JENSEN DESIGN & SURVEY, INC

1672 Donlon Street
Ventura, CA 93003
Local 805.654.6977
Fax 805.654.6979
www.jdscivil.com

HYDROLOGY REPORT

TEMPORARY OUTDOOR VEHICLE STORAGE
HUE02.5815

for: Port of Hueneme

HYDROLOGY REPORT

TEMPORARY OUTDOOR VEHICLE STORAGE
PERKINS RD AND HUENEME RD

APN#231-0-092-245 & 231-0-092-105

Perkins Rd and Hueneme Rd
Oxnard, CA 93033

prepared for:
Christina Birdsey
Port of Hueneme
333 Ponoma Street
Port Hueneme, CA 93044

prepared by:
Jensen Design & Survey, Inc.
1672 Donlon St.
Ventura, CA 93003

James C. McCoskey, P.E.

R.C.E. 76941

1st Submittal: August 8, 2018

Revised: March 4, 2019

Revised: March 20, 2019

Revised: August 24, 2021

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1.0 PROJECT OVERVIEW

1.1. PROJECT DESCRIPTION & LOCATION

The proposed site for the Port of Hueneme temporary vehicle storage area is located at the Southeast corner of Perkins Rd. and W. Hueneme Rd. in Oxnard, CA. Proposed improvements consist of: grubbing, regrading, and installing a gravel surface to create a temporary storage area for approximately 6,000 vehicles that will be offloaded from the Port of Hueneme. There will be a small increase in impervious area of less than one percent of the 33.74 acre site. See Appendix A for the Location Map. This project will be constructed with a Special Use Permit for a temporary 5 year term through the City of Oxnard (City).

1.2. SITE CONDITIONS

The existing and proposed site conditions are shown in the grading plan exhibit in Appendix A.

1.2.1. Existing Drainage Patterns

Currently, the whole site is undeveloped but has been tilled in the past with portions of the site previously graded and used for temporary parking. The site is relatively flat with a minimal slope ranging from 0.2% to 0.6% across the site. During storm events, the water either infiltrates into the ground, ponds in place, or drains towards the Southeast into an existing storm drain outlet that runs under the railroad on the South side of the lot. Any runoff leaving the site from this outlet sheet flows onto gravel and vegetation approximately 140 from the Oxnard Industrial Drain, now called the Ormond Lagoon Waterway, that is designed for a 100 year storm event. The storm drain outlet consists of a wing wall and three 12-inch CMP pipes. The outlet is currently filled with debris and sediment. The images below show the current condition of the outlet structure. The pipes are approximately 15 feet long and sloped at 6% to the South.

Figure 1- Existing Culvert Inlet

Figure 2- Existing Culvert Outlet

1.2.2. Proposed Drainage Patterns

The proposed conditions will drain the site towards the storm drain outlet at an average design slope of 0.5%. The storage area will be covered with approximately one inch of gravel which will allow the water to infiltrate into the ground at the same rate as the existing conditions. There are proposed French drains located at the South of the site. The French drains will be sloped at 0.2% and lead to a concrete rectangular channel which flows toward the existing storm drain outlet. Historical drainage patterns are maintained. The outlets will be cleaned of debris and maintained after storm events.

1.3. REPORT OBJECTIVE

The intent of this report is to provide analysis of the proposed drainage facilities for the Port of Hueneme temporary vehicle storage area and to demonstrate the site is designed in accordance with City of Oxnard design standards and sound engineering principles.

2.0 DESIGN METHODOLOGY

2.1. EXISTING ON-SITE FLOWS

Storm water flows in the existing condition were calculated using the City's Cook's Method and Ventura County's (County's) method. The entire site was analyzed as one area since there is only one outlet for the site. The storm water conditions were modeled with the Tc Calculator and VCRat software from Ventura County. The hydrographs were created using Hydraflow Hydrograph software. The City's Cook's Method was used to calculate peak flows to size channels and drains while analyzing the culverts. The County's method was used to calculate volume for detention analysis. The analysis showing the calculations for the existing peak flows can be found in Appendix B, and is summarized in the table below.

Table 1-Existing Condition
Modified Cook's Storm Water Flows

Existing Onsite Drainage			
Area (ac)	Q10 (cfs)	Q50 (cfs)	Q100 (cfs)
33.7	23.0	39.0	46.0

2.2. PROPOSED ON-SITE FLOWS

The proposed on-site flows are assumed to be the same because the improvements hold lined grade. The only impervious area added is a rectangular channel to aid in conveying the water off site and the guard shack. The total impervious area is 2,624 square feet, 0.18 percent of the total site. Two sub-areas were calculated using the City's Cook's Method to size the French drains (Subarea A) and channel (Subareas A and B) leading to the outlet. The calculated runoffs are summarized in the table below. The County's Method was used to analyze detention.

Table 2-Proposed Condition
Modified Cook's Storm Water Flows

Developed Onsite Drainage				
Drainage Area	Area (ac)	Q10 (cfs)	Q50 (cfs)	Q100 (cfs)
A	2.7	2.0	3.5	4.0
A+B	10.1	7.6	13.0	15.2
Total Site	33.7	23.0	39.0	46.0

The French drains were sized using Flow Master, resulting in two 12 inch perforated PVC pipes spaced with a 12 inch clearance and a slope of 0.25%. The channel cross section was sized using Flow Master. The rectangular channel for Subarea B were sized with a slope of 0.2%, width of three feet, and a height of one and a half feet. The calculations for the peak flows, drain sizing, and channel sizing can be found in Appendix B.

3.0 Q100 PAD PROTECTION

In the proposed development, the water will periodically pond near the existing storm drainage outlet. The extent of ponding is marked on the grading plan exhibit in Appendix A. Cars will not be stored in this area. Cars will be protected from flooding up to the 100 year storm event, exceeding Oxnard's hydrology requirements. According to FEMA mapping dated 2010, the site is in a 500 year flood zone. The FEMA map is located in Appendix E. This project does not require any further action for the 500 year storm event. According to the Industrial Drain Channel Improvements Study dated 2006, a portion of the site is flooded in the 100 year storm event at a water level up to 0.5 feet. Due to the potential for water flow onto the site from flooding of the Ormond Lagoon Waterway, an extra volume of 34,124 cubic feet of storage was included in detention to accommodate the additional water from the overflow of the Ormond Lagoon Waterway (Oxnard Industrial Drain).

4.0 DETENTION

4.1. DETENTION REQUIREMENTS

Runoff from the site will flow into the existing storm drain outlet. The storm drain outlet consists of a wing wall and three 12-inch CMP culverts that outlet to the Oxnard Industrial Drain. Detention is assumed based on the high peak flows and the limited size of the outlets. The detention needed will be calculated with the Hydraflow Hydrograph software.

The proposed site drains to the low spot near the existing outlet. Since the runoff will pond around the outlet, the area was analyzed as a detention basin. The volume and peak flow for the detention analysis was calculated with the County's method. The detention basin was sized based on the 100 year storm event, which resulted in the peak flows of 28 cfs into the basin and 2.4 cfs discharged through the culvert. The required detention volume for the site was obtained through Hydraflow Hydrographs using hydrograph outputs from VCRat software. A time of concentration of 28 minutes was used based on the calculation done in the Ventura County (County) Tc Calculator. The ponding

area has the capacity to store 98,109 cubic feet of water. For the 100 year storm event, the water volume required for detention is 63,985 cubic feet, which would fully drain in 13 hours. The detention basin was also analyzed for the 10 and 50 year storm event. These calculations can be found in Appendix C. The extra 34,124 cubic feet of storage is for the additional water from the overflowing of the Ormond Lagoon Waterway (Oxnard Industrial Drain). The water level in detention basin for the 100 year storm event is 0.43 feet high and flows into the outlet. The outlet does not become pressurized and the water level after it exits the detention basin is 0.11 feet high. The cross section of the detention basin with flow lines is shown in the figure below. The outlet was analyzed with the Federal Highway Administration's HY-8 culvert software. The outlet is inlet controlled and has a peak discharge of 2.4 cfs for the 100 year peak flow. The summary report can be found in Appendix C.

