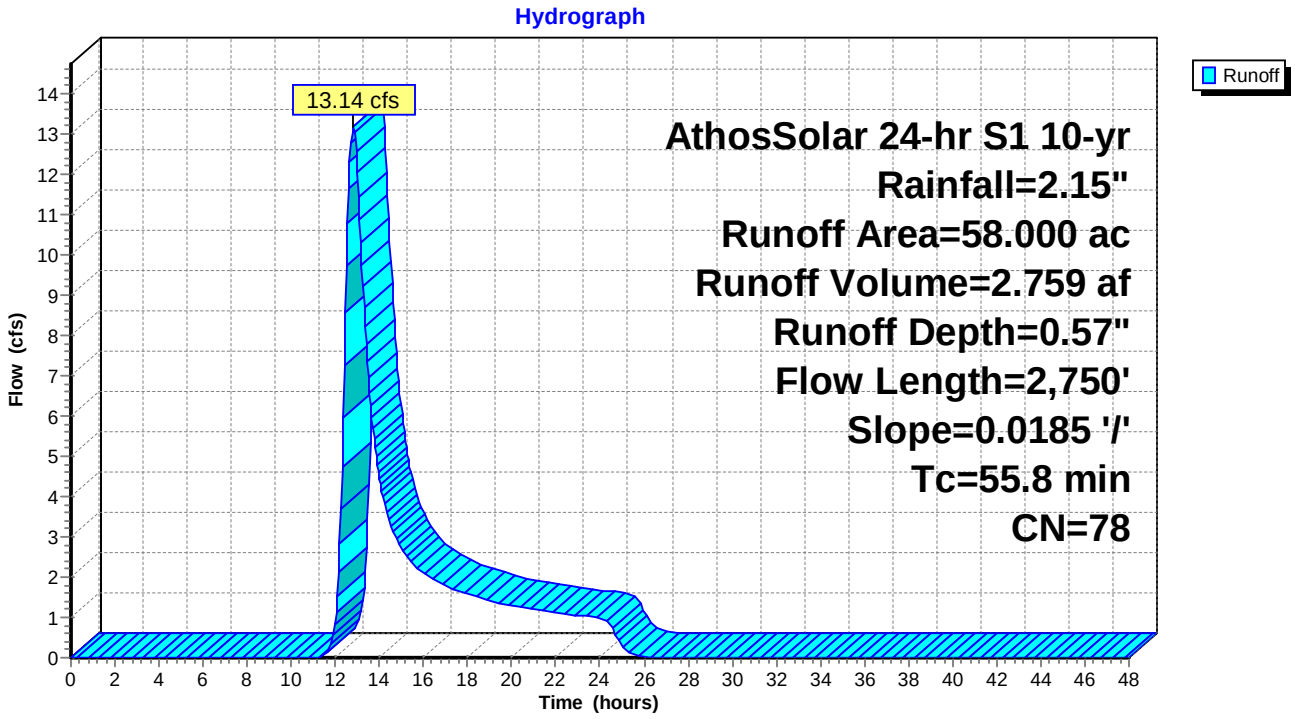
Runoff = 13.14 cfs @ 12.81 hrs, Volume= 2.759 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
55.100	77	Fallow, bare soil, HSG A
2.900	96	Gravel surface, HSG A
58.000	78	Weighted Average
58.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
55.8	2,750	0.0185	0.82		**Lag/CN Method,**

Subcatchment 58S: DA-2



Summary for Subcatchment 59S: DA-1

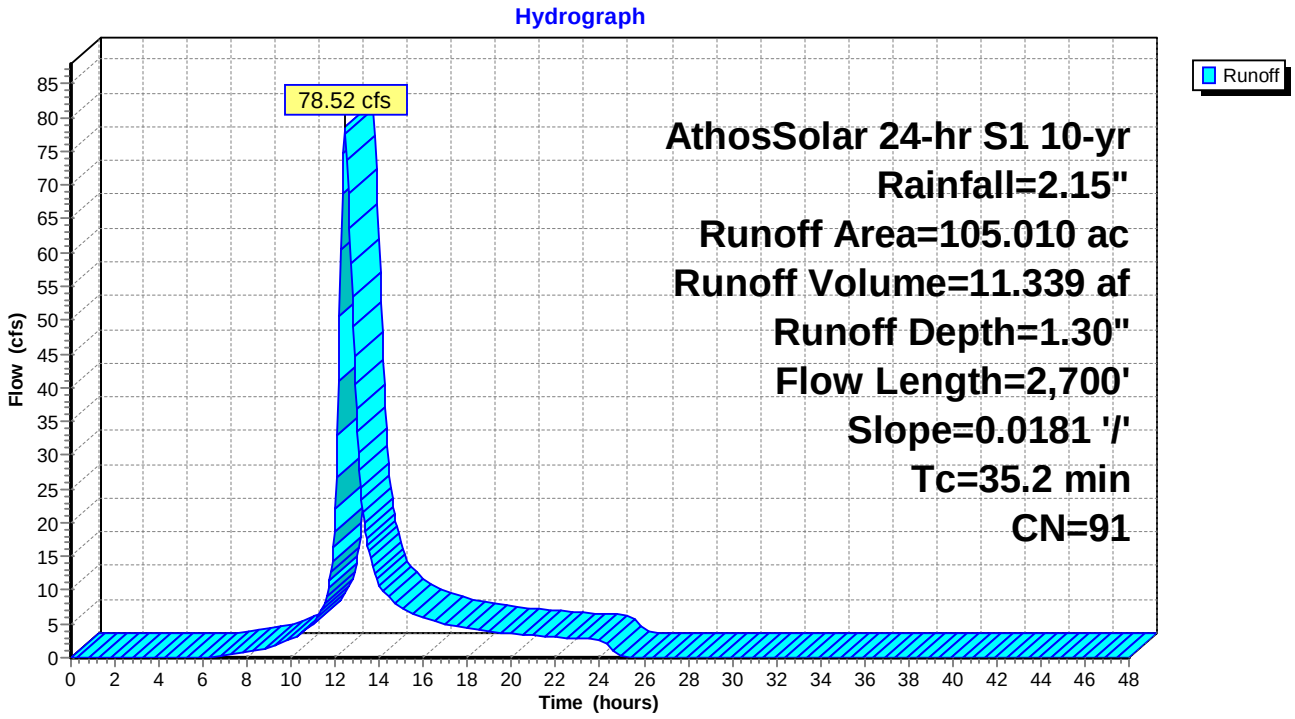
Runoff = 78.52 cfs @ 12.44 hrs, Volume= 11.339 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
99.760	91	Fallow, bare soil, HSG C
5.250	96	Gravel surface, HSG C
105.010	91	Weighted Average
105.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.2	2,700	0.0181	1.28		**Lag/CN Method,**

Subcatchment 59S: DA-1



Summary for Subcatchment 60S: DA-2

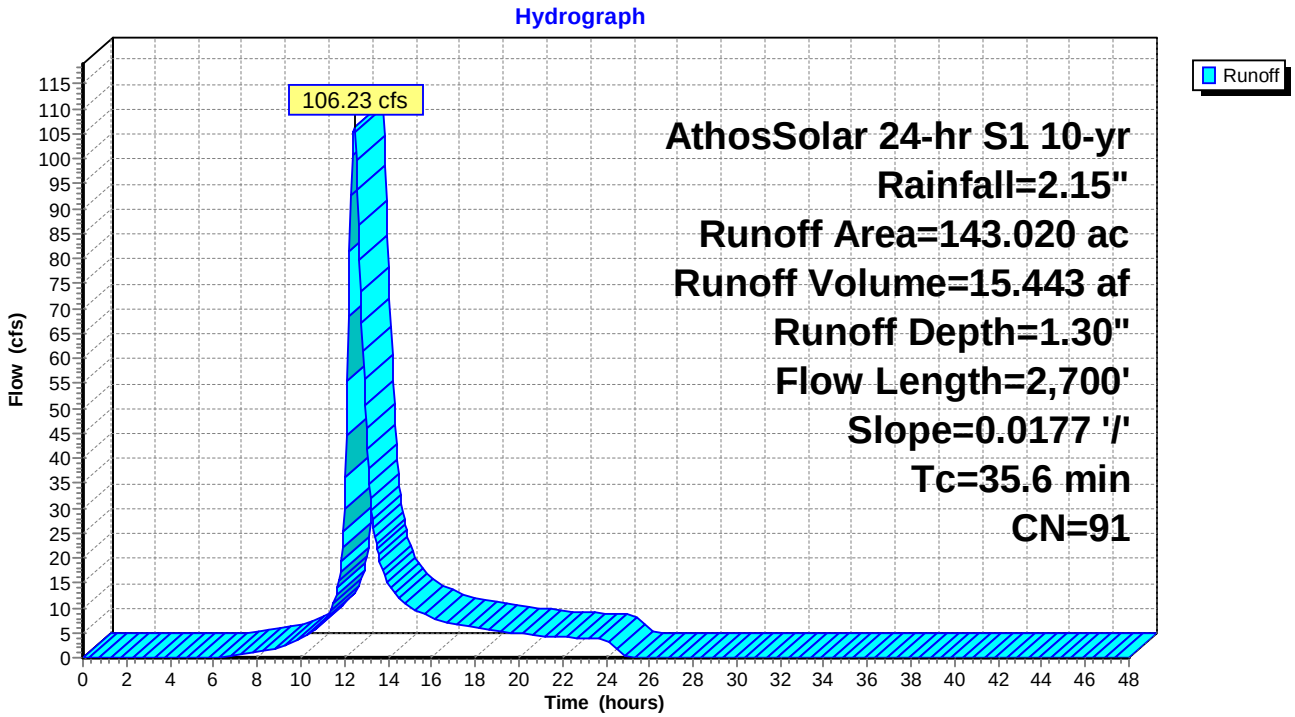
Runoff = 106.23 cfs @ 12.44 hrs, Volume= 15.443 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
135.870	91	Fallow, bare soil, HSG C
7.150	96	Gravel surface, HSG C
143.020	91	Weighted Average
143.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.6	2,700	0.0177	1.26		**Lag/CN Method,**

Subcatchment 60S: DA-2



Summary for Subcatchment 61S: DA-3

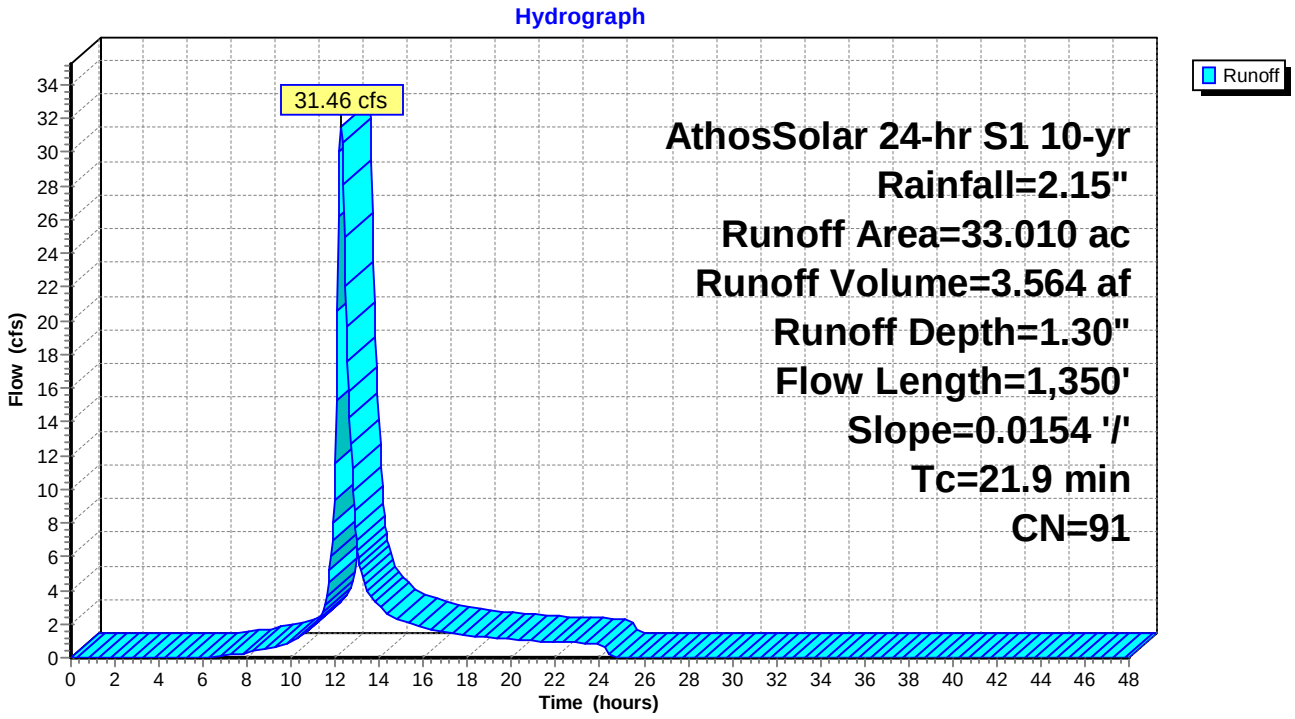
Runoff = 31.46 cfs @ 12.26 hrs, Volume= 3.564 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
31.360	91	Fallow, bare soil, HSG C
1.650	96	Gravel surface, HSG C
33.010	91	Weighted Average
33.010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	1,350	0.0154	1.03		**Lag/CN Method,**

Subcatchment 61S: DA-3



Summary for Subcatchment 62S: DA-1

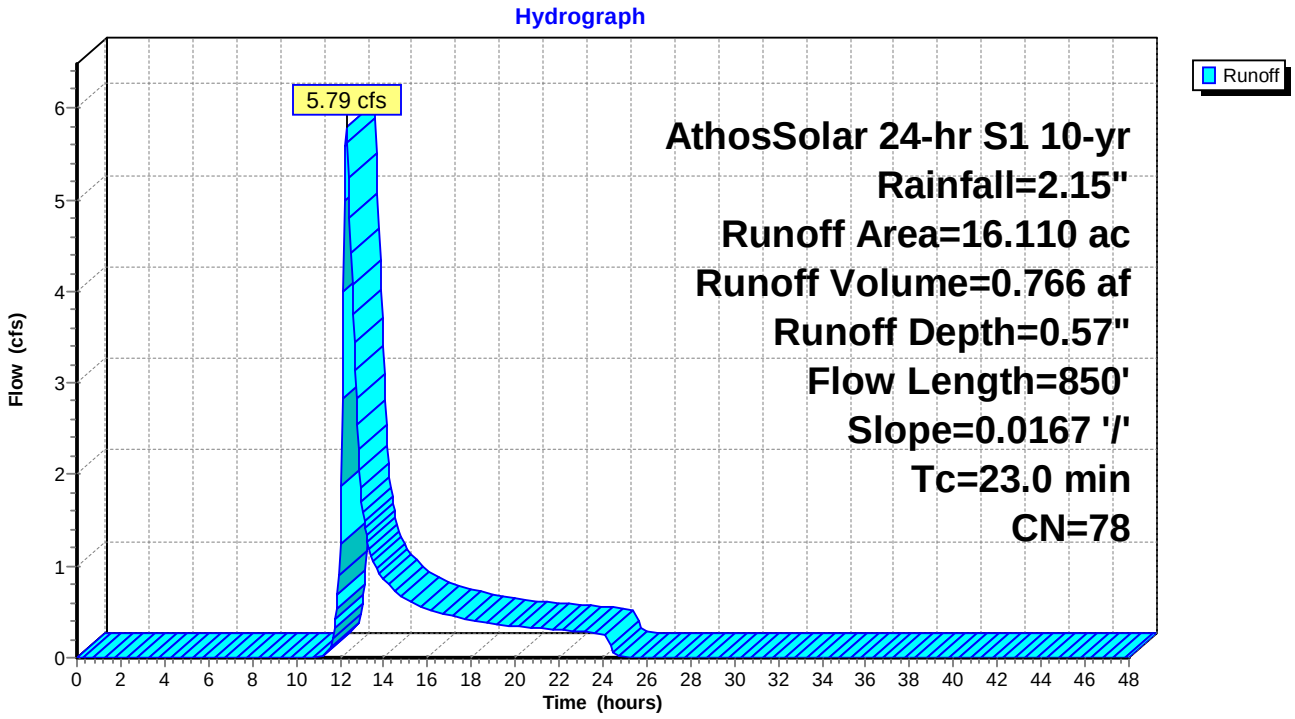
Runoff = 5.79 cfs @ 12.30 hrs, Volume= 0.766 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
15.300	77	Fallow, bare soil, HSG A
0.810	96	Gravel surface, HSG A
16.110	78	Weighted Average
16.110		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	850	0.0167	0.62		**Lag/CN Method,**

Subcatchment 62S: DA-1



Summary for Subcatchment 63S: DA-2

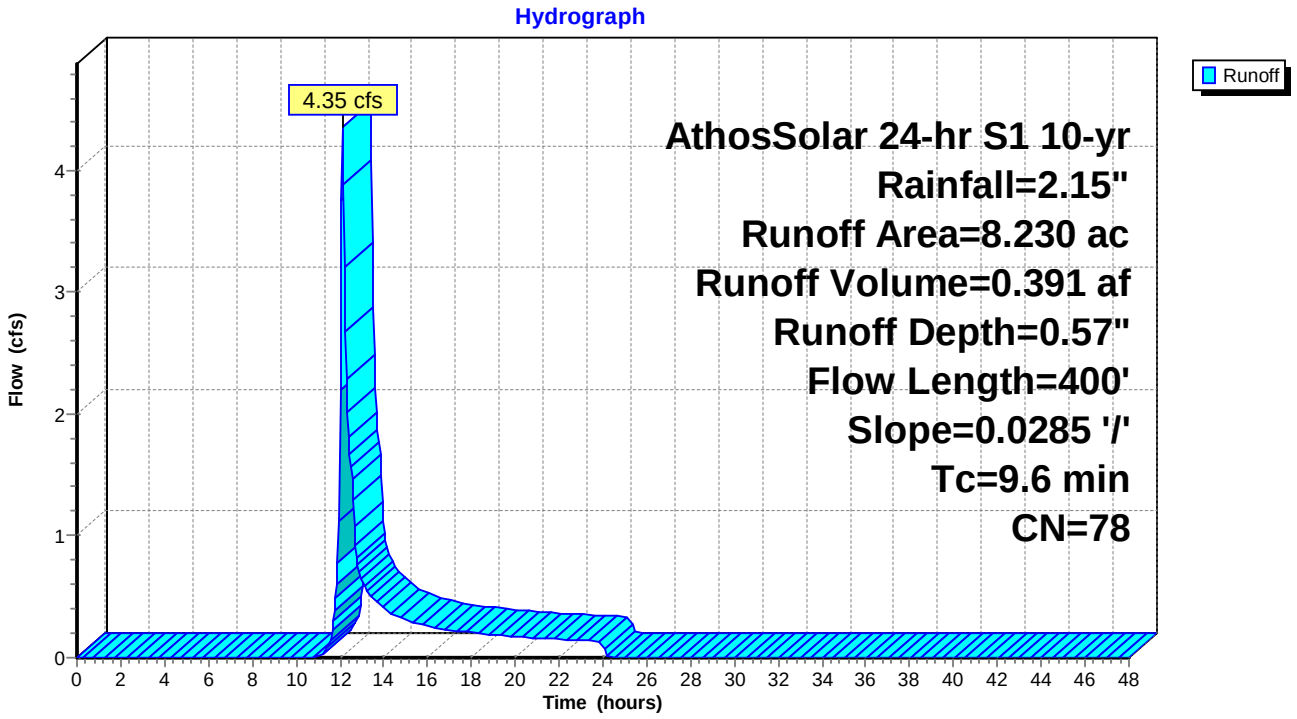
Runoff = 4.35 cfs @ 12.10 hrs, Volume= 0.391 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
7.820	77	Fallow, bare soil, HSG A
0.410	96	Gravel surface, HSG A
8.230	78	Weighted Average
8.230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	400	0.0285	0.69		**Lag/CN Method,**