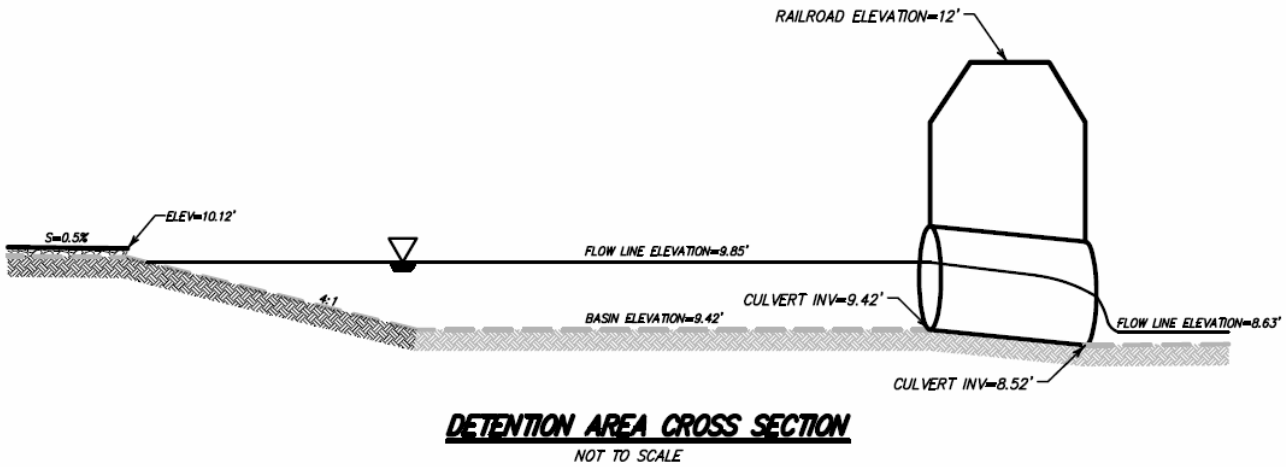


Figure 3-Cross Section of Detention Area

5.0 MS4 PERMIT COMPLIANCE

The proposed development is not subject to the MS4 Permit requirements because it does not fall into any of the categories listed in Part 4 E.II.1. of the permit. The temporary vehicle storage area contains less than 5,000 SF of impervious area on the site and cars will parked at the site for temporary storage. Vehicles will be offloaded and on loaded onto the site for extended periods of time. The proposed development will not increase the storm runoff.

The ground will be compacted to a maximum of 80-85% of relative compaction. The historical pictures of the site show that a portion of the site has been compacted over the past few years, which are included in Appendix D.

6.0 CONCLUSIONS

Design of the on-site storm drain system meets the City of Oxnard requirements for detention. The requirements for pad protection and storm water treatment do not apply for this site. The storm drain system is designed to handle a 100 year storm event. Storm water runoff will be detained when necessary prior to being routed to the Ormond Lagoon Waterway (Oxnard Industrial Drain). Calculations included in this report support the basis for the design, ensuring that all requirements put forth by the City of Oxnard are met.

7.0 APPENDICES

APPENDIX A: HYDROLOGY EXHIBITS

APPENDIX B: RUNOFF ANALYSIS

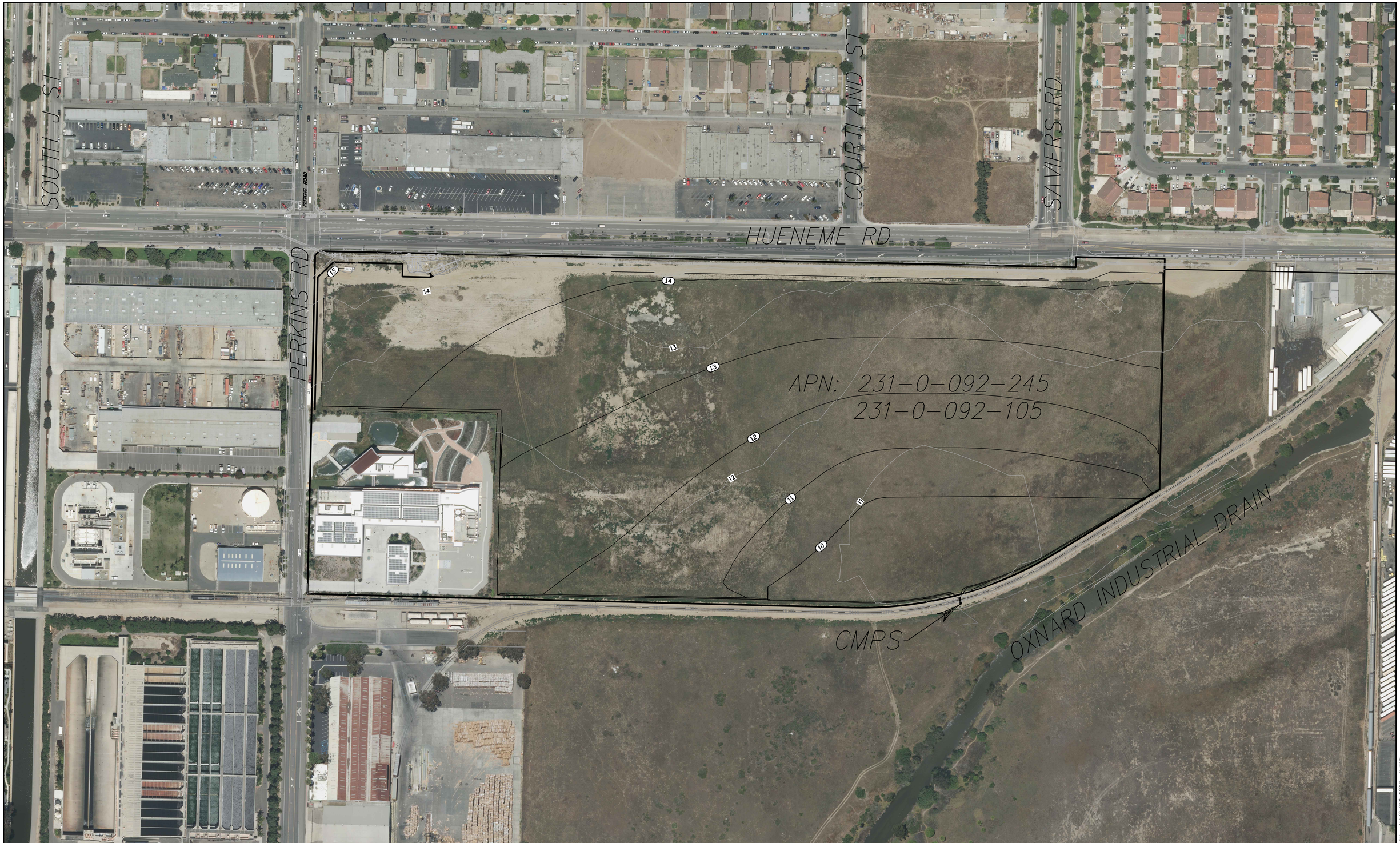
APPENDIX C: DETENTION ANALYSIS

APPENDIX D: HISTORICAL PICTURES

APPENDIX E: FEMA MAP

APPENDIX A

HYDROLOGY EXHIBITS



100' 50' 0' 100' 200'

GRAPHIC SCALE: 1"=100'

NOTE:

INFORMATION SHOWN HEREON, SUCH AS ASSESSOR'S PARCEL LINES & NUMBERS ARE PROVIDED BY THE COUNTY OF VENTURA GEOGRAPHIC INFORMATION SYSTEMS AND IS NOT BASED ON A FIELD SURVEY. ADDITIONAL EASEMENTS OF RECORD NOT SHOWN ON THIS MAP MAY EXIST AS A TITLE REPORT WAS NOT PROVIDED FOR THIS PROJECT. THIS DATA IS FOR CONCEPTUAL AND VISUAL PURPOSES ONLY AND IS NOT TO BE USED FOR MAPPING AND/OR FINAL DESIGN.

JENSEN DESIGN & SURVEY, INC
www.jdscivil.com
1672 DONLON STREET
VENTURA, CALIF. 93003
PHONE 805/654-6977
FAX 805/654-6979