Subcatchment 63S: DA-2



Summary for Subcatchment 64S: DA-1

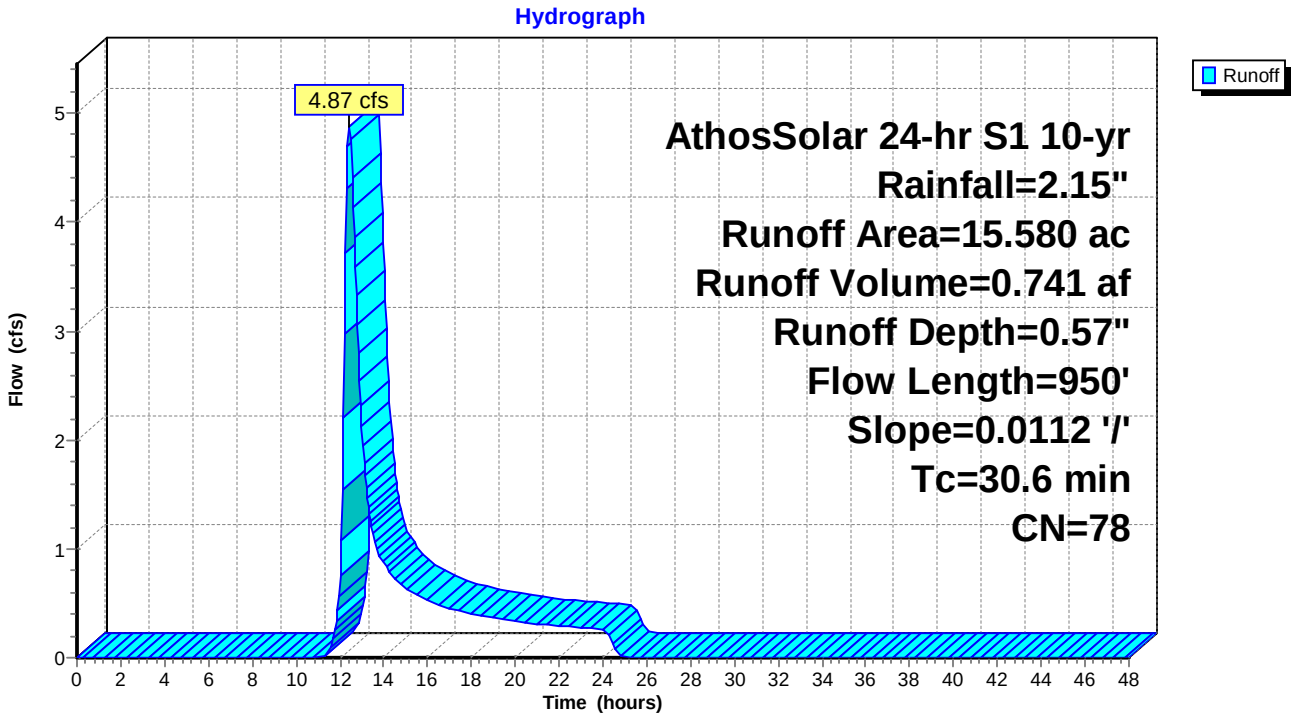
Runoff = 4.87 cfs @ 12.42 hrs, Volume= 0.741 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
14.800	77	Fallow, bare soil, HSG A
0.780	96	Gravel surface, HSG A
15.580	78	Weighted Average
15.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.6	950	0.0112	0.52		**Lag/CN Method,**

Subcatchment 64S: DA-1



Summary for Subcatchment 65S: DA-2

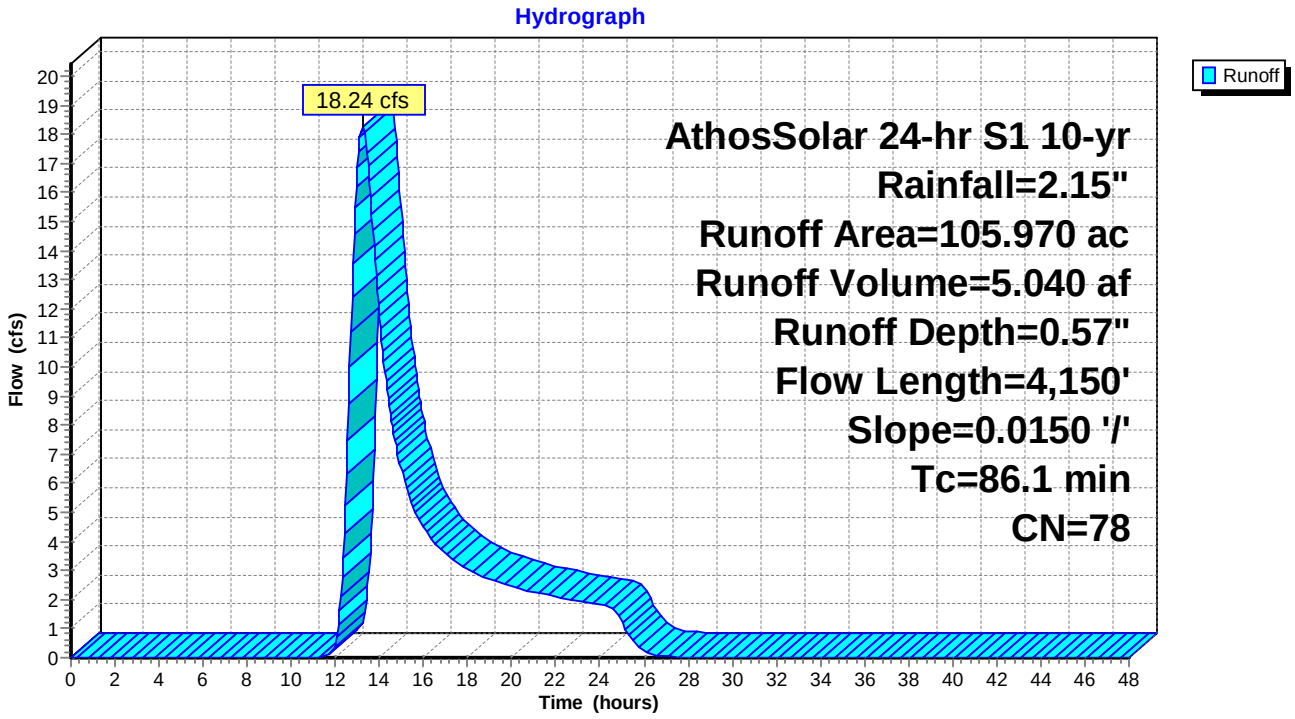
Runoff = 18.24 cfs @ 13.24 hrs, Volume= 5.040 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
100.680	77	Fallow, bare soil, HSG A
5.290	96	Gravel surface, HSG A
105.970	78	Weighted Average
105.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
86.1	4,150	0.0150	0.80		**Lag/CN Method,**

Subcatchment 65S: DA-2



Summary for Subcatchment 66S: DA-3

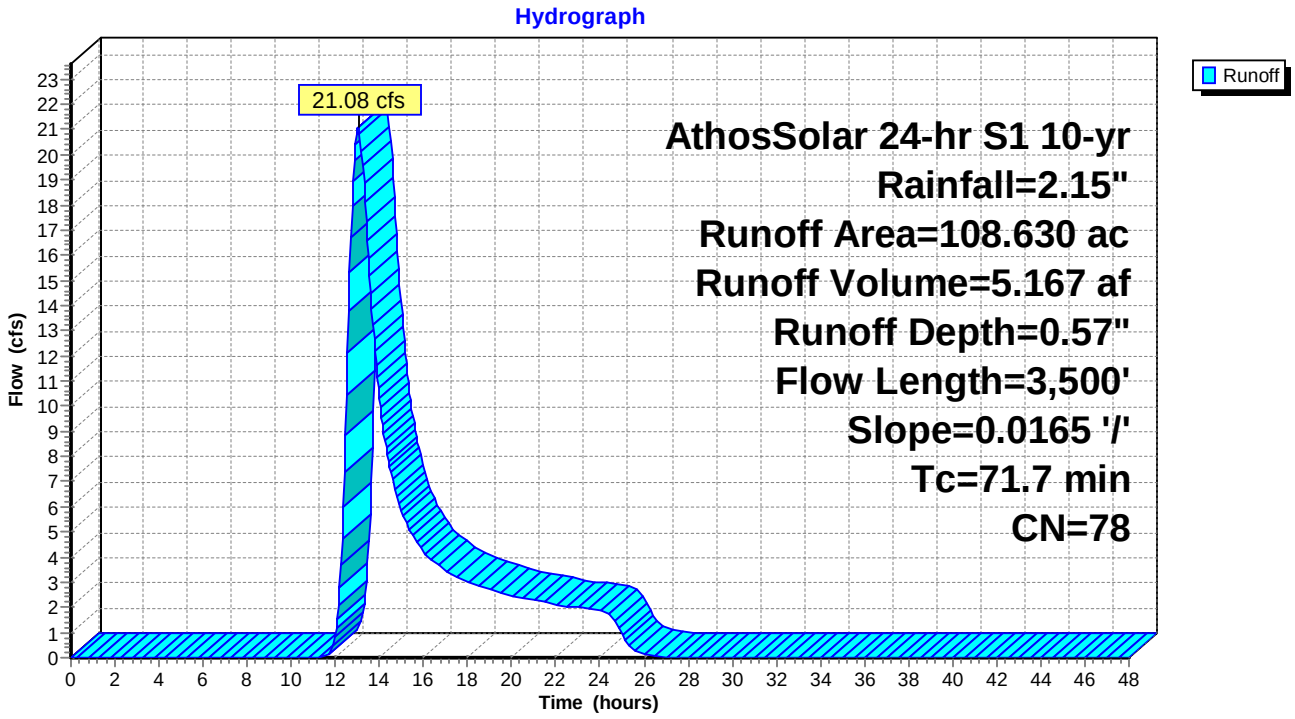
Runoff = 21.08 cfs @ 13.02 hrs, Volume= 5.167 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
103.200	77	Fallow, bare soil, HSG A
5.430	96	Gravel surface, HSG A
108.630	78	Weighted Average
108.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
71.7	3,500	0.0165	0.81		**Lag/CN Method,**

Subcatchment 66S: DA-3



Summary for Subcatchment 67S: DA-4

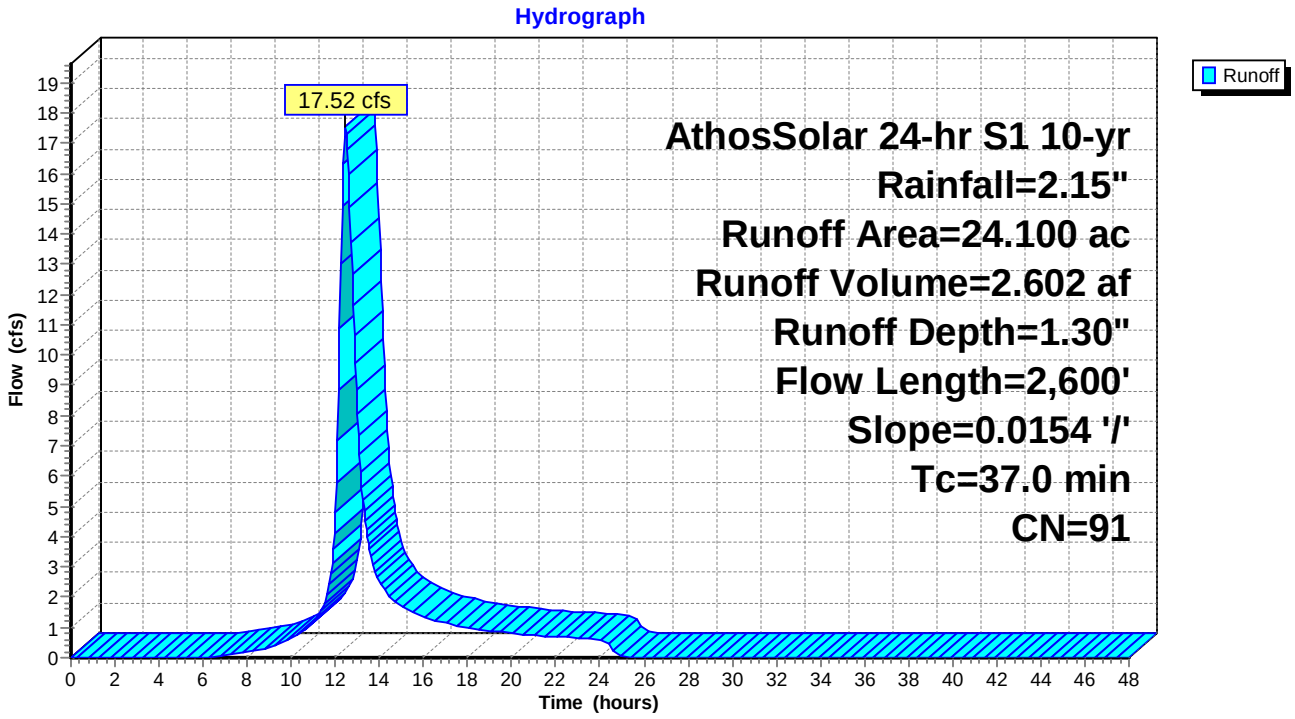
Runoff = 17.52 cfs @ 12.46 hrs, Volume= 2.602 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
22.890	91	Fallow, bare soil, HSG C
1.210	96	Gravel surface, HSG C
24.100	91	Weighted Average
24.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
37.0	2,600	0.0154	1.17		**Lag/CN Method,**

Subcatchment 67S: DA-4



Summary for Subcatchment 68S: DA-1

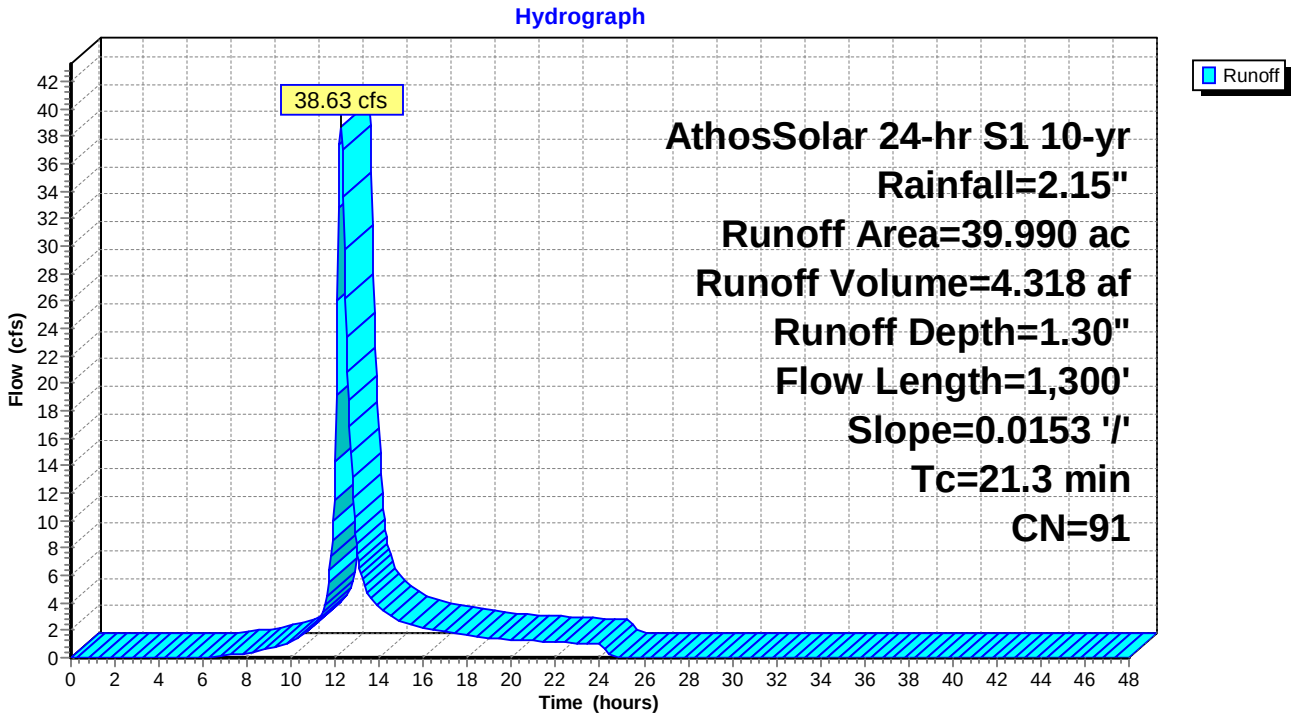
Runoff = 38.63 cfs @ 12.25 hrs, Volume= 4.318 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
38.000	91	Fallow, bare soil, HSG C
1.990	96	Gravel surface, HSG C
39.990	91	Weighted Average
39.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	1,300	0.0153	1.02		**Lag/CN Method,**

Subcatchment 68S: DA-1



Summary for Subcatchment 69S: DA-1

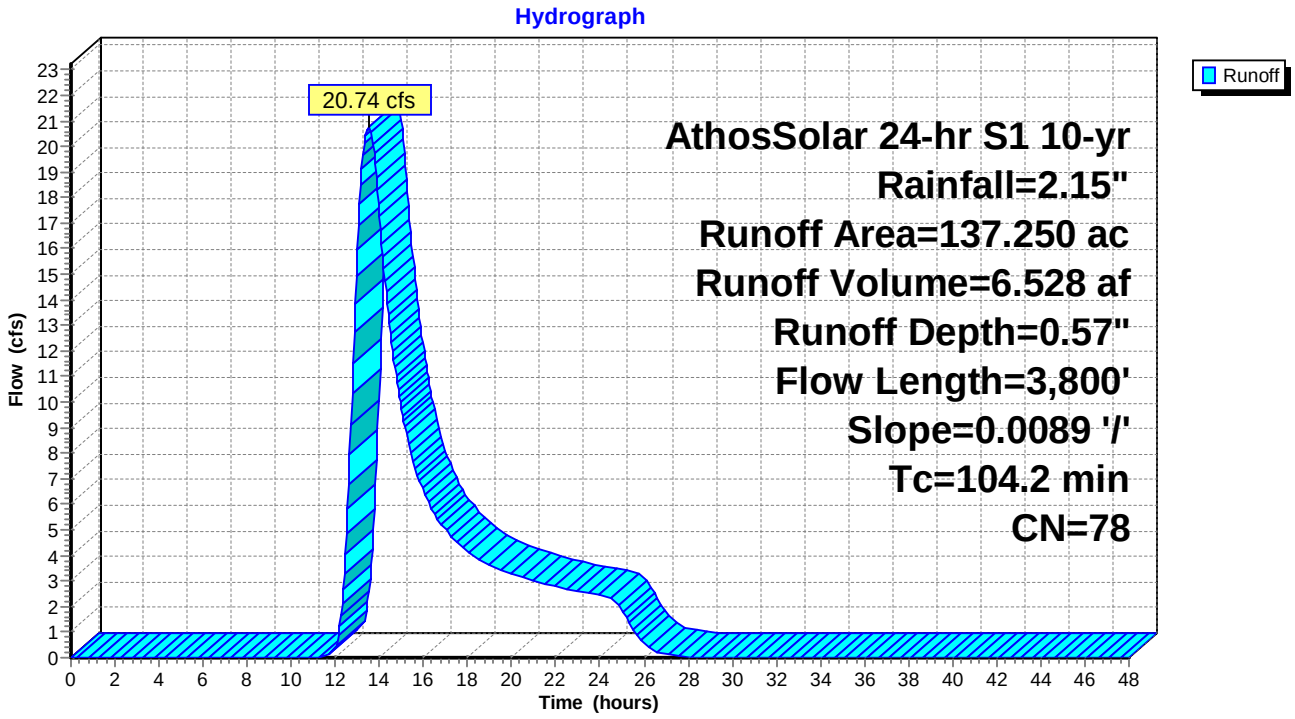
Runoff = 20.74 cfs @ 13.51 hrs, Volume= 6.528 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
130.390	77	Fallow, bare soil, HSG A
6.860	96	Gravel surface, HSG A
137.250	78	Weighted Average
137.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
104.2	3,800	0.0089	0.61		**Lag/CN Method,**

Subcatchment 69S: DA-1



Summary for Subcatchment 70S: DA-2

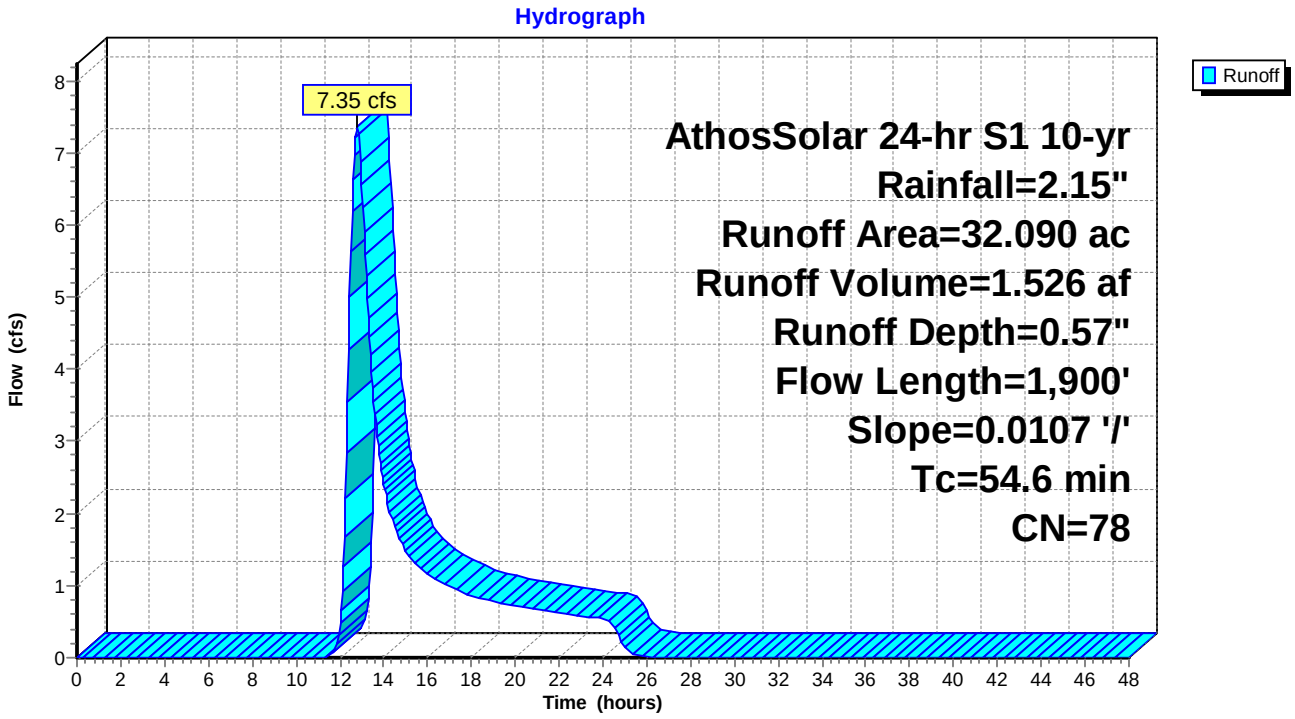
Runoff = 7.35 cfs @ 12.79 hrs, Volume= 1.526 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
30.490	77	Fallow, bare soil, HSG A
1.600	96	Gravel surface, HSG A
32.090	78	Weighted Average
32.090		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.6	1,900	0.0107	0.58		**Lag/CN Method,**

Subcatchment 70S: DA-2



Summary for Subcatchment 71S: DA-1

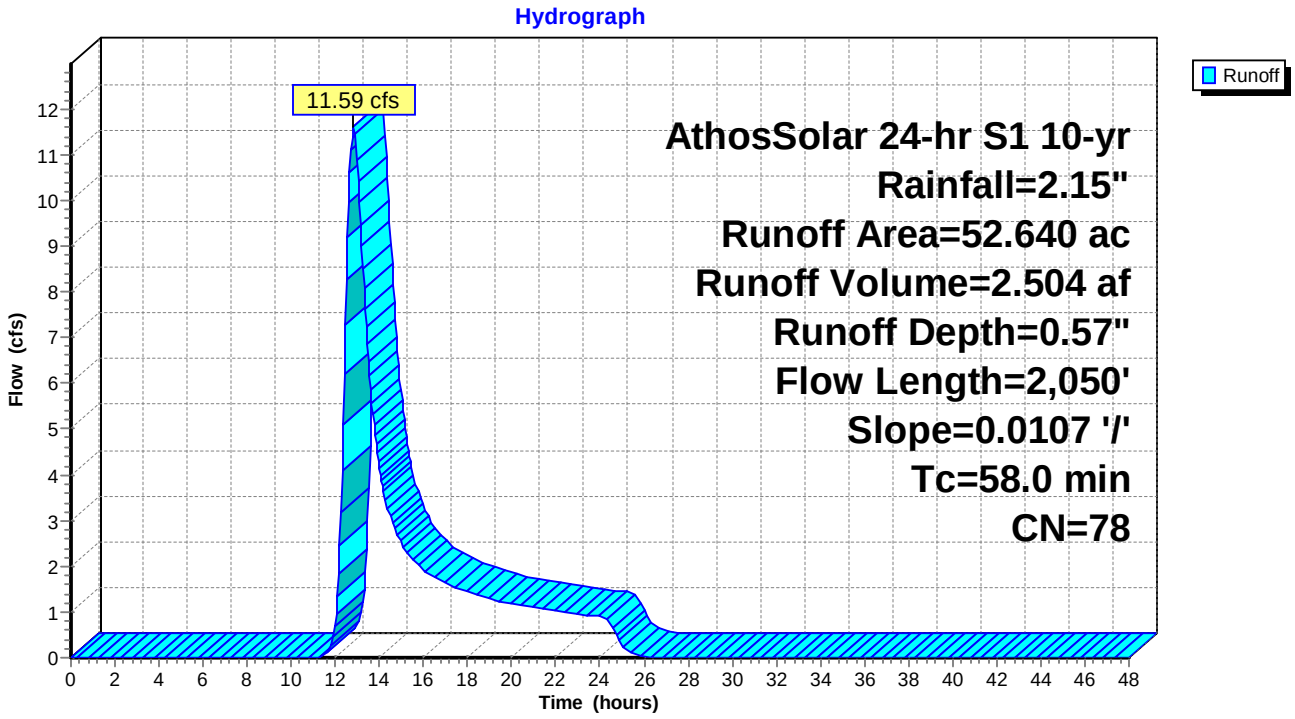
Runoff = 11.59 cfs @ 12.84 hrs, Volume= 2.504 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
50.010	77	Fallow, bare soil, HSG A
2.630	96	Gravel surface, HSG A
52.640	78	Weighted Average
52.640		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
58.0	2,050	0.0107	0.59		**Lag/CN Method,**

Subcatchment 71S: DA-1



Summary for Subcatchment 72S: DA-2

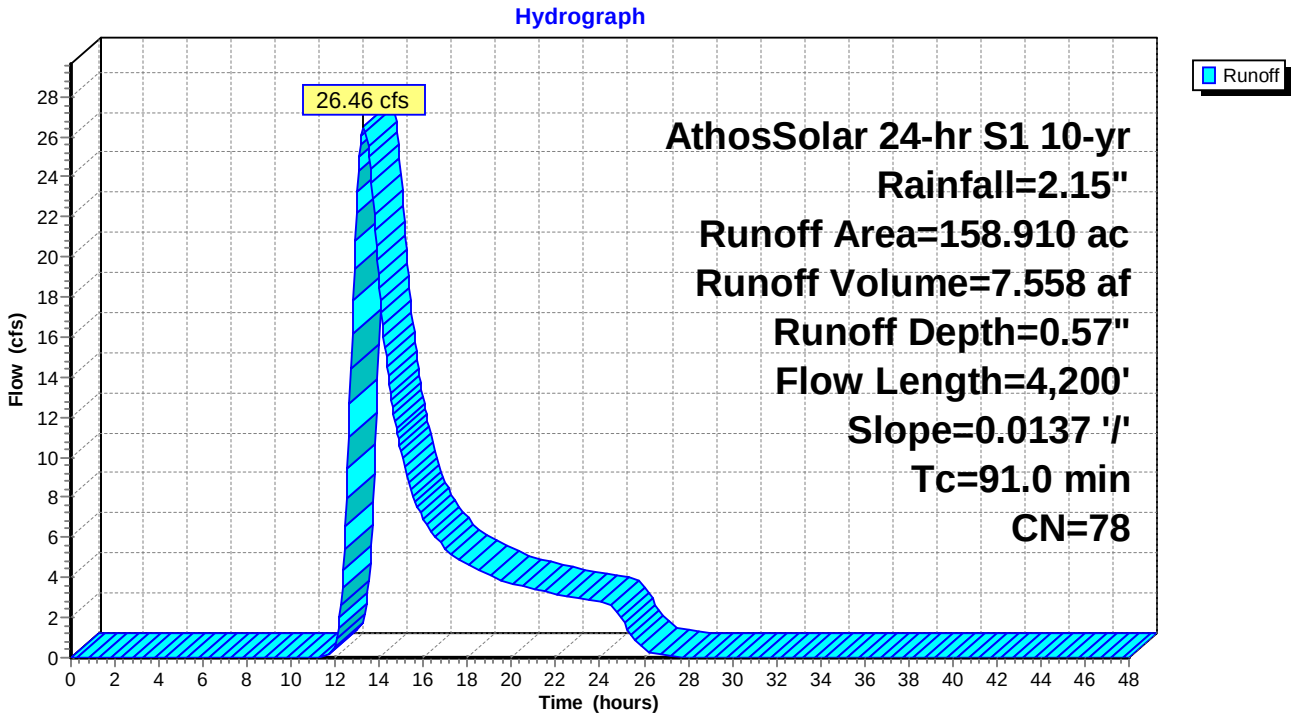
Runoff = 26.46 cfs @ 13.29 hrs, Volume= 7.558 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
150.960	77	Fallow, bare soil, HSG A
7.950	96	Gravel surface, HSG A
158.910	78	Weighted Average
158.910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
91.0	4,200	0.0137	0.77		**Lag/CN Method,**

Subcatchment 72S: DA-2



Summary for Subcatchment 73S: DA-3

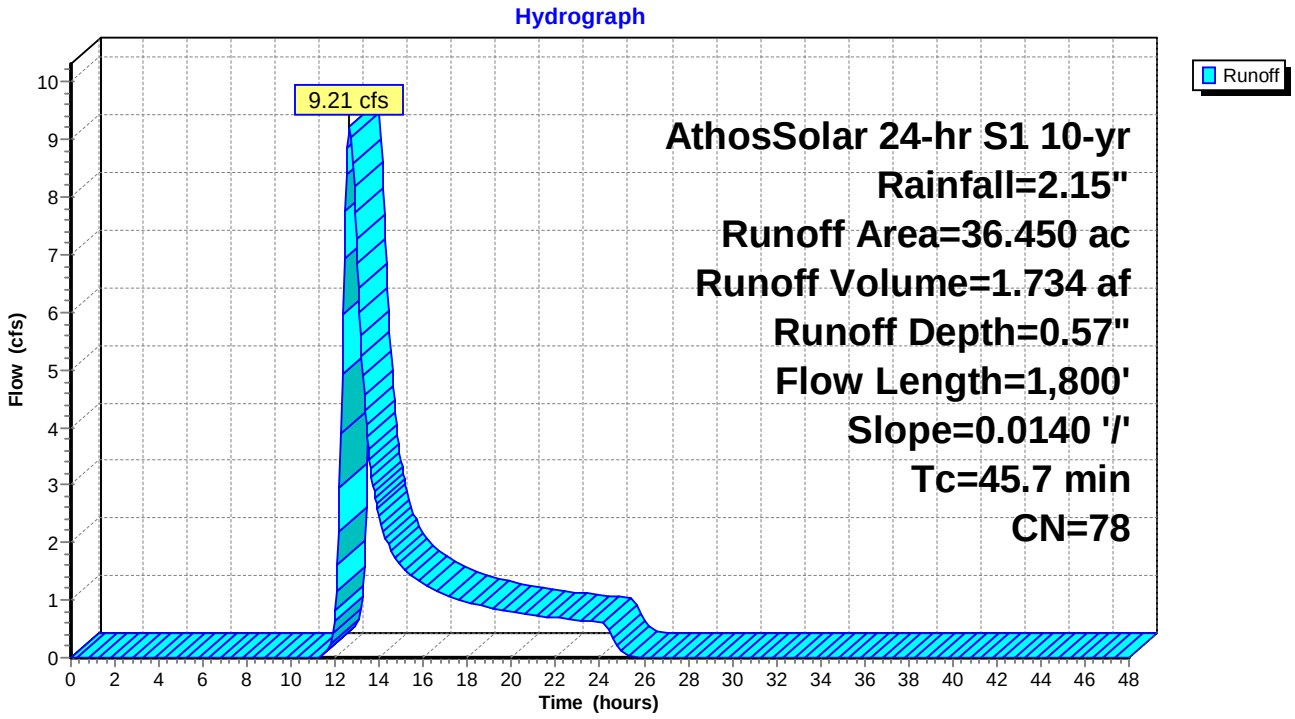
Runoff = 9.21 cfs @ 12.66 hrs, Volume= 1.734 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
34.630	77	Fallow, bare soil, HSG A
1.820	96	Gravel surface, HSG A
36.450	78	Weighted Average
36.450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.7	1,800	0.0140	0.66		**Lag/CN Method,**

Subcatchment 73S: DA-3



Summary for Subcatchment 74S: DA-4

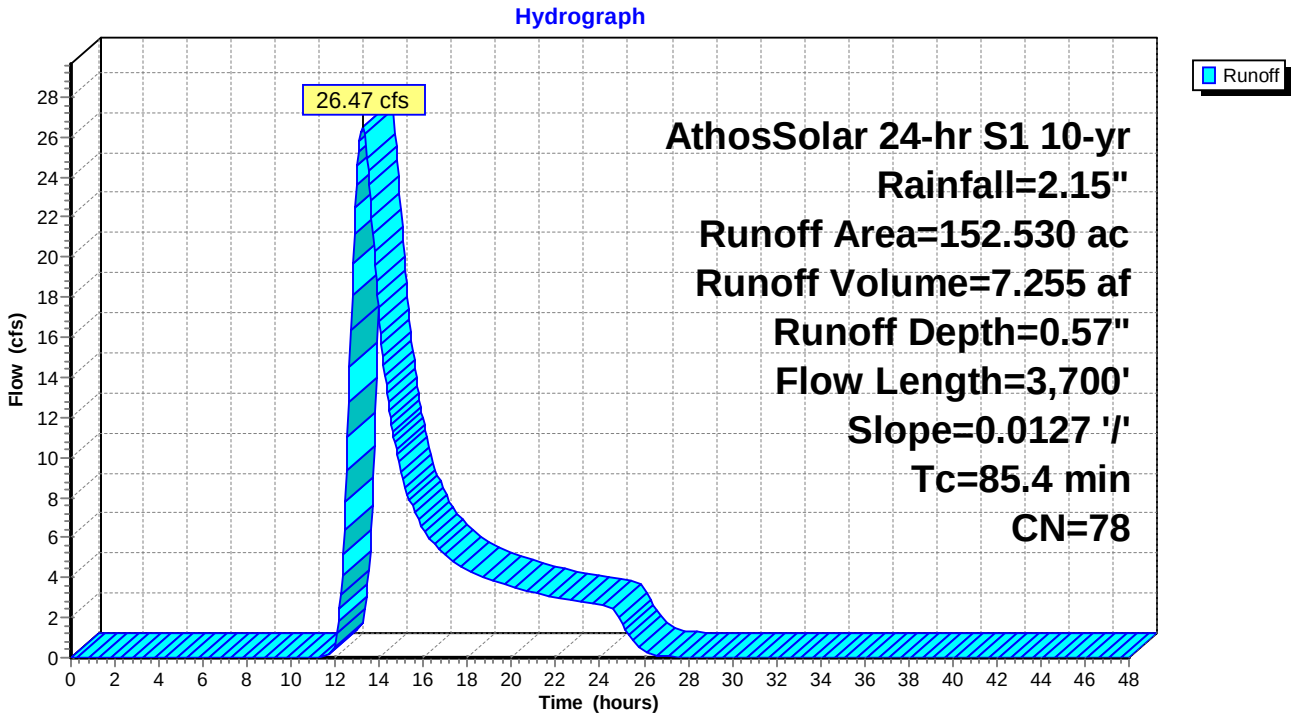
Runoff = 26.47 cfs @ 13.21 hrs, Volume= 7.255 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
AthosSolar 24-hr S1 10-yr Rainfall=2.15"

Area (ac)	CN	Description
144.900	77	Fallow, bare soil, HSG A
7.630	96	Gravel surface, HSG A
152.530	78	Weighted Average
152.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
85.4	3,700	0.0127	0.72		**Lag/CN Method,**

Subcatchment 74S: DA-4



Summary for Pond 22P: P-1 DA-1

Inflow Area = 129.980 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 17.71 cfs @ 13.74 hrs, Volume= 6.182 af
Outflow = 15.64 cfs @ 14.24 hrs, Volume= 5.132 af, Atten= 12%, Lag= 30.5 min
Primary = 15.64 cfs @ 14.24 hrs, Volume= 5.132 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.41' @ 14.24 hrs Surf.Area= 0.883 ac Storage= 1.398 af

Plug-Flow detention time= 147.1 min calculated for 5.127 af (83% of inflow)
Center-of-Mass det. time= 67.6 min (1,074.1 - 1,006.4)

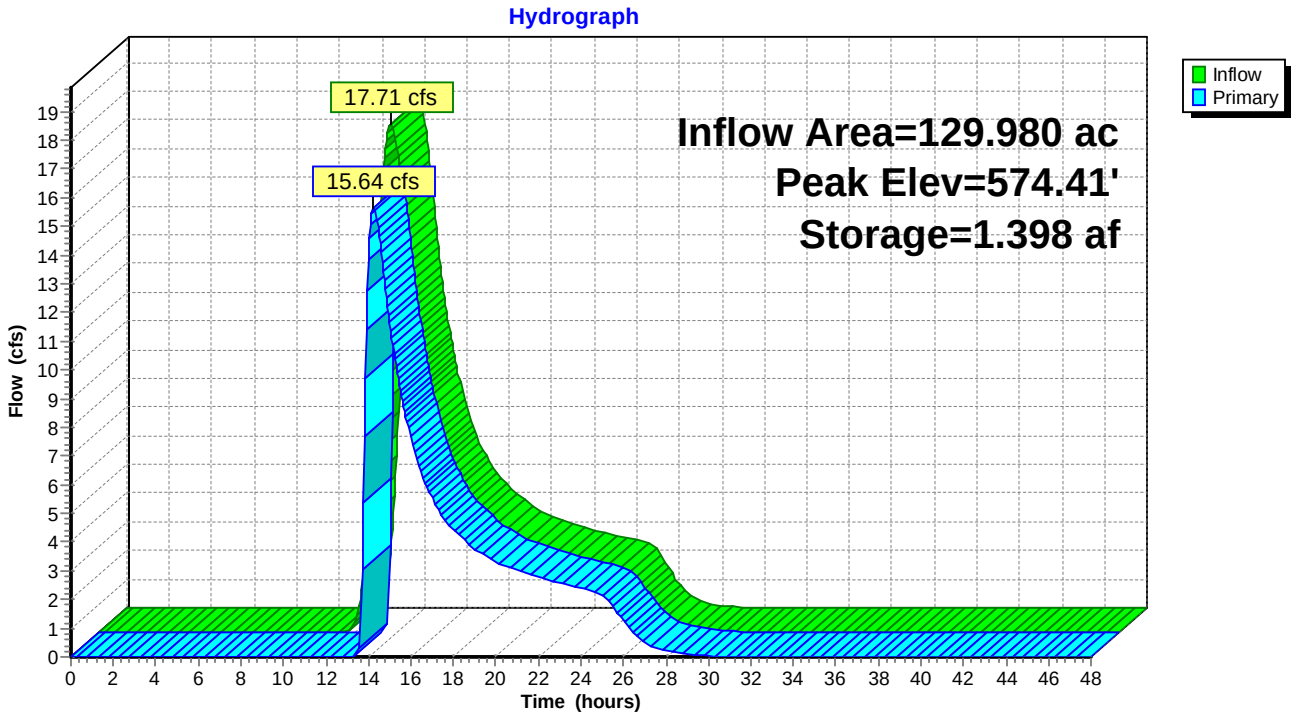
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	1.950 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.100	0.000	0.000
572.00	0.200	0.150	0.150
573.00	0.400	0.300	0.450
574.00	0.800	0.600	1.050
575.00	1.000	0.900	1.950