SCALE: 1"=100'	J.N.: HUE02.5815
DATE: 8/8/2018	DWG. NAME: 5815_Location_Map.dwg

LOCATION MAP
FOR
GLOVIS

Perkins Rd and Hueneme Rd
City of Oxnard

COUNTY OF VENTURA STATE OF CALIFORNIA

SHEET 1 OF 1

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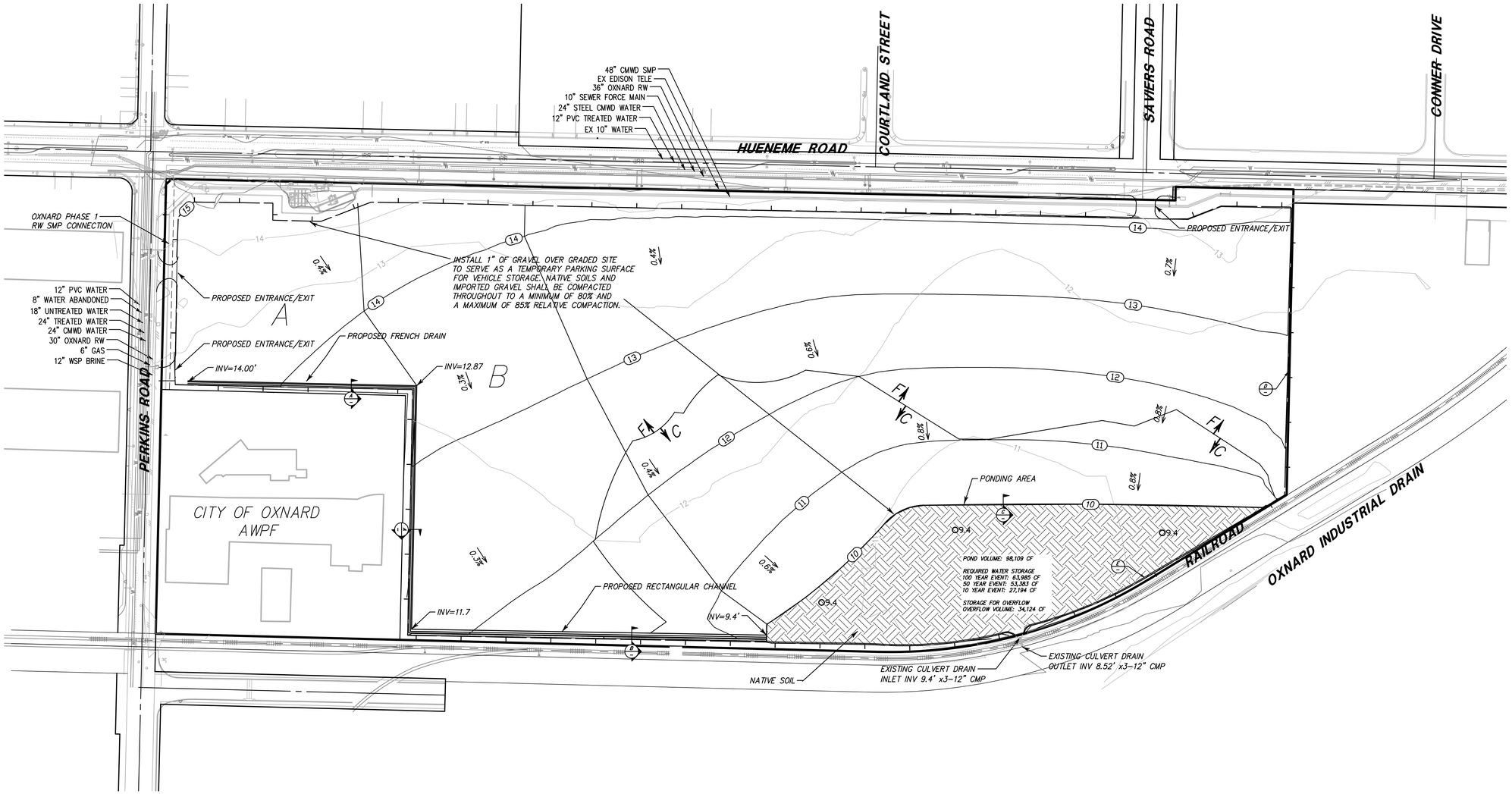
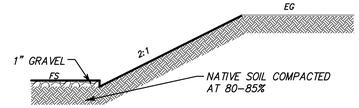


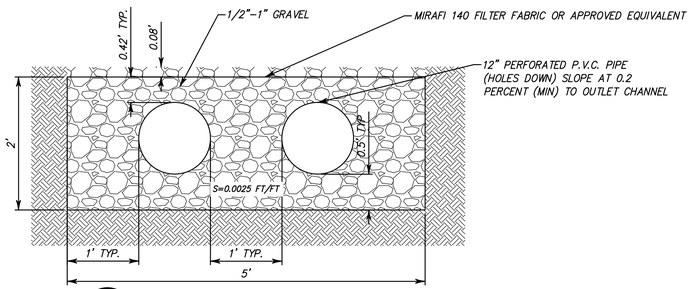
DISTURBED AREA OF DEVELOPMENT: 1,395,221 SF
GROSS CUT OF GRADING: 7,739 CY
GROSS FILL OF GRADING: 21,489 CY

TOTAL NET CUT: 13,750 CY (IMPORT)

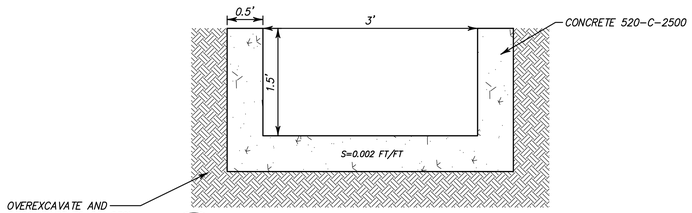


E — TYPICAL CUT SECTION
NOT TO SCALE

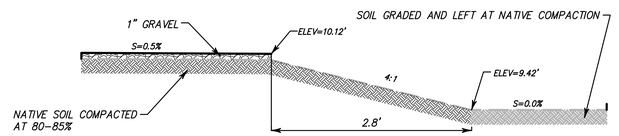
D — TYPICAL FILL SECTION
NOT TO SCALE



A — TYPICAL DRAIN SECTION
NOT TO SCALE



B — RECTANGULAR CHANNEL CROSS SECTION
NOT TO SCALE



C — TYPICAL PONDING AREA SECTION
NOT TO SCALE

NOTICE TO THE CONTRACTOR

THE EARTHWORK SUMMARY IS PROVIDED AS A COURTESY AND CONVENIENCE TO THE CONTRACTOR. QUANTITIES SHOWN ARE APPROXIMATE, BASED ON THE DIFFERENCES BETWEEN EXISTING GROUND ELEVATIONS AND ROUGH GRADE ELEVATIONS. QUANTITIES PROVIDED MAKE NO PROVISIONS FOR STRIPPING, OR OVEREXCAVATION. VARIABLES SUCH AS COMPACTION, SHRINKAGE AND THE CONTRACTORS METHOD OF OPERATION, WILL CAUSE THE VOLUME OF DIRT MOVED IN THE FIELD TO DEVIATE FROM THE CALCULATED QUANTITIES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EARTHWORK REQUIREMENTS TO ROUGH GRADE THIS JOB.

CAUTION:

EXISTING UTILITIES WERE LOCATED FROM BEST AVAILABLE INFORMATION. CONTRACTOR SHALL POTHOLE AND LOCATE EXISTING UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES.

ELEVATION DATUM
NAVD88

100' 50' 0' 100' 200'
GRAPHIC SCALE: 1"=100'

NOTE:
THIS PLAN IS APPROVED FOR CONSTRUCTION WHEN SIGNED BY THE PERMITTING AGENCY AND CIVIL ENGINEER, AND A PERMIT IS ISSUED.

REGISTERED PROFESSIONAL ENGINEER SCOTT D. MECKSTROTH No. C63337 CIVIL STATE OF CALIFORNIA

JENSEN DESIGN & SURVEY, INC
www.jdscivil.com
1672 DONLON STREET
VENTURA, CALIF. 93003
PHONE 805/654-6977
FAX 805/654-6979
SCOTT D. MECKSTROTH R.C.E. C63337 DATE

AS BUILT CERTIFICATE

I HEREBY CERTIFY THAT THE WORK SHOWN ON DRAWING No. _____ SHEET No. ____ THROUGH ____ ,MARKED AS "AS BUILT", HAS BEEN CONSTRUCTED IN CONFORMANCE WITH LINES AND GRADES AS SHOWN ON SAID PLANS, DRAWINGS, REFERENCED SPECIFICATIONS, AND APPROVED CHANGE ORDERS, AS INDICATED IN THE REVISION BLOCK.

DATE _____ SIGNATURE _____

NAME _____ INSPECTOR _____

REVISIONS

MARK	DATE	DESCRIPTION	BY

REVIEWED BY: CLARA MAGANA

CITY OF OXNARD CALIFORNIA
Development Services Department

ROUGH GRADING PLAN
OUTDOOR VEHICLE STORAGE

ACCEPTED BY: _____ CITY ENGINEER R.C.E. 46333 DATE

SCALE: HORIZ. AS NOTED VERT. AS NOTED
DRAWN BY: DCC
CHECKED BY: SDM

SHEET No. 2 OF 2
DRAWING NUMBER DWG NO

GLOVIS-TEMPO
APN 231-0-092-105
APN 231-0-092-245

Mar 22, 2019
ROUGH GRADING

\\JDS-DC1\Eng\Improvement Plans\GLOVIS-TEMPO\dwg\rough grading.dwg Mar 22, 2019, 11:02am dcarroll

APPENDIX B

RUNOFF ANALYSIS

CITY OF OXNARD'S COOK METHOD

MODIFIED COOK'S-HYDROLOGIC CALCULATIONS

Project: **Temporary Vehicle Storage - Hueneme** Job No. **HUE02.5815.001** Sheet: **1** of **1**
Watershed: **A** Designed: **DCC** Date: **Oct 26,2017**
Concentration Point: **1** Checked **SDM** Date: **6-Aug-18**
Undeveloped