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=15.62 cfs @ 14.24 hrs HW=574.41' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 15.62 cfs @ 1.89 fps)

Pond 22P: P-1 DA-1



Summary for Pond 23P: P-1 DA-2

Inflow Area = 238.470 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 23.88 cfs @ 14.71 hrs, Volume= 11.343 af
Outflow = 20.67 cfs @ 15.54 hrs, Volume= 9.243 af, Atten= 13%, Lag= 49.7 min
Primary = 20.67 cfs @ 15.54 hrs, Volume= 9.243 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.49' @ 15.54 hrs Surf.Area= 1.797 ac Storage= 2.935 af

Plug-Flow detention time= 181.2 min calculated for 9.233 af (81% of inflow)
Center-of-Mass det. time= 94.2 min (1,162.2 - 1,068.0)

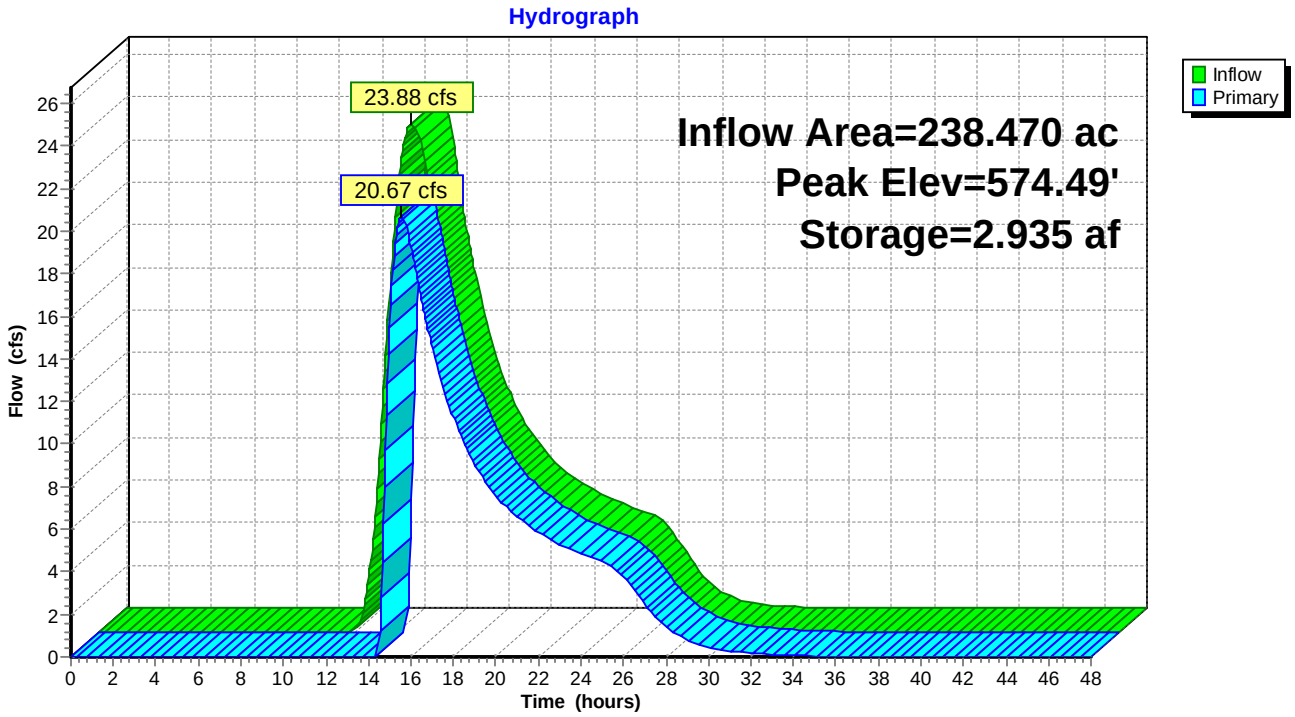
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	3.900 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.200	0.000	0.000
572.00	0.400	0.300	0.300
573.00	0.800	0.600	0.900
574.00	1.600	1.200	2.100
575.00	2.000	1.800	3.900

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=20.65 cfs @ 15.54 hrs HW=574.49' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 20.65 cfs @ 2.10 fps)

Pond 23P: P-1 DA-2



Summary for Pond 24P: P-1 DA-3

Inflow Area = 388.350 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 34.02 cfs @ 15.39 hrs, Volume= 18.472 af
Outflow = 30.16 cfs @ 16.30 hrs, Volume= 14.722 af, Atten= 11%, Lag= 54.3 min
Primary = 30.16 cfs @ 16.30 hrs, Volume= 14.722 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.62' @ 16.30 hrs Surf.Area= 2.155 ac Storage= 5.034 af

Plug-Flow detention time= 202.3 min calculated for 14.722 af (80% of inflow)
Center-of-Mass det. time= 105.9 min (1,213.9 - 1,107.9)

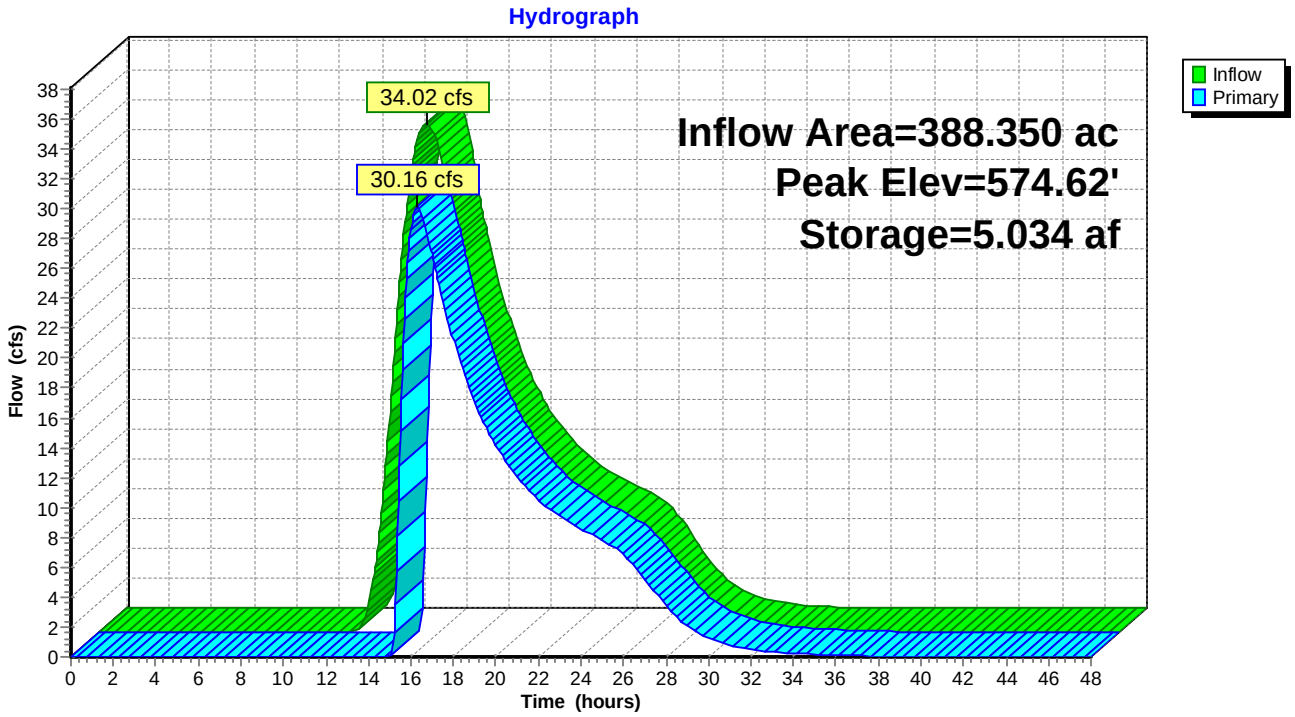
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	5.875 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	1.000	0.750	0.750
573.00	1.500	1.250	2.000
574.00	2.000	1.750	3.750
575.00	2.250	2.125	5.875

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=30.14 cfs @ 16.30 hrs HW=574.62' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 30.14 cfs @ 2.44 fps)

Pond 24P: P-1 DA-3



Summary for Pond 26P: P-1 DA-4

Inflow Area = 214.310 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 25.59 cfs @ 14.14 hrs, Volume= 10.194 af
Outflow = 22.21 cfs @ 14.78 hrs, Volume= 8.394 af, Atten= 13%, Lag= 38.3 min
Primary = 22.21 cfs @ 14.78 hrs, Volume= 8.394 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.51' @ 14.78 hrs Surf.Area= 1.514 ac Storage= 2.446 af

Plug-Flow detention time= 158.4 min calculated for 8.385 af (82% of inflow)
Center-of-Mass det. time= 75.9 min (1,106.9 - 1,031.0)

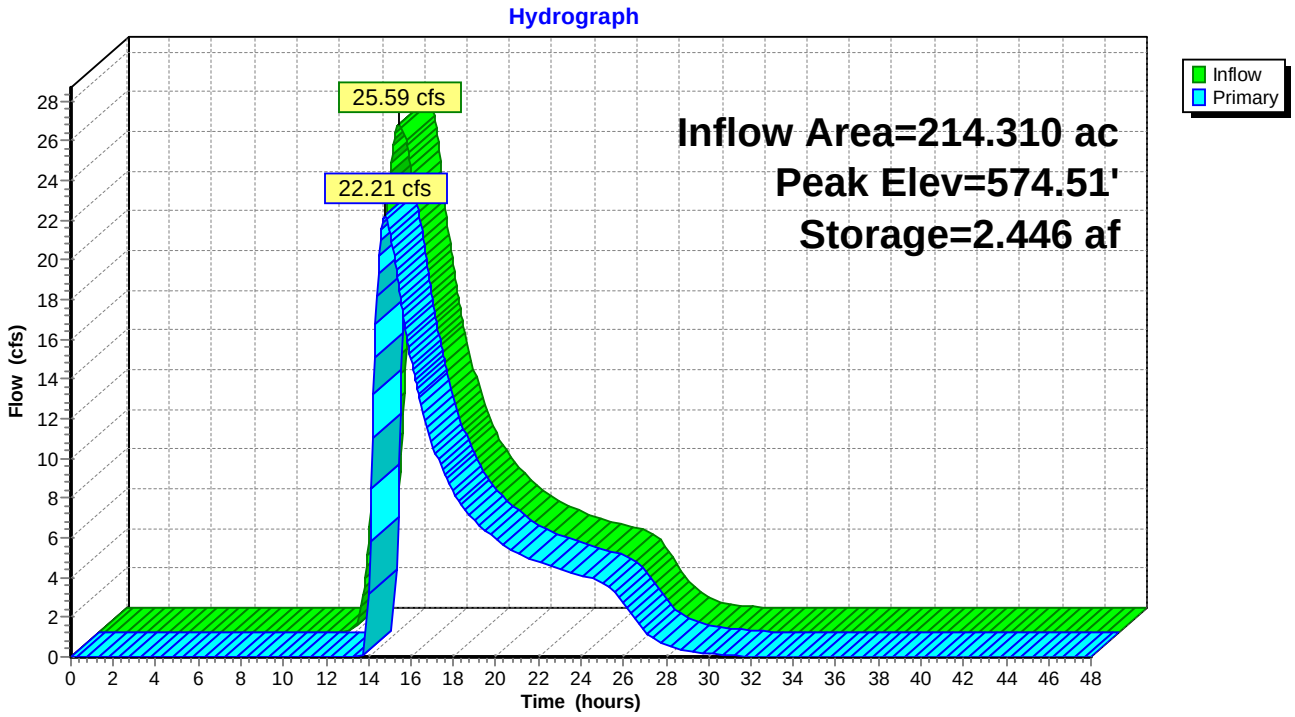
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	3.300 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.200	0.000	0.000
572.00	0.400	0.300	0.300
573.00	0.800	0.600	0.900
574.00	1.000	0.900	1.800
575.00	2.000	1.500	3.300

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=22.19 cfs @ 14.78 hrs HW=574.51' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 22.19 cfs @ 2.16 fps)

Pond 26P: P-1 DA-4



Summary for Pond 27P: P-2 DA-1

Inflow Area = 58.940 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 8.06 cfs @ 13.74 hrs, Volume= 2.803 af
Outflow = 0.82 cfs @ 25.15 hrs, Volume= 0.203 af, Atten= 90%, Lag= 684.5 min
Primary = 0.82 cfs @ 25.15 hrs, Volume= 0.203 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.06' @ 25.15 hrs Surf.Area= 1.206 ac Storage= 2.670 af

Plug-Flow detention time= 790.4 min calculated for 0.203 af (7% of inflow)
Center-of-Mass det. time= 554.9 min (1,560.4 - 1,005.5)

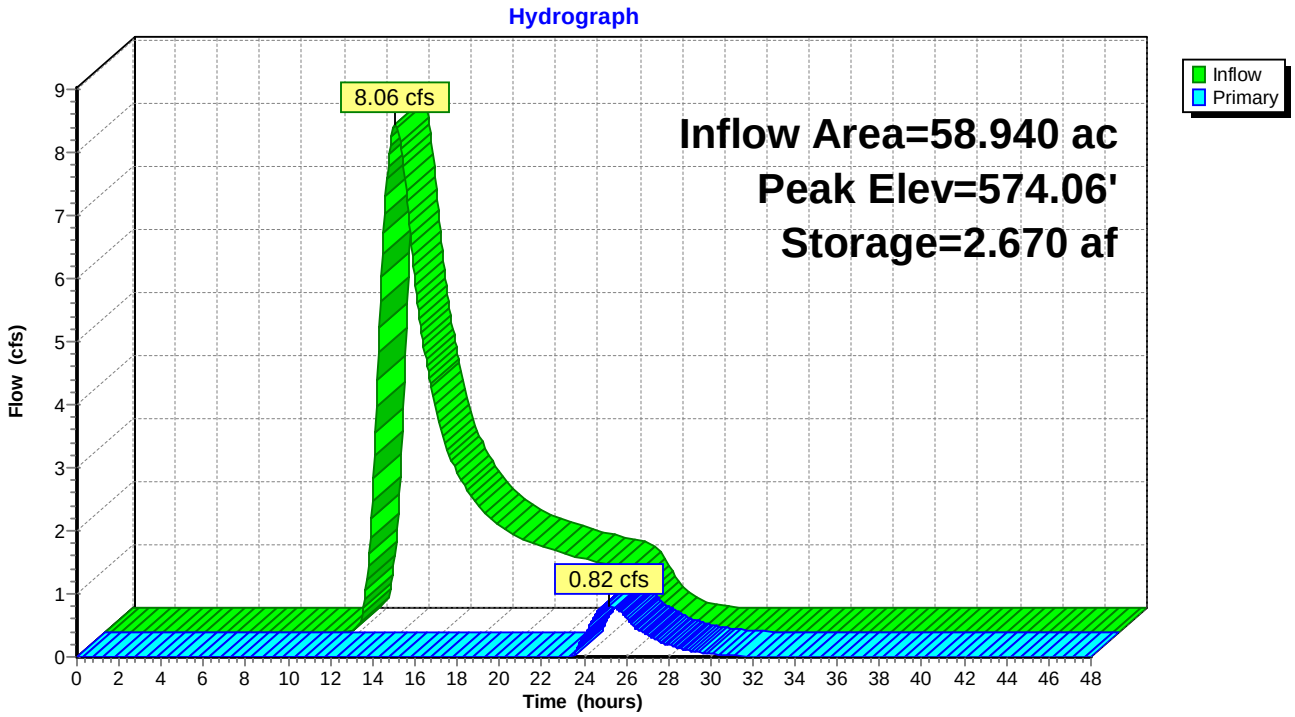
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	3.850 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	0.750	0.625	0.625
573.00	1.000	0.875	1.500
574.00	1.200	1.100	2.600
575.00	1.300	1.250	3.850

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.78 cfs @ 25.15 hrs HW=574.06' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.78 cfs @ 0.67 fps)

Pond 27P: P-2 DA-1



Summary for Pond 28P: P-2 DA-2

Inflow Area = 108.100 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 13.38 cfs @ 14.01 hrs, Volume= 5.142 af
Outflow = 1.49 cfs @ 25.35 hrs, Volume= 0.517 af, Atten= 89%, Lag= 680.5 min
Primary = 1.49 cfs @ 25.35 hrs, Volume= 0.517 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.09' @ 25.35 hrs Surf.Area= 2.316 ac Storage= 4.827 af

Plug-Flow detention time= 810.9 min calculated for 0.516 af (10% of inflow)
Center-of-Mass det. time= 574.7 min (1,597.7 - 1,023.0)

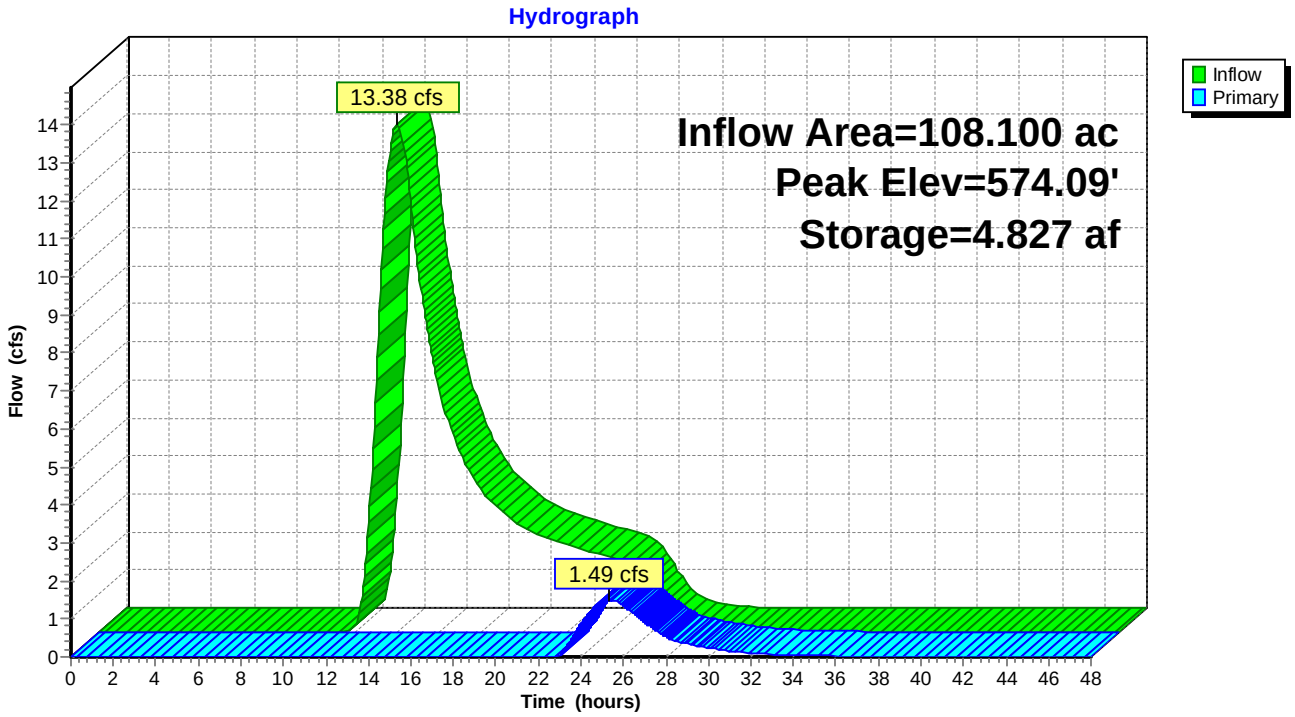
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	7.250 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	1.250	0.875	0.875
573.00	2.000	1.625	2.500
574.00	2.250	2.125	4.625
575.00	3.000	2.625	7.250

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.48 cfs @ 25.35 hrs HW=574.09' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 1.48 cfs @ 0.83 fps)

Pond 28P: P-2 DA-2



Summary for Pond 29P: P-3 DA-1

Inflow Area = 162.080 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 26.07 cfs @ 13.38 hrs, Volume= 7.709 af
Outflow = 22.26 cfs @ 13.79 hrs, Volume= 6.634 af, Atten= 15%, Lag= 24.3 min
Primary = 22.26 cfs @ 13.79 hrs, Volume= 6.634 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.51' @ 13.79 hrs Surf.Area= 1.401 ac Storage= 1.564 af

Plug-Flow detention time= 120.6 min calculated for 6.634 af (86% of inflow)
Center-of-Mass det. time= 52.9 min (1,033.9 - 981.0)

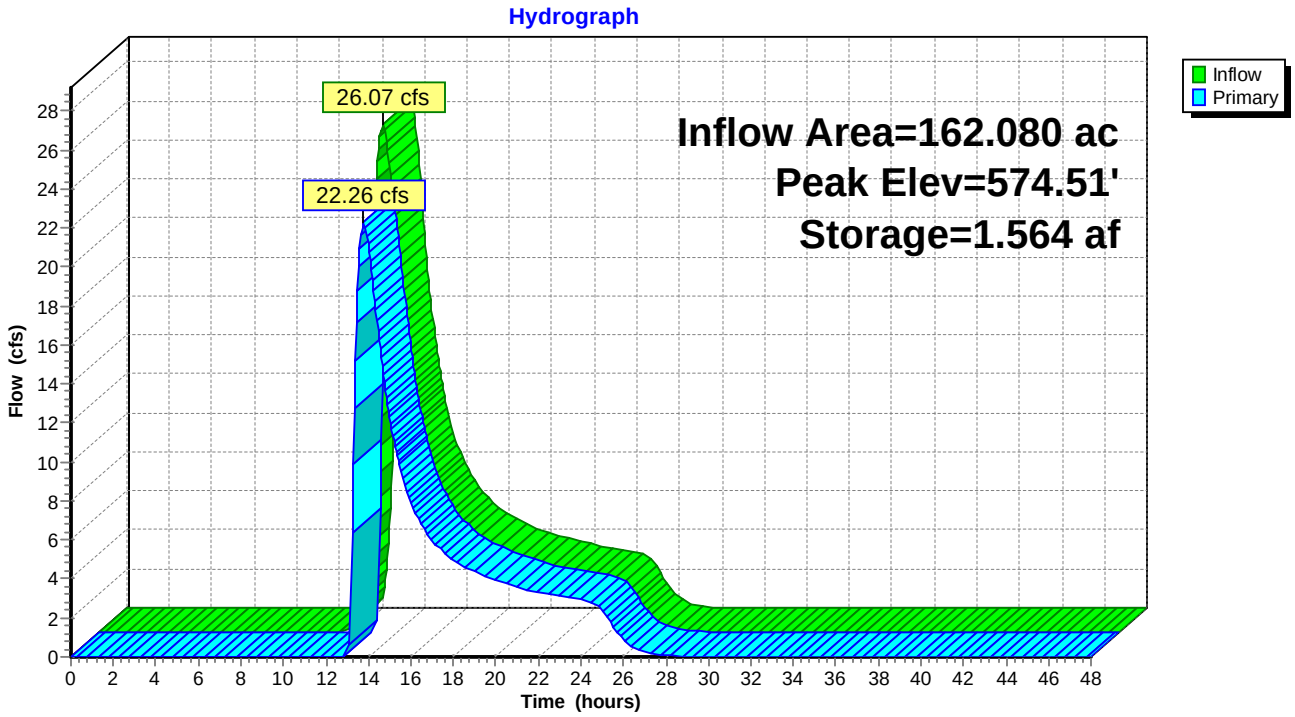
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	2.450 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.250	0.000	0.000
572.00	0.300	0.275	0.275
573.00	0.400	0.350	0.625
574.00	0.500	0.450	1.075
575.00	2.250	1.375	2.450

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=22.23 cfs @ 13.79 hrs HW=574.51' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 22.23 cfs @ 2.16 fps)

Pond 29P: P-3 DA-1



Summary for Pond 30P: P-3 DA-2

Inflow Area = 324.340 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 37.07 cfs @ 14.28 hrs, Volume= 15.427 af
Outflow = 32.51 cfs @ 14.87 hrs, Volume= 12.802 af, Atten= 12%, Lag= 35.0 min
Primary = 32.51 cfs @ 14.87 hrs, Volume= 12.802 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.65' @ 14.87 hrs Surf.Area= 1.896 ac Storage= 3.641 af

Plug-Flow detention time= 157.5 min calculated for 12.789 af (83% of inflow)
Center-of-Mass det. time= 77.2 min (1,114.1 - 1,036.9)

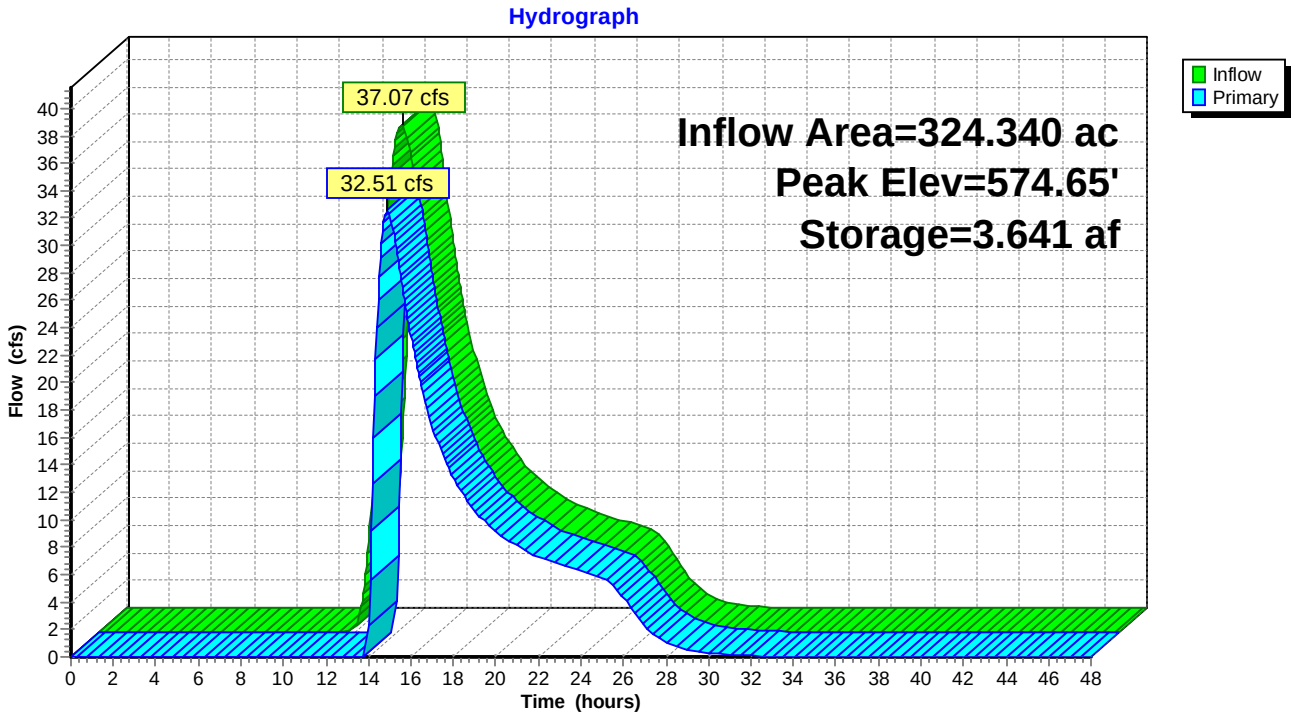
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	4.375 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	0.750	0.625	0.625
573.00	1.000	0.875	1.500
574.00	1.250	1.125	2.625
575.00	2.250	1.750	4.375

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=32.49 cfs @ 14.87 hrs HW=574.65' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 32.49 cfs @ 2.52 fps)

Pond 30P: P-3 DA-2



Summary for Pond 31P: P-3 DA-3

Inflow Area = 322.450 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 31.99 cfs @ 14.76 hrs, Volume= 15.337 af
Outflow = 28.39 cfs @ 15.54 hrs, Volume= 12.587 af, Atten= 11%, Lag= 46.9 min
Primary = 28.39 cfs @ 15.54 hrs, Volume= 12.587 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.60' @ 15.54 hrs Surf.Area= 1.948 ac Storage= 3.779 af

Plug-Flow detention time= 172.7 min calculated for 12.574 af (82% of inflow)
Center-of-Mass det. time= 87.9 min (1,159.3 - 1,071.4)

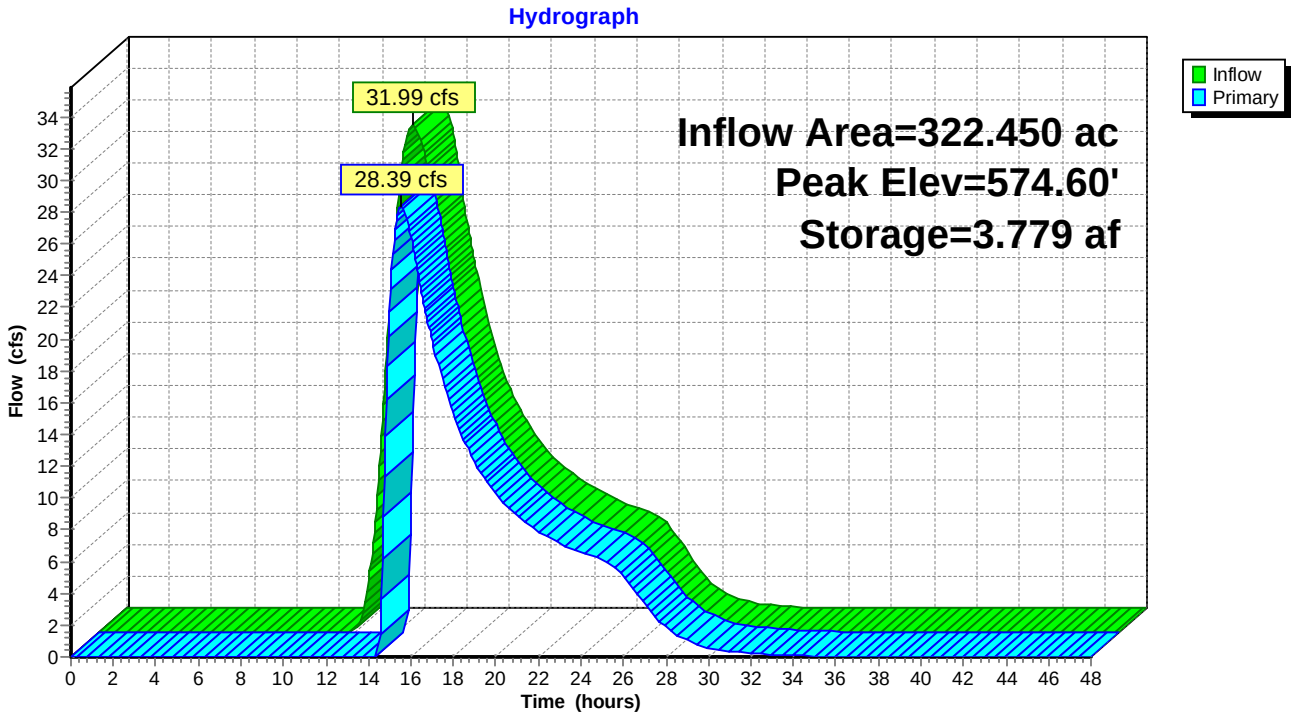
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	4.625 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	0.750	0.625	0.625
573.00	1.000	0.875	1.500
574.00	1.500	1.250	2.750
575.00	2.250	1.875	4.625

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=28.38 cfs @ 15.54 hrs HW=574.60' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 28.38 cfs @ 2.38 fps)

Pond 31P: P-3 DA-3



Summary for Pond 32P: P-4 DA-1

Inflow Area = 52.610 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 11.76 cfs @ 12.81 hrs, Volume= 2.502 af
Outflow = 1.02 cfs @ 21.94 hrs, Volume= 0.452 af, Atten= 91%, Lag= 547.4 min
Primary = 1.02 cfs @ 21.94 hrs, Volume= 0.452 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.07' @ 21.94 hrs Surf.Area= 1.160 ac Storage= 2.128 af

Plug-Flow detention time= 631.0 min calculated for 0.452 af (18% of inflow)
Center-of-Mass det. time= 437.1 min (1,382.7 - 945.6)

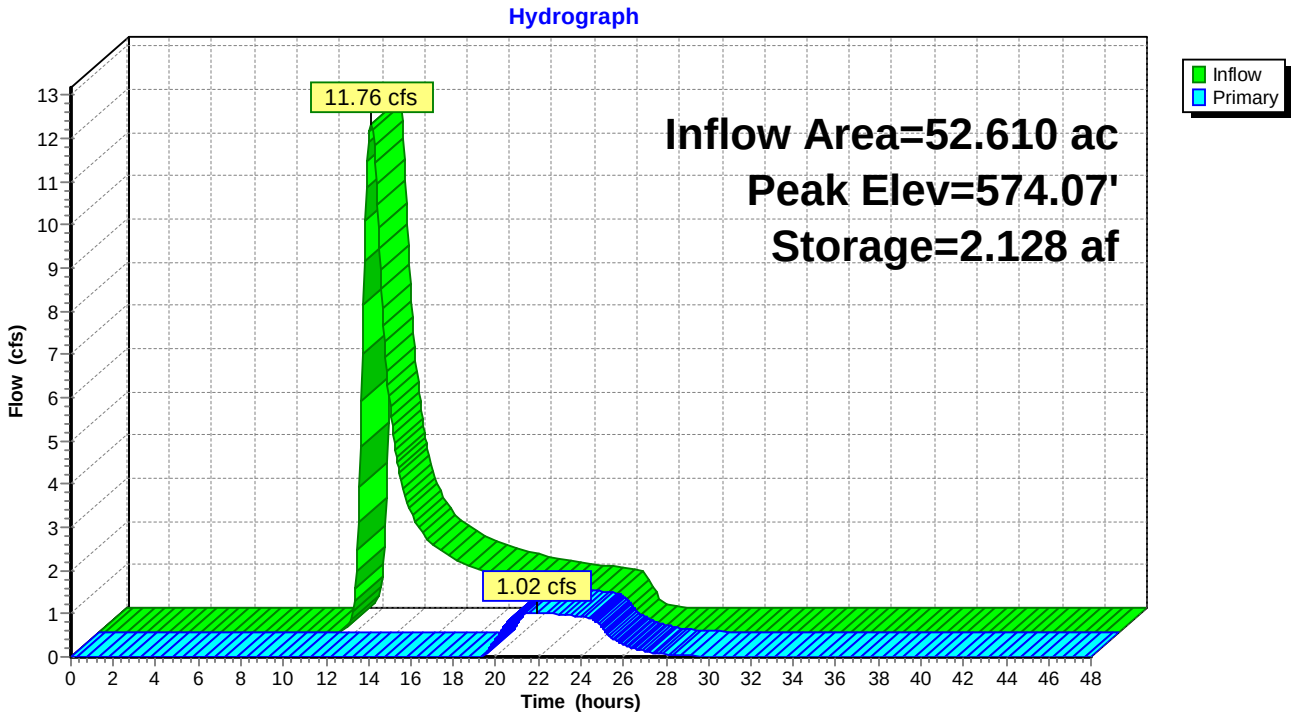
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	3.275 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.250	0.000	0.000
572.00	0.500	0.375	0.375
573.00	0.850	0.675	1.050
574.00	1.150	1.000	2.050
575.00	1.300	1.225	3.275

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.99 cfs @ 21.94 hrs HW=574.07' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.99 cfs @ 0.73 fps)

Pond 32P: P-4 DA-1



Summary for Pond 33P: P-4 DA-2

Inflow Area = 58.000 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 13.14 cfs @ 12.81 hrs, Volume= 2.759 af
Outflow = 1.10 cfs @ 22.20 hrs, Volume= 0.534 af, Atten= 92%, Lag= 563.6 min
Primary = 1.10 cfs @ 22.20 hrs, Volume= 0.534 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.07' @ 22.20 hrs Surf.Area= 1.608 ac Storage= 2.337 af

Plug-Flow detention time= 636.9 min calculated for 0.533 af (19% of inflow)
Center-of-Mass det. time= 445.9 min (1,390.7 - 944.8)

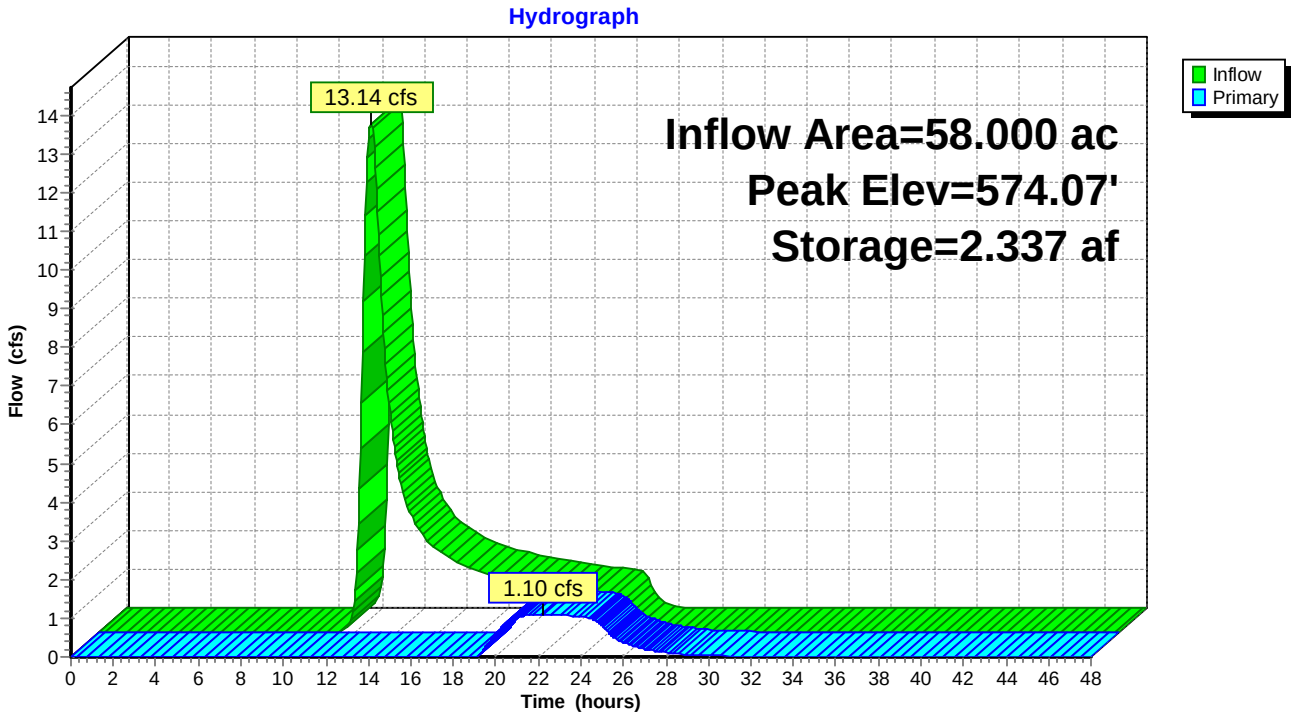
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	4.475 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.250	0.000	0.000
572.00	0.500	0.375	0.375
573.00	0.850	0.675	1.050
574.00	1.500	1.175	2.225
575.00	3.000	2.250	4.475

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.08 cfs @ 22.20 hrs HW=574.07' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 1.08 cfs @ 0.75 fps)

Pond 33P: P-4 DA-2



Summary for Pond 34P: P-5 DA-1

Inflow Area = 105.010 ac, 0.00% Impervious, Inflow Depth = 1.30" for 10-yr event
Inflow = 78.52 cfs @ 12.44 hrs, Volume= 11.339 af
Outflow = 46.83 cfs @ 12.83 hrs, Volume= 8.589 af, Atten= 40%, Lag= 23.4 min
Primary = 46.83 cfs @ 12.83 hrs, Volume= 8.589 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.80' @ 12.83 hrs Surf.Area= 2.296 ac Storage= 4.261 af