Watershed Constants:

Drainage Area	**2.7**	Acres			
Length	**325**	Feet	Fall	**2.25**	Feet
Width	**361.88**	Feet	Slope	**0.69**	%
Length/Width	**0.90**		Shape Correction Factor	**115.0**	
Soil Type	**B**		RI-Correction Factor	**123**	%

Computation of "C"

Type of Development	"C" Factor	Present	Future
Undeveloped	40-45	45%	45%
Residential	60		0%
Commercial & Industrial	70		0%

Composite "C" Factor (Plate 62 Oxnard Standards)
Runoff: Q (from Curve): **1.44** x L/W Factor **1.15** x RI Factor **1.23**

Frequency		Frequency Factor	**Q**
20%	Q_5	65%	1.33 cfs
10%	Q_{10}	100%	**2.04** cfs
4%	Q_{25}	135%	2.75 cfs
2%	Q_{50}	170%	3.47 cfs
1%	Q_{100}	200%	4.08 cfs

MODIFIED COOK'S-HYDROLOGIC CALCULATIONS

Project: **Temporary Vehicle Storage - Hueneme** Job No. **HUE02.5815.001** Sheet: **1** of **1**
Watershed: **A+B** Designed: **DCC** Date: **Oct 26,2017**
Concentration Point: **1** Checked **SDM** Date: **6-Aug-18**
Undeveloped

Watershed Constants:

Drainage Area	**10.1**	Acres			
Length	**784**	Feet	Fall	**2.5**	Feet
Width	**561.17**	Feet	Slope	**0.32**	%
Length/Width	**1.40**		Shape Correction Factor	**112.2**	
Soil Type	**B**		RI-Correction Factor	**123**	%

Computation of "C"

Type of Development	"C" Factor	Present	Future
Undeveloped	40-45	45%	45%
Residential	60		0%
Commercial & Industrial	70		0%

Composite "C" Factor (Plate 62 Oxnard Standards)
Runoff: Q (from Curve): **5.52** x L/W Factor **1.12** x RI Factor **1.23**

Frequency		Frequency Factor	**Q**
20%	Q_5	65%	4.95 cfs
10%	Q_{10}	100%	**7.62** cfs
4%	Q_{25}	135%	10.29 cfs
2%	Q_{50}	170%	12.95 cfs
1%	Q_{100}	200%	15.24 cfs

MODIFIED COOK'S-HYDROLOGIC CALCULATIONS

Project: **Temporary Vehicle Storage - Hueneme** Job No. **HUE02.5815.001** Sheet: **1** of **1**
Watershed: **Total Site** Designed: **DCC** Date: **Oct 26,2017**
Concentration Point: **1** Checked **SDM** Date: **6-Aug-18**
Undeveloped

Watershed Constants:

Drainage Area **33.7** Acres
Length **840** Feet
Width **1747.59** Feet
Fall **5** Feet
Slope **0.60** %

Length/Width **0.48**
Soil Type **B**
Shape Correction Factor **119.7**
RI-Correction Factor **123** %

Computation of "C"

Type of Development	"C" Factor	Present	Future
Undeveloped	40-45	45%	45%
Residential	60		0%
Commercial & Industrial	70		0%

Composite "C" Factor (Plate 62 Oxnard Standards)
Runoff: Q (from Curve): **15.61** x L/W Factor **1.20** x RI Factor **1.23**

Frequency		Frequency Factor	**Q**
20%	Q_5	65%	14.94 cfs
10%	Q_{10}	100%	**22.98** cfs
4%	Q_{25}	135%	31.02 cfs
2%	Q_{50}	170%	39.07 cfs
1%	Q_{100}	200%	45.96 cfs

French Drain Design

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.00200	ft/ft
Normal Depth	12.00	in
Diameter	12.00	in

Results

Discharge	2.07	ft^3/s
Flow Area	0.79	ft^2
Wetted Perimeter	3.14	ft
Hydraulic Radius	3.00	in
Top Width	0.00	ft
Critical Depth	0.61	ft
Percent Full	100.0	%
Critical Slope	0.00412	ft/ft
Velocity	2.64	ft/s
Velocity Head	0.11	ft
Specific Energy	1.11	ft
Froude Number	0.00	
Maximum Discharge	2.23	ft^3/s
Discharge Full	2.07	ft^3/s
Slope Full	0.00200	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Channel Sizing

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00200	ft/ft
Normal Depth	1.50	ft
Bottom Width	3.00	ft

Results

Discharge	18.99	ft^3/s
Flow Area	4.50	ft^2
Wetted Perimeter	6.00	ft
Hydraulic Radius	0.75	ft
Top Width	3.00	ft
Critical Depth	1.08	ft
Critical Slope	0.00494	ft/ft
Velocity	4.22	ft/s
Velocity Head	0.28	ft
Specific Energy	1.78	ft
Froude Number	0.61	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	1.08	ft
Channel Slope	0.00200	ft/ft
Critical Slope	0.00494	ft/ft

APPENDIX C

DETENTION ANALYSIS

VENTURA COUNTY'S METHOD

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Crossing 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Culvert 2 Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
9.85	2.40	0.80	0.80	0.80	0.00	7
10.17	4.92	1.64	1.64	1.64	0.00	3
12.00	14.72	4.91	4.91	4.91	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing 1

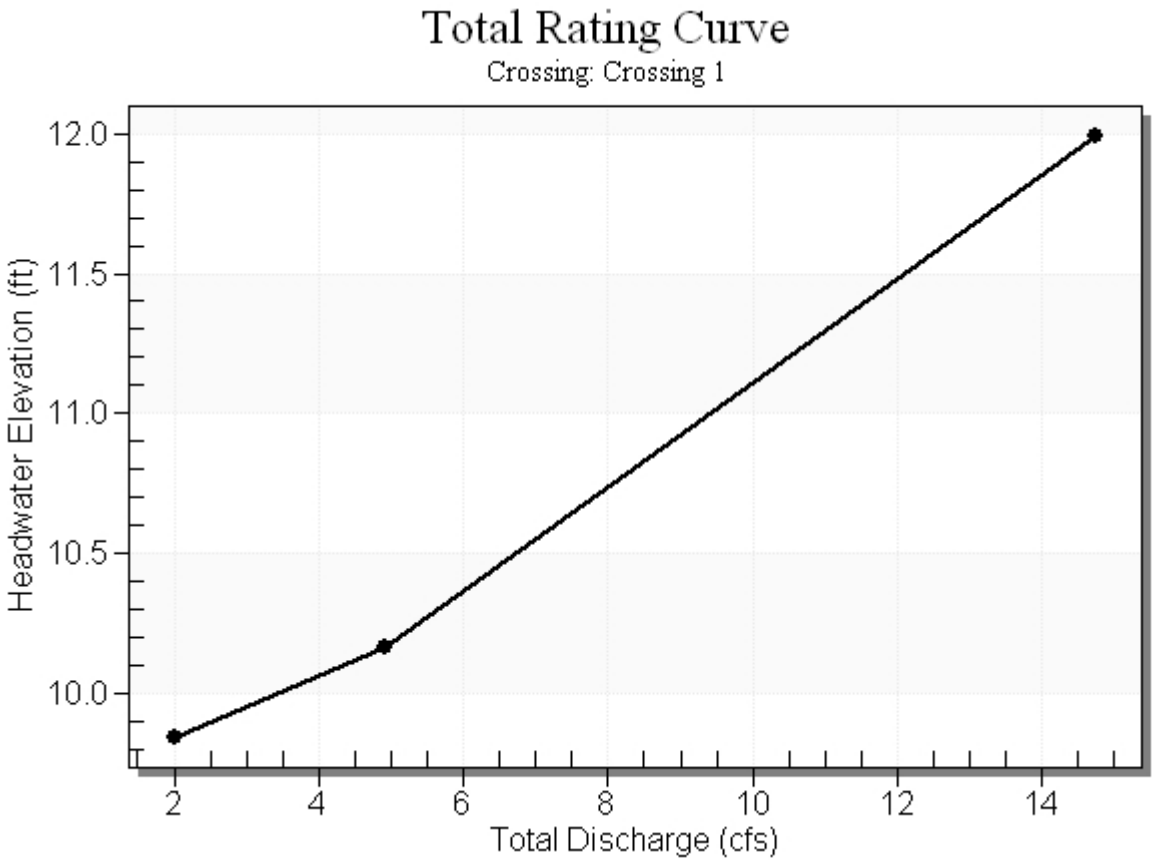


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.40	0.80	9.85	0.446	0.0*	1-S2n	0.283	0.337	0.283	0.108	3.532	2.491
4.92	1.64	10.17	0.768	0.0*	1-S2n	0.459	0.542	0.459	0.184	4.506	3.464

* Full Flow Headwater elevation is below inlet invert.