Plug-Flow detention time= 191.0 min calculated for 8.580 af (76% of inflow)
Center-of-Mass det. time= 92.4 min (951.8 - 859.4)

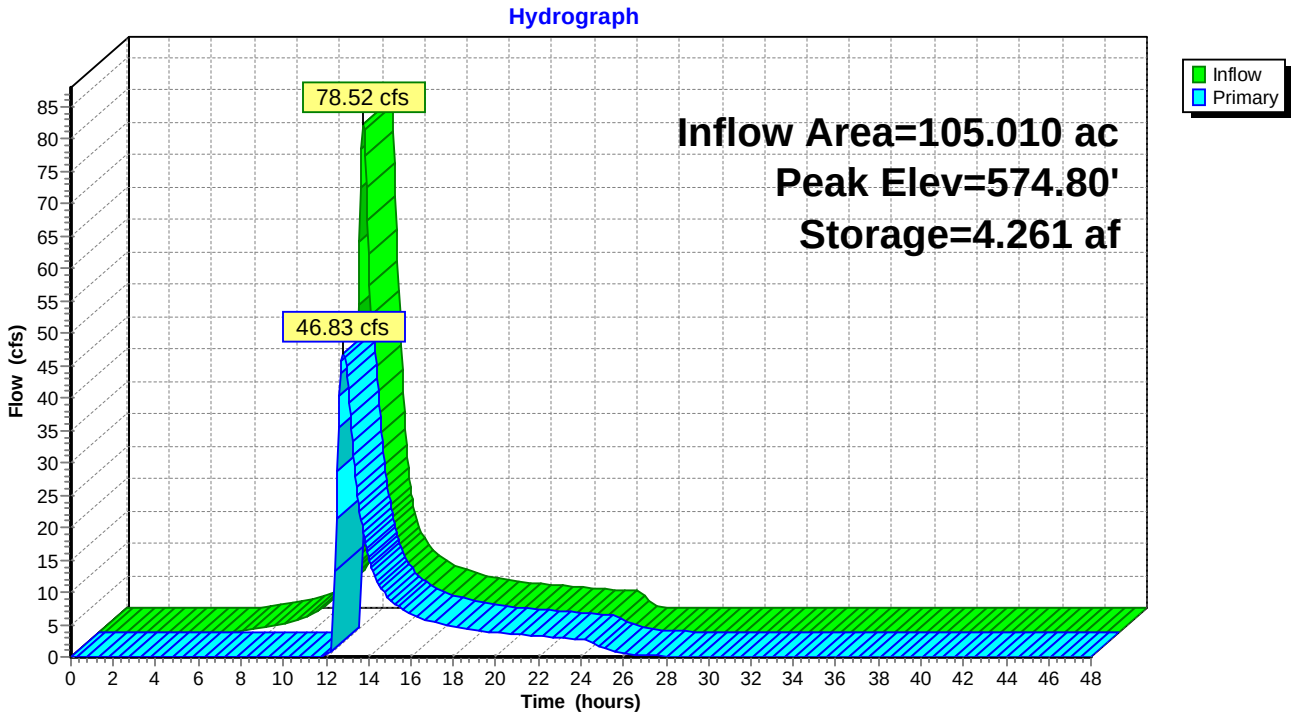
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	4.750 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	0.750	0.625	0.625
573.00	1.000	0.875	1.500
574.00	1.500	1.250	2.750
575.00	2.500	2.000	4.750

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=46.73 cfs @ 12.83 hrs HW=574.80' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 46.73 cfs @ 2.94 fps)

Pond 34P: P-5 DA-1



Summary for Pond 35P: P-5 DA-2

Inflow Area = 143.020 ac, 0.00% Impervious, Inflow Depth = 1.30" for 10-yr event
Inflow = 106.23 cfs @ 12.44 hrs, Volume= 15.443 af
Outflow = 61.71 cfs @ 12.85 hrs, Volume= 11.693 af, Atten= 42%, Lag= 24.5 min
Primary = 61.71 cfs @ 12.85 hrs, Volume= 11.693 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.95' @ 12.85 hrs Surf.Area= 2.477 ac Storage= 5.883 af

Plug-Flow detention time= 197.6 min calculated for 11.693 af (76% of inflow)
Center-of-Mass det. time= 97.8 min (957.5 - 859.7)

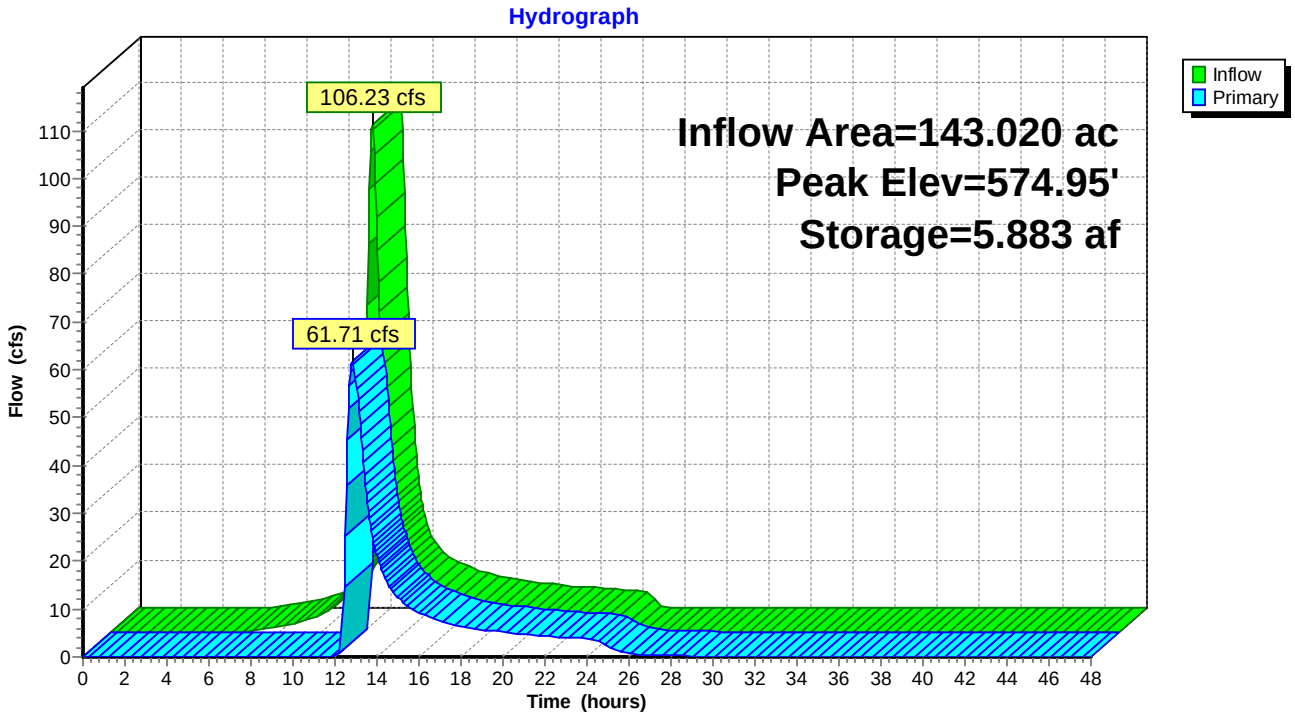
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	6.000 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.500	0.000	0.000
572.00	1.000	0.750	0.750
573.00	1.500	1.250	2.000
574.00	2.000	1.750	3.750
575.00	2.500	2.250	6.000

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=61.70 cfs @ 12.85 hrs HW=574.95' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 61.70 cfs @ 3.24 fps)

Pond 35P: P-5 DA-2



Summary for Pond 36P: P-5 DA-3

Inflow Area = 33.010 ac, 0.00% Impervious, Inflow Depth = 1.30" for 10-yr event
Inflow = 31.46 cfs @ 12.26 hrs, Volume= 3.564 af
Outflow = 17.90 cfs @ 12.55 hrs, Volume= 2.714 af, Atten= 43%, Lag= 17.4 min
Primary = 17.90 cfs @ 12.55 hrs, Volume= 2.714 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.45' @ 12.55 hrs Surf.Area= 1.401 ac Storage= 1.278 af

Plug-Flow detention time= 173.1 min calculated for 2.712 af (76% of inflow)
Center-of-Mass det. time= 75.3 min (922.4 - 847.0)

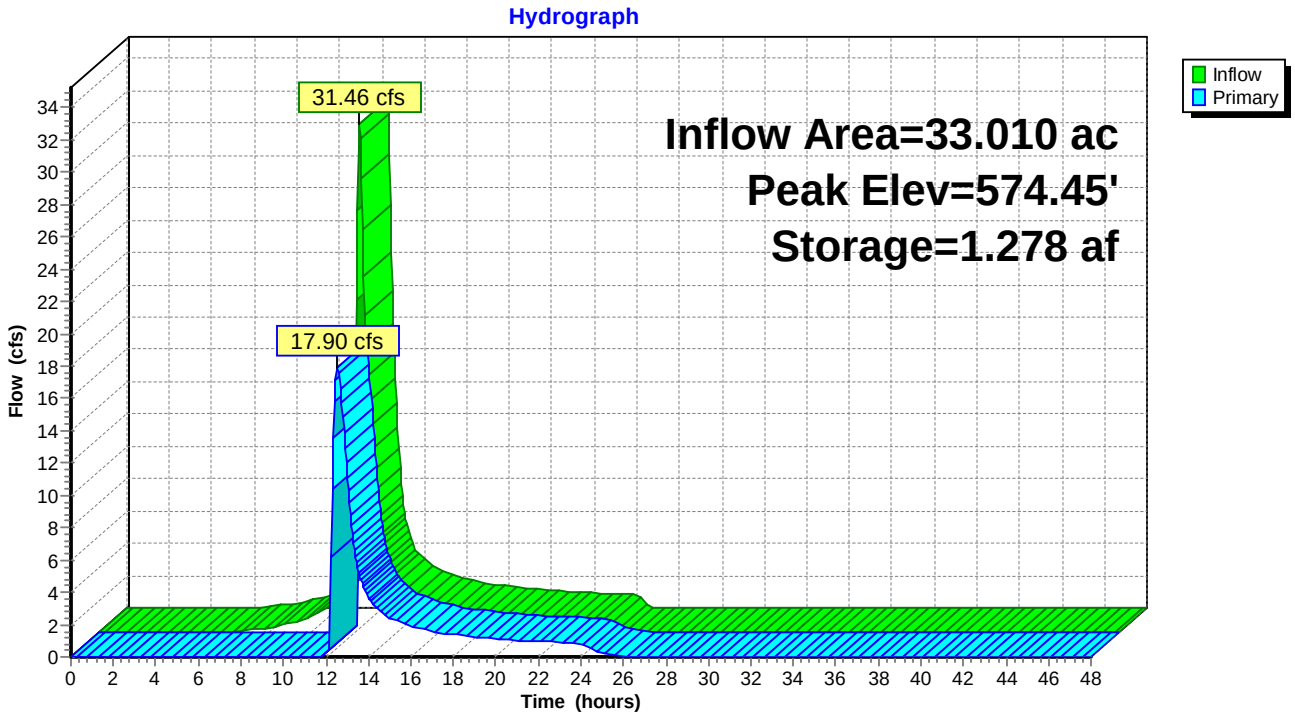
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	2.350 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.100	0.000	0.000
572.00	0.250	0.175	0.175
573.00	0.300	0.275	0.450
574.00	0.500	0.400	0.850
575.00	2.500	1.500	2.350

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=17.87 cfs @ 12.55 hrs HW=574.45' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 17.87 cfs @ 1.99 fps)

Pond 36P: P-5 DA-3



Summary for Pond 37P: P-6 DA-1

Inflow Area = 16.110 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 5.79 cfs @ 12.30 hrs, Volume= 0.766 af
Outflow = 5.09 cfs @ 12.42 hrs, Volume= 0.686 af, Atten= 12%, Lag= 7.3 min
Primary = 5.09 cfs @ 12.42 hrs, Volume= 0.686 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.20' @ 12.42 hrs Surf.Area= 0.242 ac Storage= 0.110 af

Plug-Flow detention time= 78.2 min calculated for 0.686 af (90% of inflow)
Center-of-Mass det. time= 26.4 min (940.8 - 914.4)

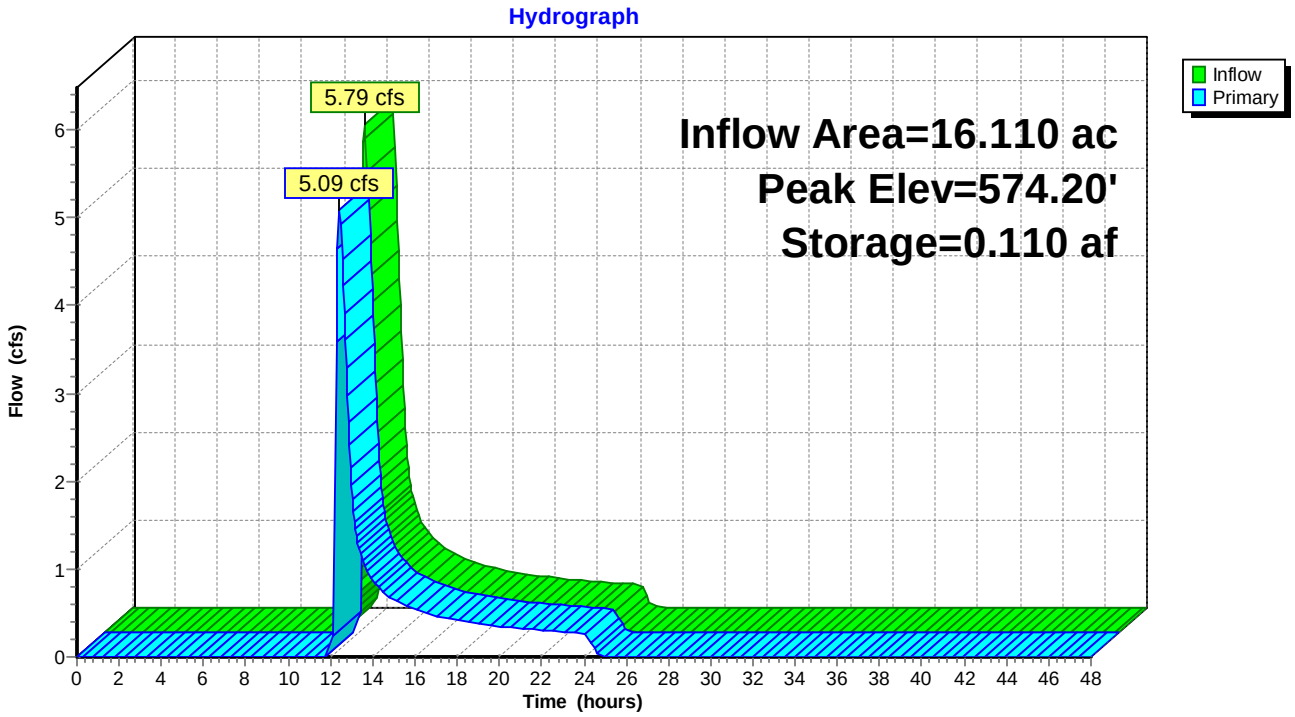
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	0.605 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.010	0.000	0.000
572.00	0.020	0.015	0.015
573.00	0.030	0.025	0.040
574.00	0.050	0.040	0.080
575.00	1.000	0.525	0.605

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.04 cfs @ 12.42 hrs HW=574.20' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 5.04 cfs @ 1.25 fps)

Pond 37P: P-6 DA-1



Summary for Pond 38P: P-6 DA-2

Inflow Area = 8.230 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 4.35 cfs @ 12.10 hrs, Volume= 0.391 af
Outflow = 3.79 cfs @ 12.16 hrs, Volume= 0.374 af, Atten= 13%, Lag= 3.7 min
Primary = 3.79 cfs @ 12.16 hrs, Volume= 0.374 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.17' @ 12.16 hrs Surf.Area= 0.183 ac Storage= 0.034 af

Plug-Flow detention time= 35.4 min calculated for 0.374 af (96% of inflow)
Center-of-Mass det. time= 11.9 min (913.9 - 901.9)

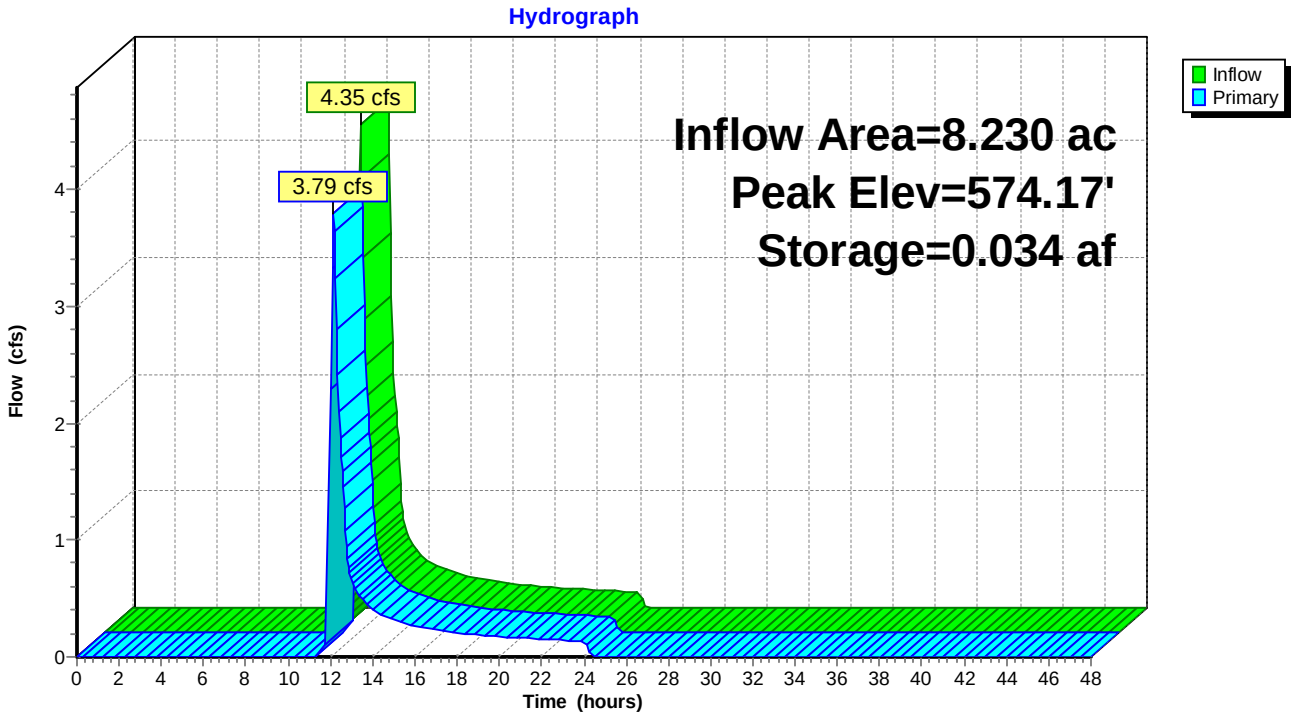
Volume	Invert	Avail.Storage	Storage Description
#1	573.00'	0.527 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
573.00	0.015	0.000	0.000
574.00	0.020	0.017	0.017
575.00	1.000	0.510	0.527

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.73 cfs @ 12.16 hrs HW=574.16' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 3.73 cfs @ 1.14 fps)

Pond 38P: P-6 DA-2



Summary for Pond 39P: P-7 DA-1

Inflow Area = 15.580 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 4.87 cfs @ 12.42 hrs, Volume= 0.741 af
Outflow = 4.28 cfs @ 12.58 hrs, Volume= 0.646 af, Atten= 12%, Lag= 9.3 min
Primary = 4.28 cfs @ 12.58 hrs, Volume= 0.646 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.18' @ 12.58 hrs Surf.Area= 0.229 ac Storage= 0.121 af

Plug-Flow detention time= 94.6 min calculated for 0.645 af (87% of inflow)
Center-of-Mass det. time= 32.7 min (954.2 - 921.4)

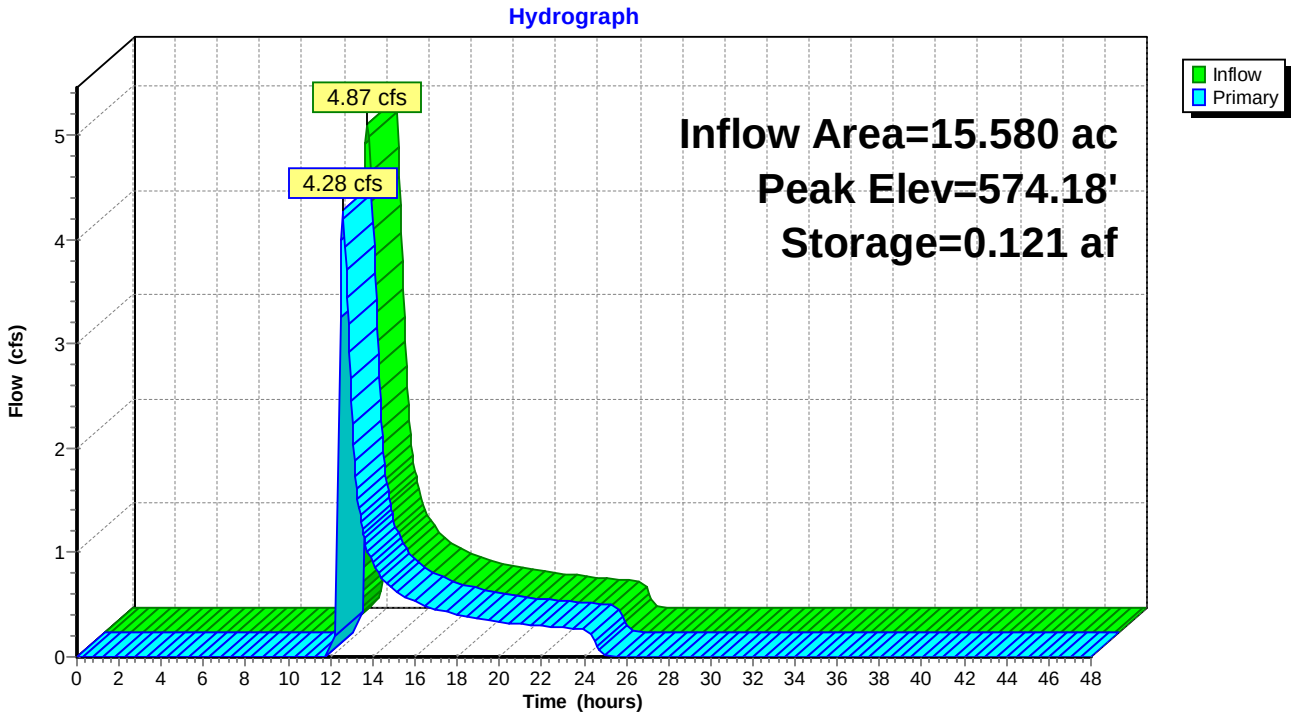
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	0.625 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.010	0.000	0.000
572.00	0.020	0.015	0.015
573.00	0.040	0.030	0.045
574.00	0.060	0.050	0.095
575.00	1.000	0.530	0.625

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.25 cfs @ 12.58 hrs HW=574.18' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 4.25 cfs @ 1.19 fps)

Pond 39P: P-7 DA-1



Summary for Pond 40P: P-7 DA-2

Inflow Area = 105.970 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 18.24 cfs @ 13.24 hrs, Volume= 5.040 af
Outflow = 16.03 cfs @ 13.58 hrs, Volume= 4.240 af, Atten= 12%, Lag= 20.7 min
Primary = 16.03 cfs @ 13.58 hrs, Volume= 4.240 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.42' @ 13.58 hrs Surf.Area= 0.710 ac Storage= 1.054 af

Plug-Flow detention time= 130.4 min calculated for 4.240 af (84% of inflow)
Center-of-Mass det. time= 55.0 min (1,027.9 - 972.9)

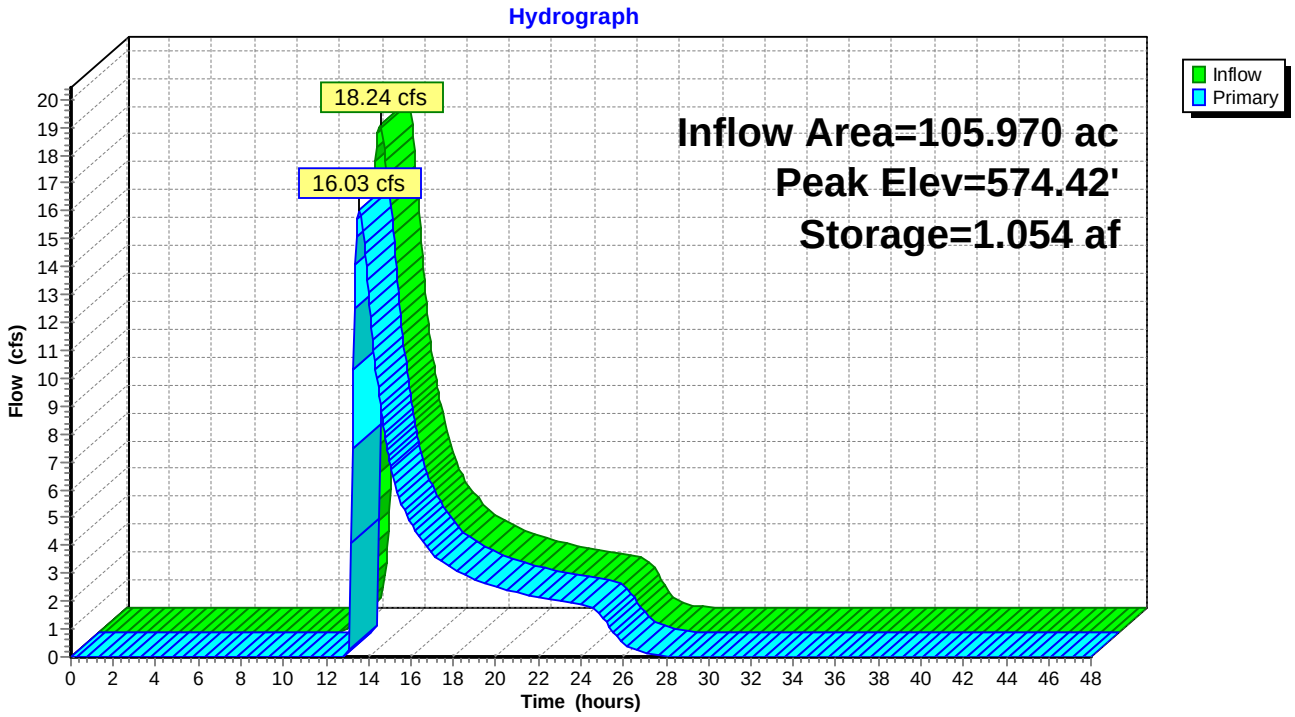
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	1.550 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.100	0.000	0.000
572.00	0.200	0.150	0.150
573.00	0.300	0.250	0.400
574.00	0.500	0.400	0.800
575.00	1.000	0.750	1.550

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=15.99 cfs @ 13.58 hrs HW=574.42' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 15.99 cfs @ 1.90 fps)

Pond 40P: P-7 DA-2



Summary for Pond 41P: P-7 DA-3

Inflow Area = 108.630 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 21.08 cfs @ 13.02 hrs, Volume= 5.167 af
Outflow = 18.73 cfs @ 13.31 hrs, Volume= 4.417 af, Atten= 11%, Lag= 17.5 min
Primary = 18.73 cfs @ 13.31 hrs, Volume= 4.417 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.46' @ 13.31 hrs Surf.Area= 0.678 ac Storage= 0.999 af

Plug-Flow detention time= 116.7 min calculated for 4.412 af (85% of inflow)
Center-of-Mass det. time= 47.7 min (1,007.2 - 959.5)

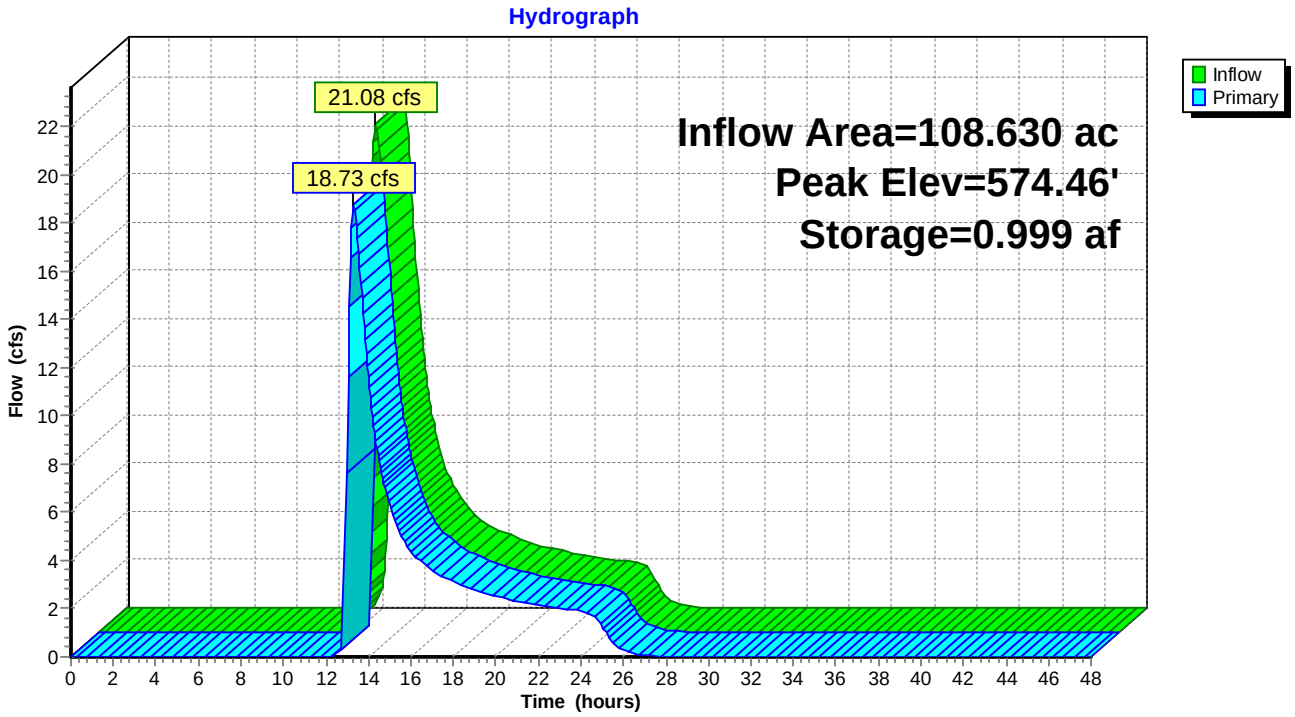
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	1.450 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.100	0.000	0.000
572.00	0.200	0.150	0.150
573.00	0.300	0.250	0.400
574.00	0.400	0.350	0.750
575.00	1.000	0.700	1.450

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=18.68 cfs @ 13.31 hrs HW=574.46' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 18.68 cfs @ 2.02 fps)

Pond 41P: P-7 DA-3



Summary for Pond 42P: P-7 DA-4

Inflow Area = 24.100 ac, 0.00% Impervious, Inflow Depth = 1.30" for 10-yr event
Inflow = 17.52 cfs @ 12.46 hrs, Volume= 2.602 af
Outflow = 16.85 cfs @ 12.55 hrs, Volume= 2.562 af, Atten= 4%, Lag= 5.4 min
Primary = 16.85 cfs @ 12.55 hrs, Volume= 2.562 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.43' @ 12.55 hrs Surf.Area= 0.451 ac Storage= 0.144 af

Plug-Flow detention time= 18.6 min calculated for 2.562 af (98% of inflow)
Center-of-Mass det. time= 9.4 min (870.4 - 861.0)

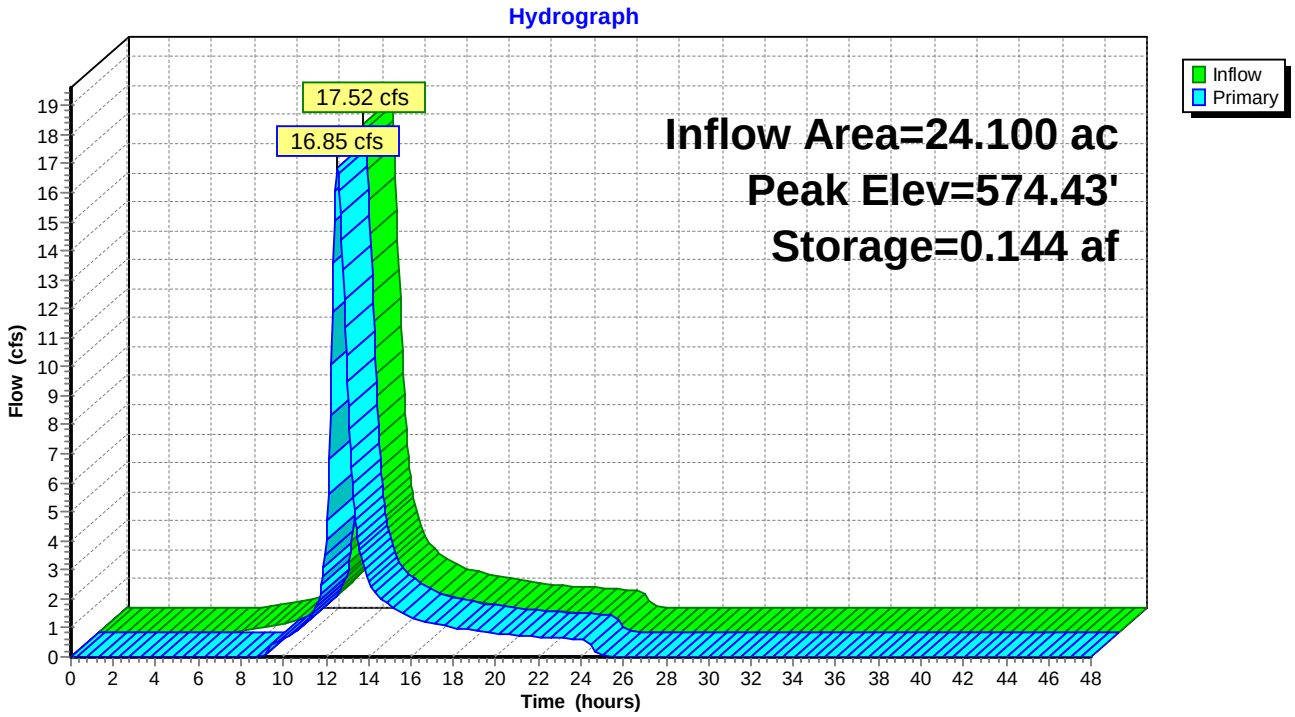
Volume	Invert	Avail.Storage	Storage Description
#1	572.00'	0.555 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
572.00	0.010	0.000	0.000
573.00	0.020	0.015	0.015
574.00	0.030	0.025	0.040
575.00	1.000	0.515	0.555

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=16.83 cfs @ 12.55 hrs HW=574.43' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 16.83 cfs @ 1.94 fps)

Pond 42P: P-7 DA-4



Summary for Pond 43P: P-8 DA-1

Inflow Area = 39.990 ac, 0.00% Impervious, Inflow Depth = 1.30" for 10-yr event
Inflow = 38.63 cfs @ 12.25 hrs, Volume= 4.318 af
Outflow = 35.03 cfs @ 12.33 hrs, Volume= 4.243 af, Atten= 9%, Lag= 5.2 min
Primary = 35.03 cfs @ 12.33 hrs, Volume= 4.243 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.67' @ 12.33 hrs Surf.Area= 0.687 ac Storage= 0.320 af

Plug-Flow detention time= 20.8 min calculated for 4.239 af (98% of inflow)
Center-of-Mass det. time= 10.5 min (857.0 - 846.5)

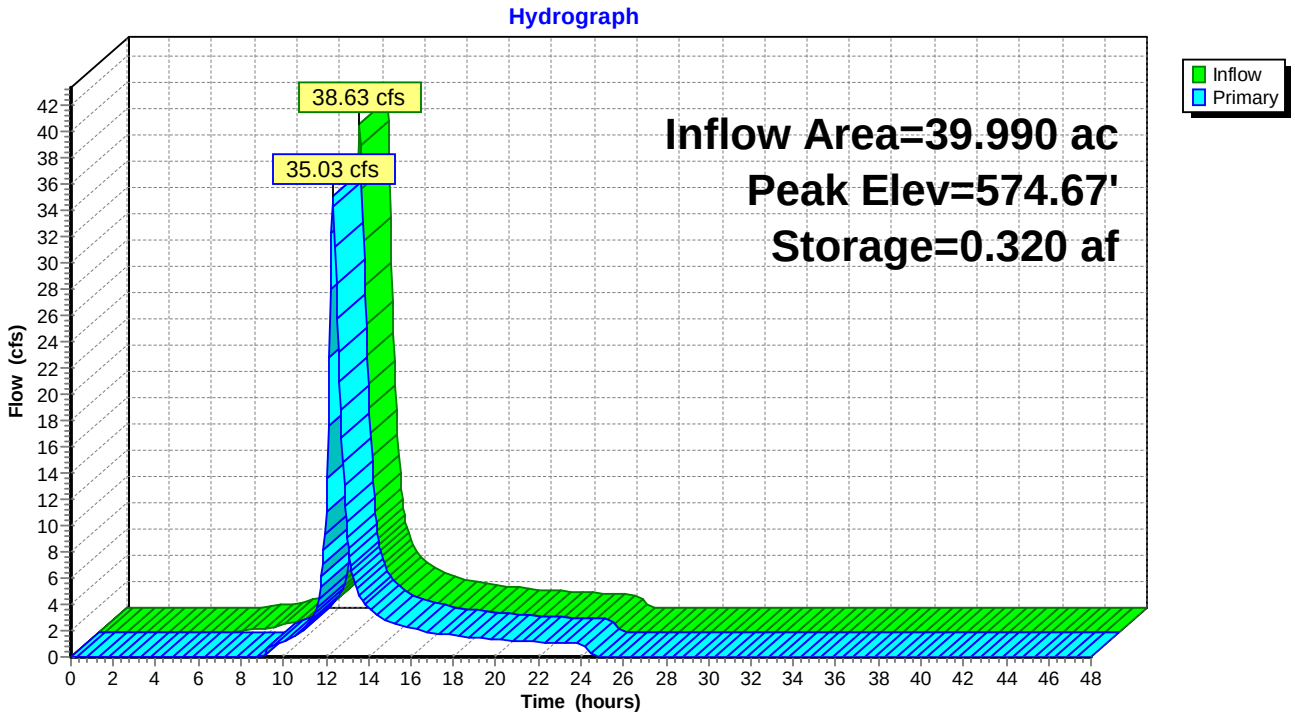
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	0.595 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.010	0.000	0.000
572.00	0.020	0.015	0.015
573.00	0.030	0.025	0.040
574.00	0.040	0.035	0.075
575.00	1.000	0.520	0.595

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=34.83 cfs @ 12.33 hrs HW=574.67' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 34.83 cfs @ 2.59 fps)

Pond 43P: P-8 DA-1



Summary for Pond 44P: P-9 DA-1

Inflow Area = 137.250 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 20.74 cfs @ 13.51 hrs, Volume= 6.528 af
Outflow = 18.36 cfs @ 13.89 hrs, Volume= 5.403 af, Atten= 11%, Lag= 23.1 min
Primary = 18.36 cfs @ 13.89 hrs, Volume= 5.403 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.46' @ 13.89 hrs Surf.Area= 0.783 ac Storage= 1.441 af

Plug-Flow detention time= 142.6 min calculated for 5.403 af (83% of inflow)
Center-of-Mass det. time= 61.5 min (1,051.0 - 989.5)