****

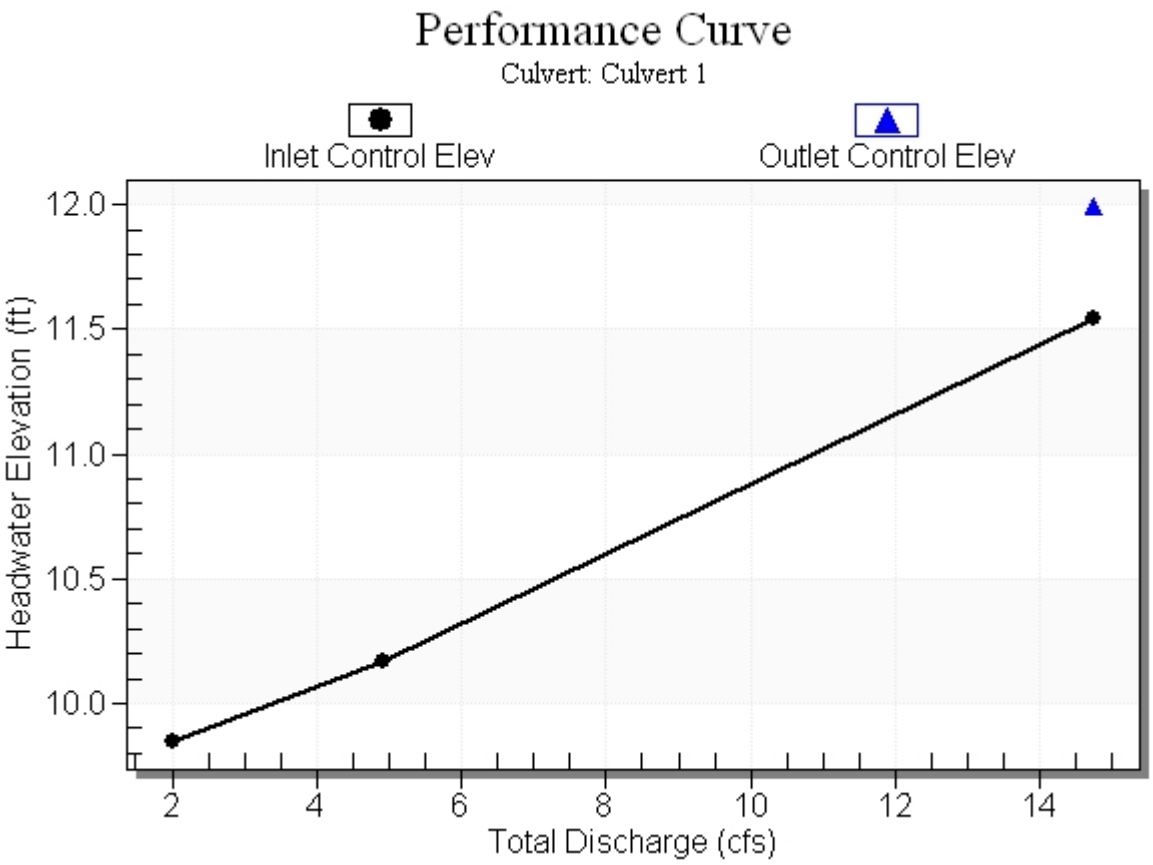
Straight Culvert

Inlet Elevation (invert): 9.42 ft, Outlet Elevation (invert): 8.52 ft

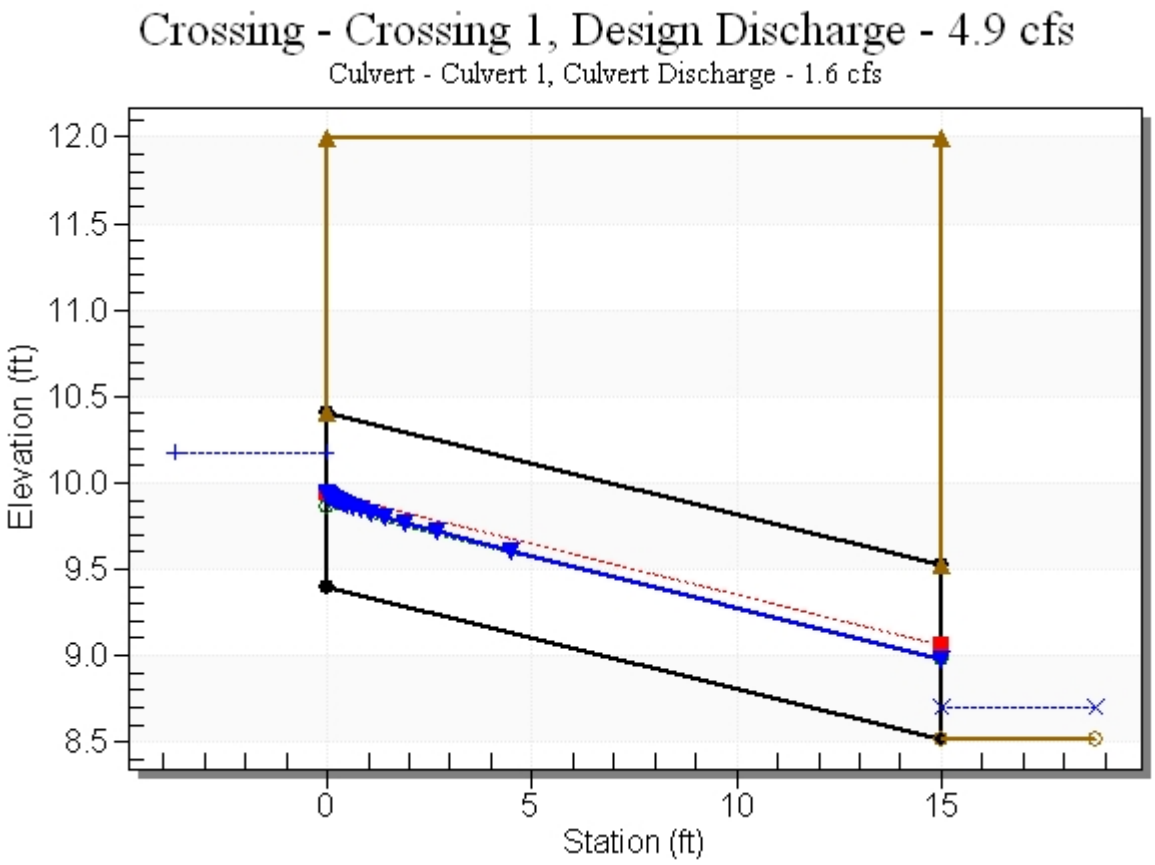
Culvert Length: 15.03 ft, Culvert Slope: 0.0587

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9.42 ft

Outlet Station: 15.00 ft

Outlet Elevation: 8.52 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Culvert Summary Table: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.40	0.80	9.85	0.446	0.0*	1-S2n	0.283	0.337	0.283	0.108	3.532	2.491
4.92	1.64	10.17	0.768	0.0*	1-S2n	0.459	0.542	0.459	0.184	4.506	3.464

* Full Flow Headwater elevation is below inlet invert.