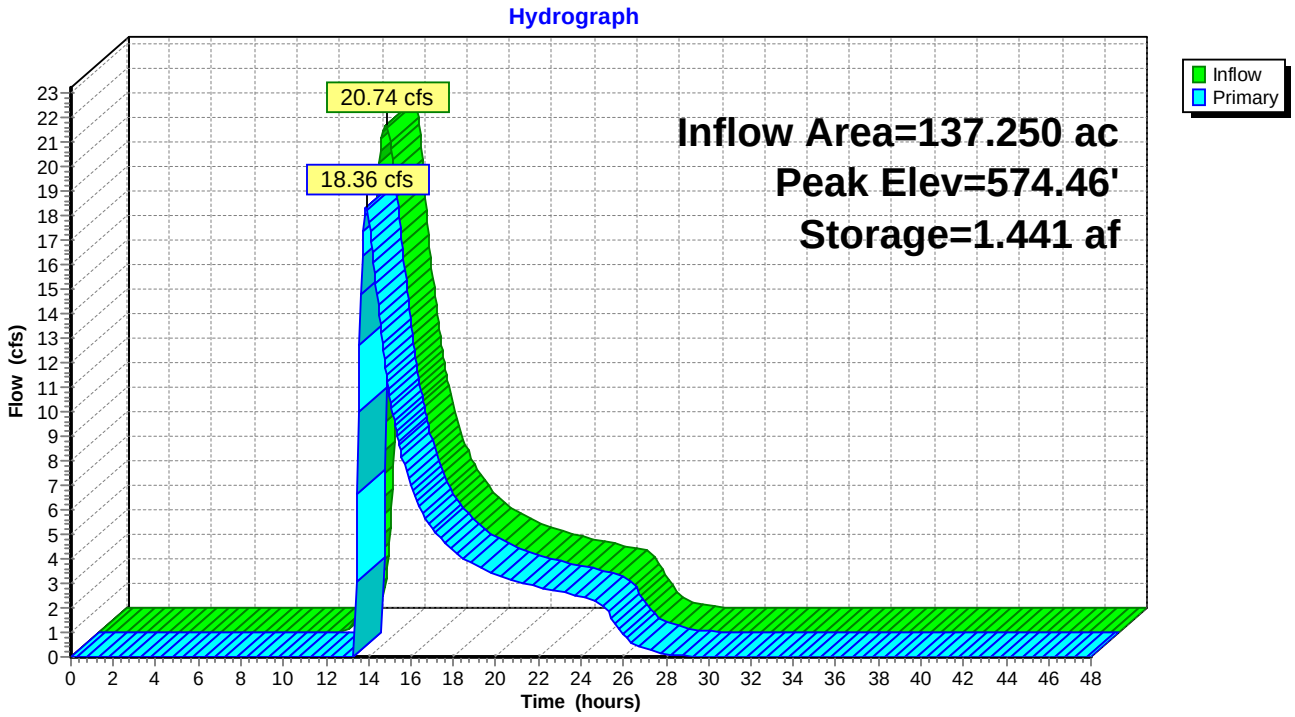
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	1.925 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.250	0.000	0.000
572.00	0.300	0.275	0.275
573.00	0.400	0.350	0.625
574.00	0.600	0.500	1.125
575.00	1.000	0.800	1.925

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=18.34 cfs @ 13.89 hrs HW=574.46' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 18.34 cfs @ 2.01 fps)

Pond 44P: P-9 DA-1



Summary for Pond 45P: P-9 DA-2

Inflow Area = 32.090 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 7.35 cfs @ 12.79 hrs, Volume= 1.526 af
Outflow = 6.49 cfs @ 13.02 hrs, Volume= 1.291 af, Atten= 12%, Lag= 13.5 min
Primary = 6.49 cfs @ 13.02 hrs, Volume= 1.291 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.24' @ 13.02 hrs Surf.Area= 0.351 ac Storage= 0.294 af

Plug-Flow detention time= 116.3 min calculated for 1.290 af (85% of inflow)
Center-of-Mass det. time= 43.8 min (987.4 - 943.6)

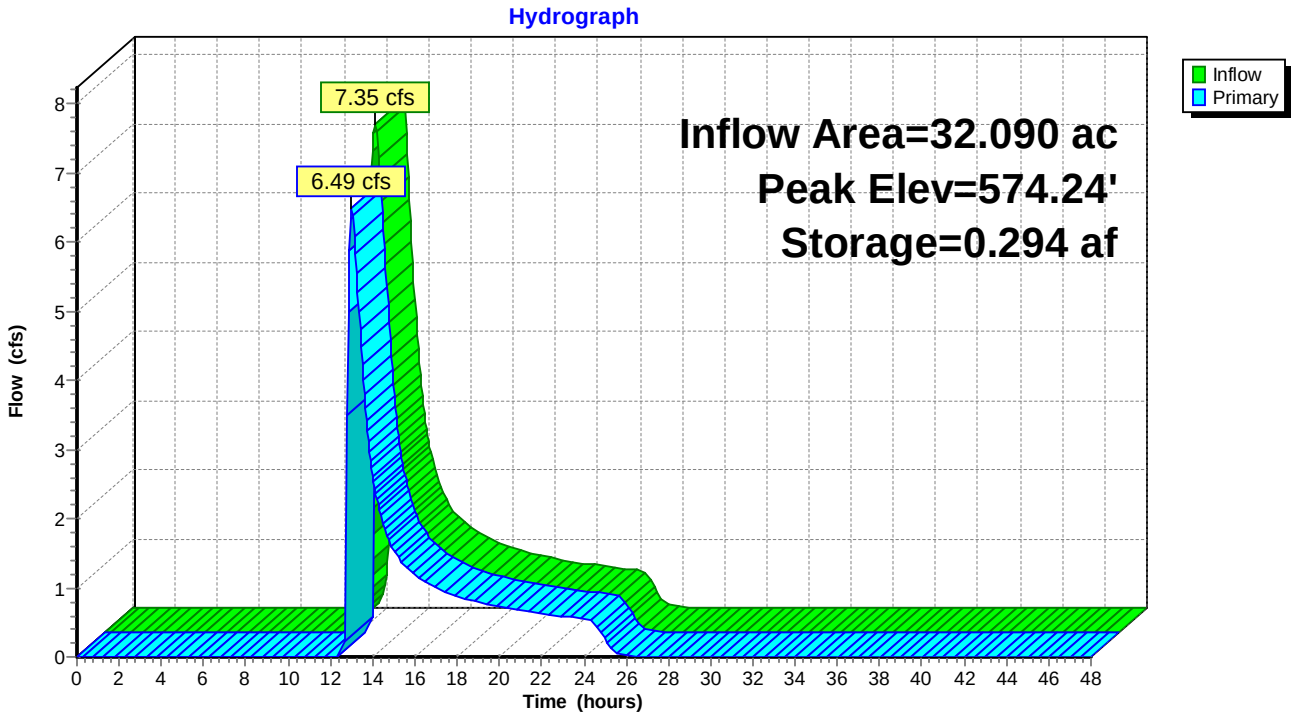
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	0.810 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.020	0.000	0.000
572.00	0.050	0.035	0.035
573.00	0.100	0.075	0.110
574.00	0.150	0.125	0.235
575.00	1.000	0.575	0.810

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.46 cfs @ 13.02 hrs HW=574.24' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 6.46 cfs @ 1.37 fps)

Pond 45P: P-9 DA-2



Summary for Pond 46P: P-10 DA-1

Inflow Area = 52.640 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 11.59 cfs @ 12.84 hrs, Volume= 2.504 af
Outflow = 10.26 cfs @ 13.07 hrs, Volume= 2.129 af, Atten= 11%, Lag= 14.2 min
Primary = 10.26 cfs @ 13.07 hrs, Volume= 2.129 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.32' @ 13.07 hrs Surf.Area= 0.454 ac Storage= 0.479 af

Plug-Flow detention time= 115.2 min calculated for 2.129 af (85% of inflow)
Center-of-Mass det. time= 44.0 min (990.7 - 946.7)

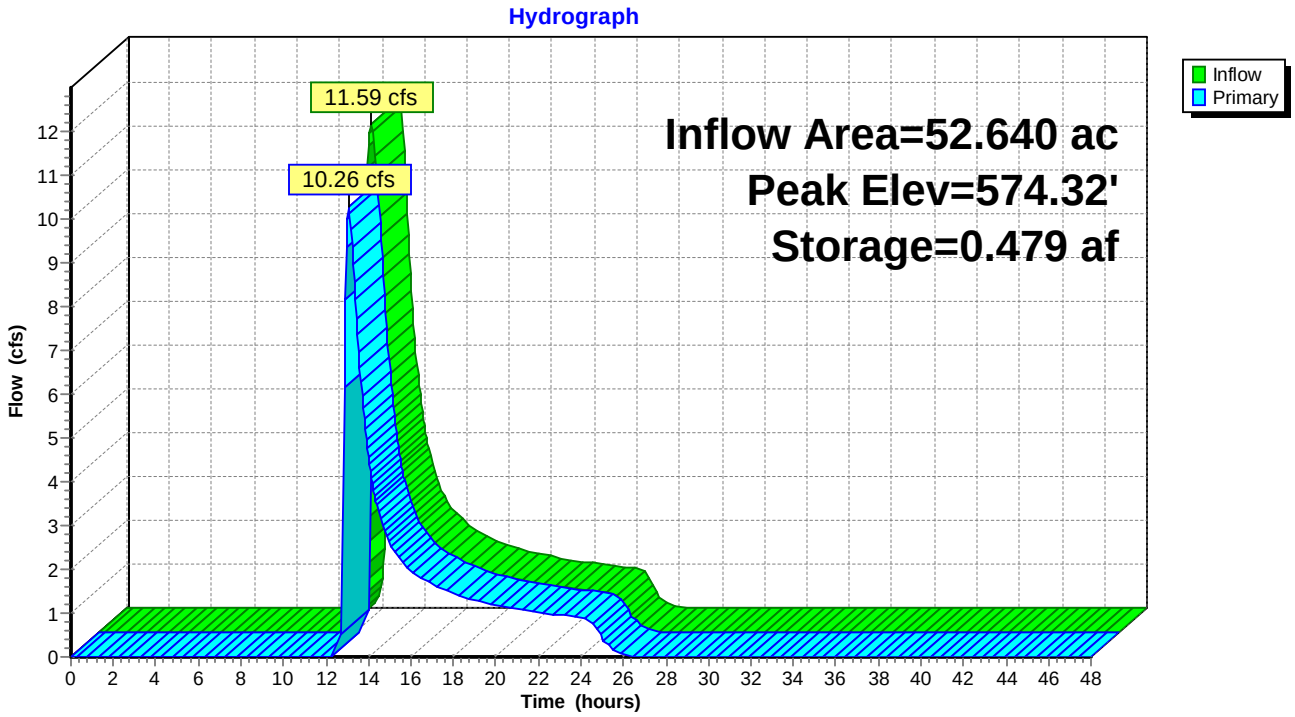
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	0.975 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.050	0.000	0.000
572.00	0.100	0.075	0.075
573.00	0.150	0.125	0.200
574.00	0.200	0.175	0.375
575.00	1.000	0.600	0.975

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=10.22 cfs @ 13.07 hrs HW=574.32' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 10.22 cfs @ 1.61 fps)

Pond 46P: P-10 DA-1



Summary for Pond 47P: P-10 DA-2

Inflow Area = 158.910 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 26.46 cfs @ 13.29 hrs, Volume= 7.558 af
Outflow = 23.31 cfs @ 13.68 hrs, Volume= 6.383 af, Atten= 12%, Lag= 23.3 min
Primary = 23.31 cfs @ 13.68 hrs, Volume= 6.383 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.53' @ 13.68 hrs Surf.Area= 0.859 ac Storage= 1.588 af

Plug-Flow detention time= 130.6 min calculated for 6.377 af (84% of inflow)
Center-of-Mass det. time= 57.3 min (1,034.8 - 977.5)

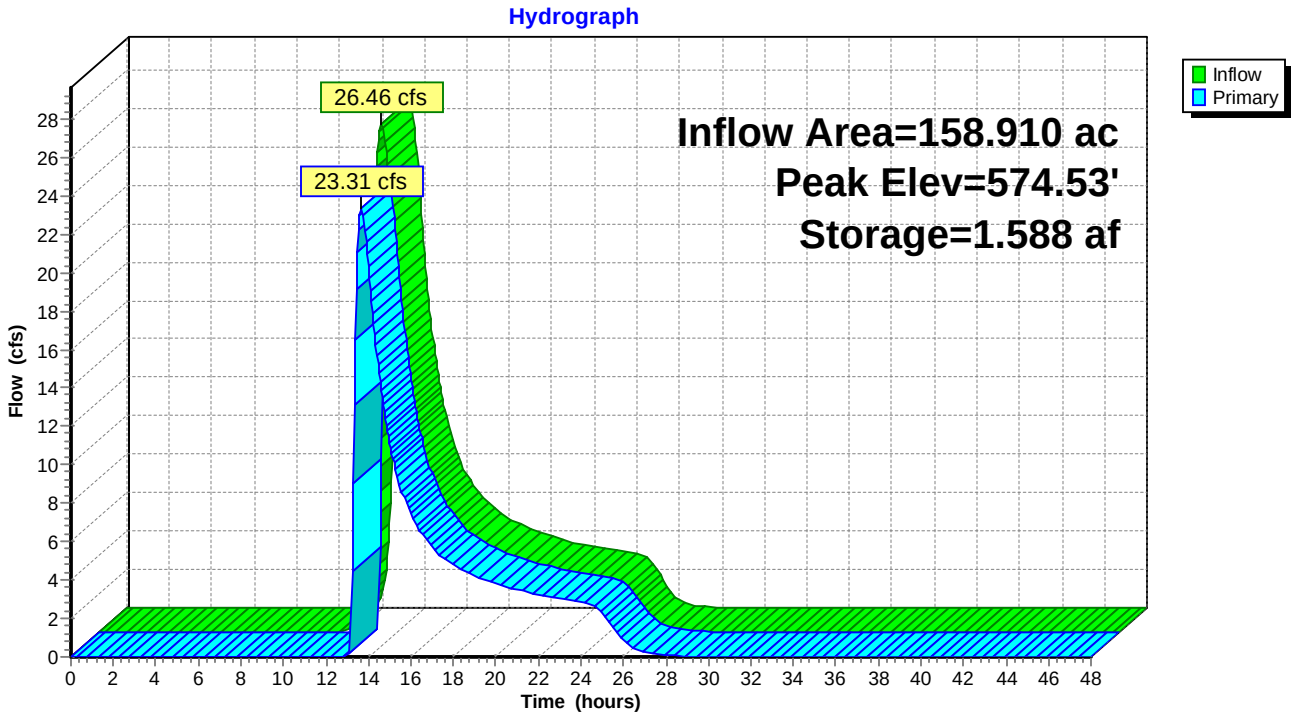
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	2.025 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.150	0.000	0.000
572.00	0.250	0.200	0.200
573.00	0.500	0.375	0.575
574.00	0.700	0.600	1.175
575.00	1.000	0.850	2.025

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=23.27 cfs @ 13.68 hrs HW=574.53' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 23.27 cfs @ 2.20 fps)

Pond 47P: P-10 DA-2



Summary for Pond 48P: P-10 DA-3

Inflow Area = 36.450 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 9.21 cfs @ 12.66 hrs, Volume= 1.734 af
Outflow = 8.05 cfs @ 12.87 hrs, Volume= 1.469 af, Atten= 13%, Lag= 12.9 min
Primary = 8.05 cfs @ 12.87 hrs, Volume= 1.469 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.27' @ 12.87 hrs Surf.Area= 0.359 ac Storage= 0.330 af

Plug-Flow detention time= 114.0 min calculated for 1.469 af (85% of inflow)
Center-of-Mass det. time= 41.6 min (977.0 - 935.4)

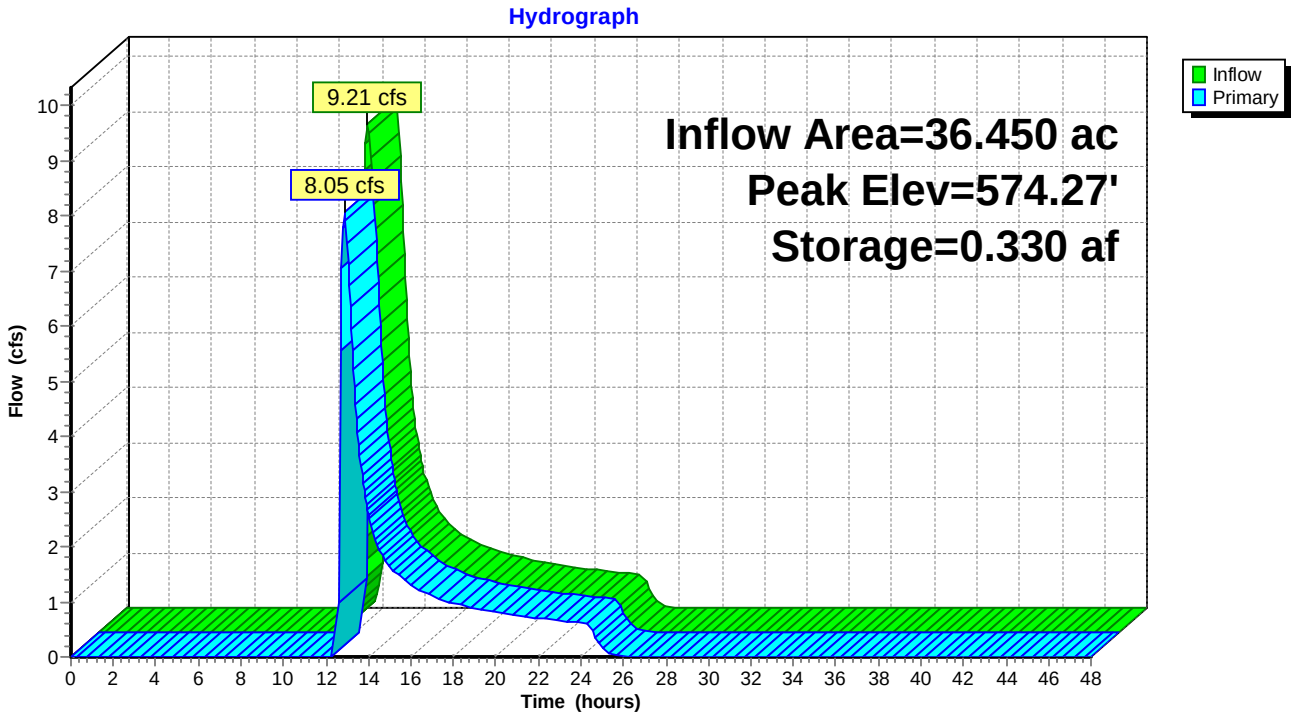
Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	0.825 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.050	0.000	0.000
572.00	0.080	0.065	0.065
573.00	0.100	0.090	0.155
574.00	0.120	0.110	0.265
575.00	1.000	0.560	0.825

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=8.00 cfs @ 12.87 hrs HW=574.27' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 8.00 cfs @ 1.48 fps)

Pond 48P: P-10 DA-3



Summary for Pond 49P: P-10 DA-4

Inflow Area = 152.530 ac, 0.00% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 26.47 cfs @ 13.21 hrs, Volume= 7.255 af
Outflow = 23.52 cfs @ 13.56 hrs, Volume= 6.205 af, Atten= 11%, Lag= 20.5 min
Primary = 23.52 cfs @ 13.56 hrs, Volume= 6.205 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 574.53' @ 13.56 hrs Surf.Area= 0.836 ac Storage= 1.446 af

Plug-Flow detention time= 123.0 min calculated for 6.205 af (86% of inflow)
Center-of-Mass det. time= 53.1 min (1,025.3 - 972.2)

Volume	Invert	Avail.Storage	Storage Description
#1	571.00'	1.875 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
571.00	0.150	0.000	0.000
572.00	0.250	0.200	0.200
573.00	0.400	0.325	0.525
574.00	0.650	0.525	1.050
575.00	1.000	0.825	1.875

Device	Routing	Invert	Outlet Devices
#1	Primary	574.00'	**20.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=23.48 cfs @ 13.56 hrs HW=574.53' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 23.48 cfs @ 2.21 fps)

Pond 49P: P-10 DA-4