****

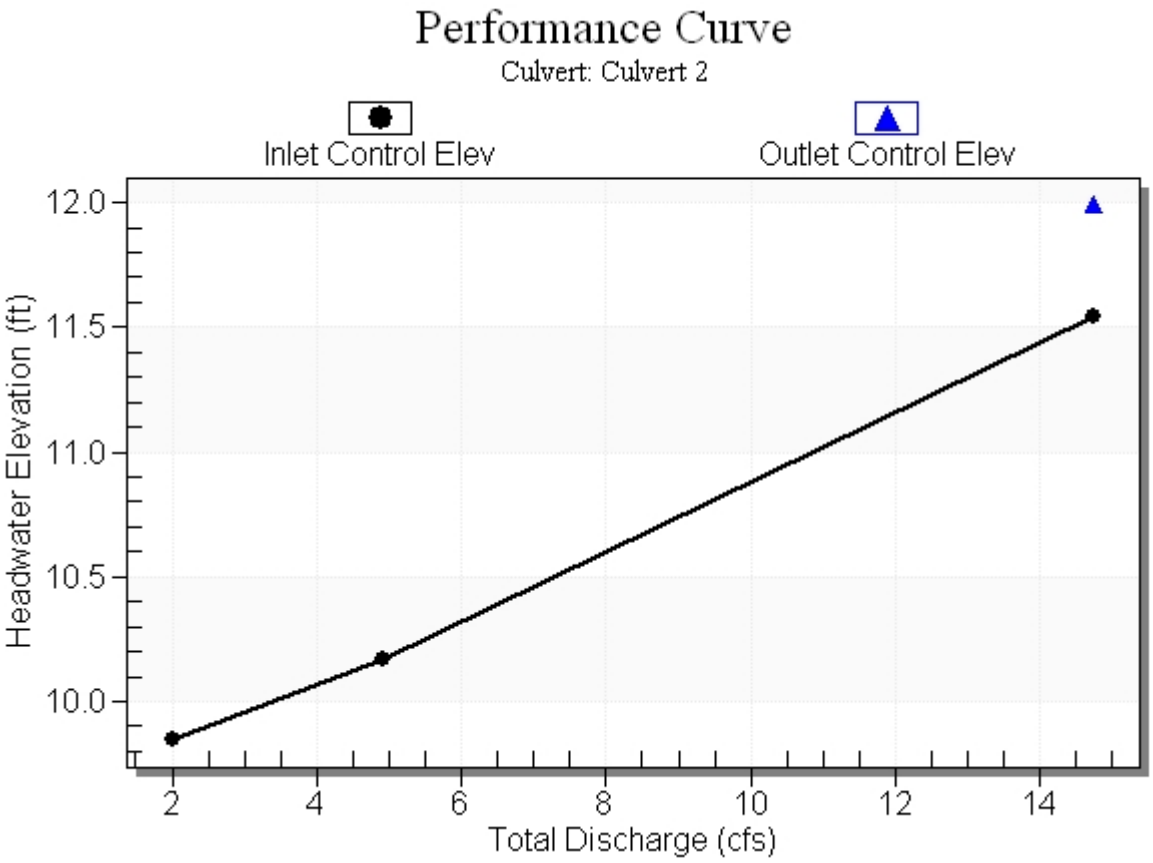
Straight Culvert

Inlet Elevation (invert): 9.42 ft, Outlet Elevation (invert): 8.52 ft

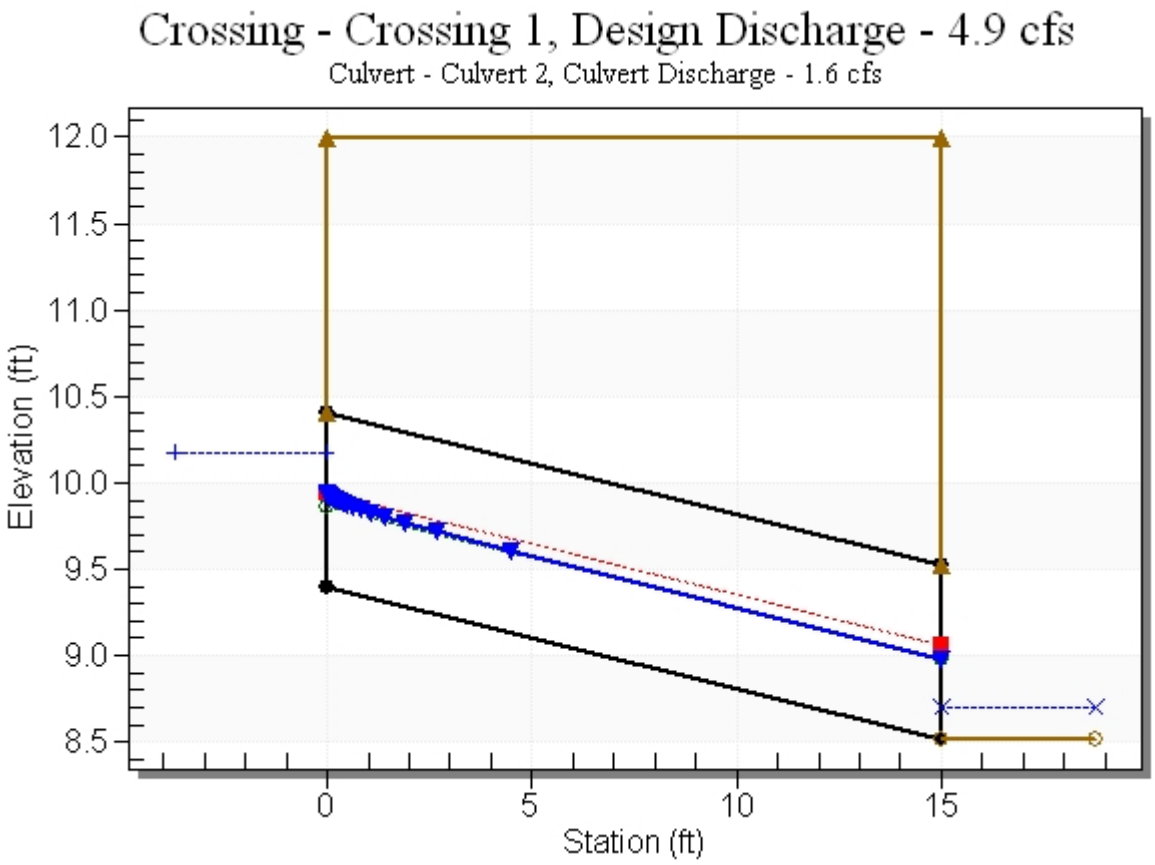
Culvert Length: 15.03 ft, Culvert Slope: 0.0587

****

Culvert Performance Curve Plot: Culvert 2



Water Surface Profile Plot for Culvert: Culvert 2



Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9.42 ft

Outlet Station: 15.00 ft

Outlet Elevation: 8.52 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 4 - Culvert Summary Table: Culvert 3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.40	0.80	9.85	0.446	0.0*	1-S2n	0.283	0.337	0.283	0.108	3.532	2.491
4.92	1.64	10.17	0.768	0.0*	1-S2n	0.459	0.542	0.459	0.184	4.506	3.464

* Full Flow Headwater elevation is below inlet invert.

****

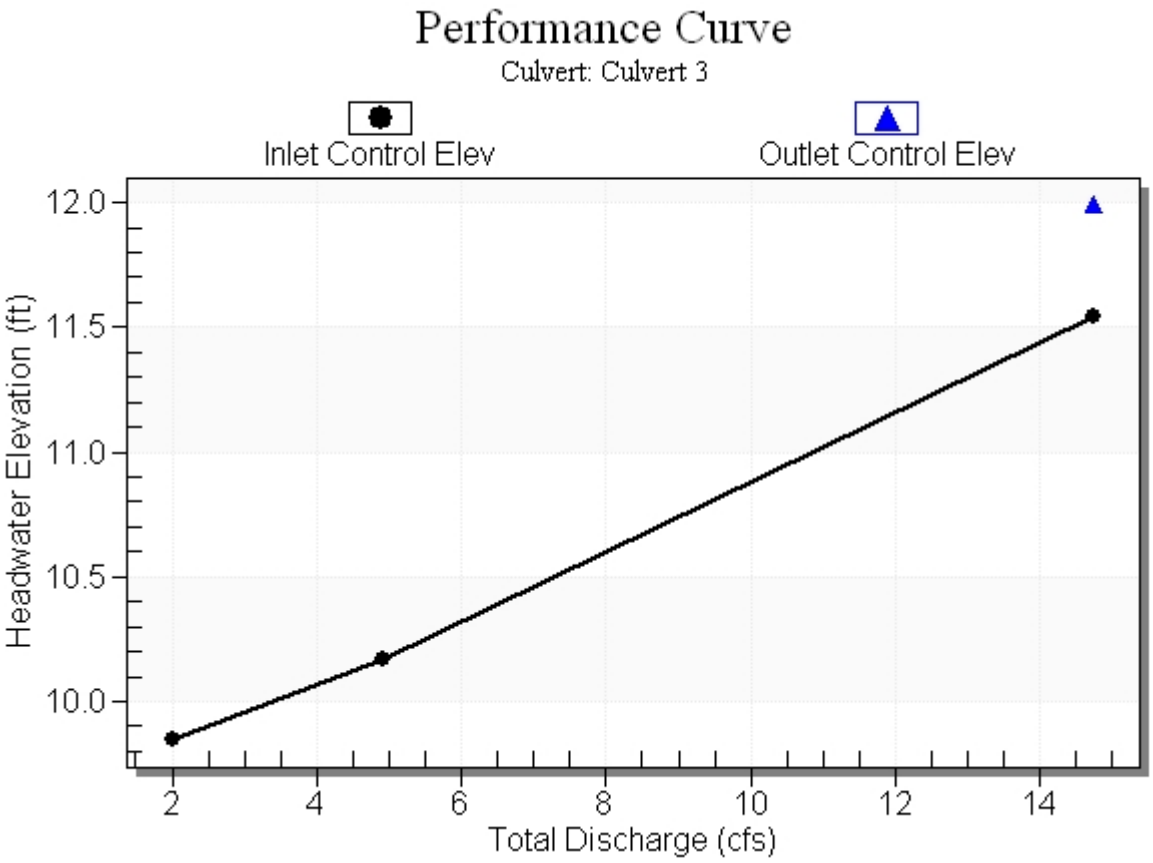
Straight Culvert

Inlet Elevation (invert): 9.42 ft, Outlet Elevation (invert): 8.52 ft

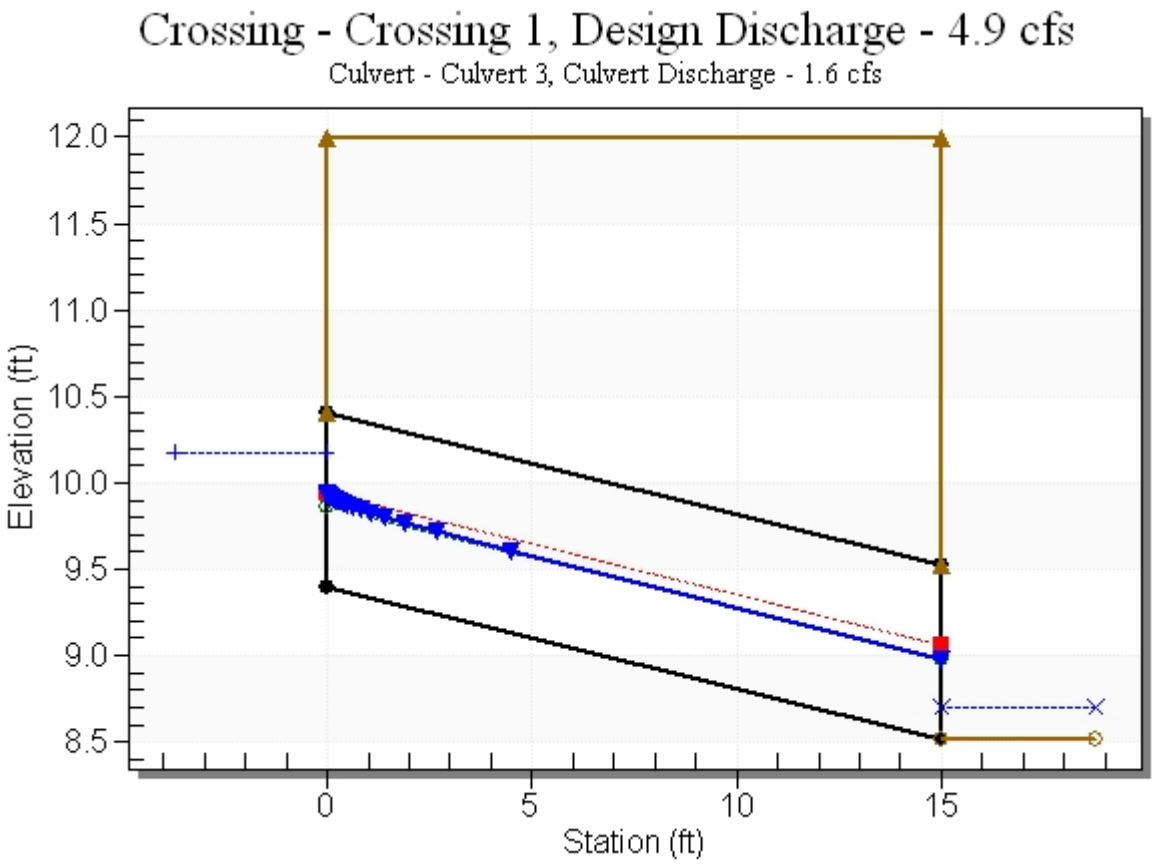
Culvert Length: 15.03 ft, Culvert Slope: 0.0587

****

Culvert Performance Curve Plot: Culvert 3



Water Surface Profile Plot for Culvert: Culvert 3



Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9.42 ft

Outlet Station: 15.00 ft

Outlet Elevation: 8.52 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 3

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated Aluminum

Embedment: 0.00 in

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 5 - Downstream Channel Rating Curve (Crossing: Crossing 1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
2.40	8.63	0.11	2.49	0.07	1.37
4.92	8.70	0.18	3.46	0.11	1.49

Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 7.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0130

Channel Invert Elevation: 8.52 ft

Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 12.00 ft

Crest Elevation: 12.00 ft

Roadway Surface: Gravel

Roadway Top Width: 15.00 ft

VENTURA COUNTY WATERSHED PROTECTION DISTRICT
TIME OF CONCENTRATION
TC Program Version: 2.64.0.37
Project: HUE02.5815
Date: 12:00:00 AM
Engineer: Dalton Cunicelli
Consultant: JDS

S U M M A R Y O F C O M P U T A T I O N S

Watershed Name: Existing Watershed

Name	Zone	Storm	Soil	Area (acres)	TC (min)
Temporary Parking Lot	REV2	10	3.00	33.7 / 34	TC ERROR
Temporary Parking Lot	REV2	25	3.00	33.7 / 34	TC ERROR
Temporary Parking Lot	REV2	50	3.00	33.7 / 34	27.911 / 28
Temporary Parking Lot	REV2	100	3.00	33.7 / 34	20.991 / 21

Watershed Name: Proposed Watershed

Sub-Area Name: Temporary Parking Lot
Computing Tc for all rainfall frequencies for sub-area Temporary Parking Lot...

Tc for frequency = 10.00: 41.363 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 41.363 min. = 41 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 10
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 1.039
C Total: 0.298
Sum Q Segments (cfs): 10.43
Q Total (cfs): 10.43
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 2,481.79
Time of Concentration (min): 41.363

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 41.3632
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038

Effective Slope: 0.0038
Q for Flow Path (cfs): 10.43
Avg Velocity (ft/s): 0.40
Passed Scour Check: YES
Scour Velocity (ft/sec): 1.56

Tc for frequency = 25.00: 32.625 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 32.625 min. = 33 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 25
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 1.345
C Total: 0.353
Sum Q Segments (cfs): 16.00
Q Total (cfs): 16.00
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 1,957.52
Time of Concentration (min): 32.625

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 32.6253
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038
Effective Slope: 0.0038
Q for Flow Path (cfs): 16.00
Avg Velocity (ft/s): 0.51
Passed Scour Check: YES
Scour Velocity (ft/sec): 1.74

Tc for frequency = 50.00: 27.911 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 27.911 min. = 28 min.

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 50
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 1.614
C Total: 0.380
Sum Q Segments (cfs): 20.71
Q Total (cfs): 20.71
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 1,674.64
Time of Concentration (min): 27.911

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 27.9107
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038
Effective Slope: 0.0038
Q for Flow Path (cfs): 20.71
Avg Velocity (ft/s): 0.60
Passed Scour Check: YES
Scour Velocity (ft/sec): 1.87

Tc for frequency = 100.00: 20.991 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 20.991 min. = 21 min.

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 100
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 2.011
C Total: 0.407
Sum Q Segments (cfs): 27.60
Q Total (cfs): 27.60
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 1,259.48
Time of Concentration (min): 20.991

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 20.9914
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038
Effective Slope: 0.0038
Q for Flow Path (cfs): 27.60
Avg Velocity (ft/s): 0.79
Passed Scour Check: YES
Scour Velocity (ft/sec): 2.02

VENTURA COUNTY WATERSHED PROTECTION DISTRICT
TIME OF CONCENTRATION
TC Program Version: 2.64.0.37
Project: HUE02.5815
Date: 12:00:00 AM
Engineer: Dalton Cunicelli
Consultant: JDS

S U M M A R Y O F C O M P U T A T I O N S

Watershed Name: Proposed Watershed

Name	Zone	Storm	Soil	Area (acres)	TC (min)
Temporary Parking Lot	REV2	10	3.00	33.7 / 34	TC ERROR
Temporary Parking Lot	REV2	25	3.00	33.7 / 34	TC ERROR
Temporary Parking Lot	REV2	50	3.00	33.7 / 34	27.911 / 28
Temporary Parking Lot	REV2	100	3.00	33.7 / 34	20.991 / 21

Watershed Name: Proposed Watershed

Sub-Area Name: Temporary Parking Lot
Computing Tc for all rainfall frequencies for sub-area Temporary Parking Lot...

Tc for frequency = 10.00: 41.363 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 41.363 min. = 41 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 10
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 1.039
C Total: 0.298
Sum Q Segments (cfs): 10.43
Q Total (cfs): 10.43
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 2,481.79
Time of Concentration (min): 41.363

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 41.3632
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038

Effective Slope: 0.0038
Q for Flow Path (cfs): 10.43
Avg Velocity (ft/s): 0.40
Passed Scour Check: YES
Scour Velocity (ft/sec): 1.56

Tc for frequency = 25.00: 32.625 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 32.625 min. = 33 min. ** TC ERROR **

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 25
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 1.345
C Total: 0.353
Sum Q Segments (cfs): 16.00
Q Total (cfs): 16.00
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 1,957.52
Time of Concentration (min): 32.625

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 32.6253
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038
Effective Slope: 0.0038
Q for Flow Path (cfs): 16.00
Avg Velocity (ft/s): 0.51
Passed Scour Check: YES
Scour Velocity (ft/sec): 1.74

Tc for frequency = 50.00: 27.911 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 27.911 min. = 28 min.

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 50
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
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Intensity (in/hr): 1.614
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Q Total (cfs): 20.71
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 1,674.64
Time of Concentration (min): 27.911

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 27.9107
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038
Effective Slope: 0.0038
Q for Flow Path (cfs): 20.71
Avg Velocity (ft/s): 0.60
Passed Scour Check: YES
Scour Velocity (ft/sec): 1.87

Tc for frequency = 100.00: 20.991 Minutes
DATA FOR SUB AREA 1

SUB AREA TIME OF CONCENTRATION: 20.991 min. = 21 min.

SUB AREA INPUT DATA

Sub Area Name: Temporary Parking Lot
Total Area (ac): 33.74
Flood Zone: 2
Rainfall Zone: REV2
Storm Frequency (years): 100
Development Type: Undeveloped
Soil Type: 3.00
Percent Impervious: 0
SUB AREA OUTPUT

Intensity (in/hr): 2.011
C Total: 0.407
Sum Q Segments (cfs): 27.60
Q Total (cfs): 27.60
Sum Percent Area (%): 100.0
Sum of Flow Path Travel Times (sec): 1,259.48
Time of Concentration (min): 20.991

DATA FOR FLOW PATH 1

Flow Path Name: FlowPath
FLOW PATH TRAVEL TIME (min): 20.9914
Flow Type: Overland
Length (ft): 1000
Top Elevation (ft): 11.5
Bottom Elevation (ft): 7.73
Contributing Area (acres): 33.74
Percent of Sub-Area (%): 100.0
Overland Type: Valley
Development Type: Undeveloped
Map Slope: 0.0038
Effective Slope: 0.0038
Q for Flow Path (cfs): 27.60
Avg Velocity (ft/s): 0.79
Passed Scour Check: YES
Scour Velocity (ft/sec): 2.02

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: HUE02.5815 10 yr

Project Description

VCRat version: 2.64.0.30
VCRain version: 201601
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: REV2: Oxnard Plain - Nyeland Drain
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: HUE02.5815 10 yr

Model Results

NODE ID	SOIL TYPE	RAIN ZONE	TC (MIN)	% IMP	SUBAREA DATA AND RESULTS AREA (AC)	SUBAREA DATA AND RESULTS FLOW (CFS)	ACCUMULATED DATA AREA (AC)	ACCUMULATED DATA FLOW (CFS)	ACCUMULATED DATA TIME (MIN)	ROUTING AFTER ACCUMULATION CHANNEL TYPE	LENGTH (FT)	SLOPE (FT/FT)	SIZE (FT)	H:V (Z)	N VALUES CHNL	N VALUES SIDES	VEL (FT/S)	DEPTH (FT)
1A	030	A10	30	0	34	13	34	13	1158	-------	----	-------	---	----	-----	-----	--	--
2A	---	---	--	--	---	---	34	13	1158	-------	----	-------	---	----	-----	-----	--	--

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 34 acres
HYDROGRAPH PEAK: 13 cfs
TIME OF PEAK: 1158 minutes
HYDROGRAPH VOLUME: 0.64 acre-ft

TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)
0	0.00	100	0.01	200	0.00	300	0.01	400	0.01
500	0.00	600	0.01	700	0.01	800	0.01	900	0.01
1000	0.02	1050	0.02	1100	0.03	1110	0.03	1120	0.76
1130	2.52	1131	2.67	1132	2.81	1133	2.92	1134	3.06
1135	3.17	1136	3.31	1137	3.41	1138	3.56	1139	3.66
1140	3.81	1141	3.93	1142	4.05	1143	4.17	1144	4.29
1145	4.64	1146	5.00	1147	5.36	1148	5.72	1149	7.12
1150	8.55	1151	9.93	1152	11.20	1153	12.52	1154	12.84
1155	12.94	1156	12.97	1157	13.04	1158	13.07	1159	13.06
1160	13.05	1161	12.98	1162	12.91	1163	12.87	1164	12.80
1165	12.61	1166	12.39	1167	12.17	1168	11.95	1169	11.77
1170	11.55	1171	11.29	1172	11.04	1173	10.74	1174	10.48
1175	10.01	1176	9.50	1177	8.91	1178	8.35	1179	6.72
1180	5.09	1181	3.50	1182	1.90	1183	0.31	1184	0.03
1185	0.03	1186	0.03	1187	0.03	1188	0.03	1189	0.03
1190	0.03	1191	0.03	1192	0.03	1193	0.02	1194	0.02
1195	0.02	1196	0.02	1197	0.02	1198	0.02	1199	0.02
1200	0.02	1201	0.02	1202	0.02	1203	0.02	1204	0.02
1205	0.02	1206	0.02	1207	0.02	1208	0.02	1209	0.02
1210	0.02	1211	0.02	1212	0.02	1213	0.02	1214	0.02
1215	0.02	1216	0.02	1217	0.02	1218	0.02	1219	0.02
1220	0.02	1221	0.02	1222	0.02	1223	0.02	1224	0.02
1225	0.02	1226	0.02	1227	0.02	1228	0.02	1229	0.01
1230	0.01	1231	0.01	1232	0.01	1233	0.01	1234	0.01
1235	0.01	1236	0.01	1237	0.01	1238	0.01	1239	0.01
1240	0.01	1241	0.01	1242	0.01	1243	0.01	1244	0.01
1245	0.01	1246	0.01	1247	0.01	1248	0.01	1249	0.01

1250	0.01	1251	0.01	1252	0.01	1253	0.01	1254	0.01
1255	0.01	1256	0.01	1257	0.01	1258	0.01	1259	0.01
1260	0.01	1261	0.01	1262	0.01	1263	0.01	1264	0.01
1265	0.01	1266	0.01	1267	0.01	1268	0.01	1269	0.01
1270	0.01	1271	0.01	1272	0.01	1273	0.01	1274	0.01
1275	0.01	1276	0.01	1277	0.01	1278	0.01	1279	0.01
1280	0.01	1281	0.01	1282	0.01	1283	0.01	1284	0.01
1285	0.01	1286	0.01	1287	0.01	1288	0.01	1289	0.01
1290	0.01	1291	0.01	1292	0.01	1293	0.01	1294	0.01
1295	0.01	1296	0.01	1297	0.01	1298	0.01	1299	0.01
1300	0.01	1310	0.01	1320	0.01	1330	0.01	1340	0.00
1350	0.01	1360	0.01	1370	0.01	1380	0.00	1390	0.01
1400	0.01	1420	0.00	1440	0.01	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: HUE02.5815 10 yr

VCRat Model Input

Model Lines

```
005     1  001A Header place holder
005     1  002A Header place holder
999
999
006     1  001A 030000003430A97                              G1
006     1  002A 010      099A97                            1  2
999
```

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: HUE02.5815 50 yr

Project Description

VCRat version: 2.64.0.30
VCRain version: 201601
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: REV2: Oxnard Plain - Nyeland Drain
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: HUE02.5815 50 yr

Model Results

NODE ID	SOIL TYPE	RAIN ZONE	TC (MIN)	% IMP	SUBAREA AREA (AC)	SUBAREA FLOW (CFS)	ACCUMULATED AREA (AC)	ACCUMULATED FLOW (CFS)	ACCUMULATED TIME (MIN)	ROUTING AFTER ACCUMULATION CHANNEL TYPE	LENGTH (FT)	SLOPE (FT/FT)	SIZE (FT)	H:V (Z)	N VALUES CHNL	N VALUES SIDES	VEL (FT/S)	DEPTH (FT)
1A	030	A50	28	1	34	21	34	21	1158	-------	----	-------	---	----	-----	-----	--	--
2A	---	---	--	--	---	---	34	21	1158	-------	----	-------	---	----	-----	-----	--	--

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 34 acres
HYDROGRAPH PEAK: 21 cfs
TIME OF PEAK: 1158 minutes
HYDROGRAPH VOLUME: 1.33 acre-ft

TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)
0	0.00	100	0.04	200	0.04	300	0.04	400	0.04
500	0.04	600	0.05	700	0.07	800	0.07	900	0.09
1000	0.12	1050	0.16	1100	0.74	1110	2.25	1120	4.64
1130	6.98	1131	7.18	1132	7.38	1133	7.57	1134	7.73
1135	7.92	1136	8.12	1137	8.32	1138	8.47	1139	8.58
1140	8.69	1141	8.84	1142	9.03	1143	9.22	1144	9.37
1145	9.91	1146	10.38	1147	10.87	1148	11.37	1149	13.19
1150	15.05	1151	16.88	1152	18.72	1153	20.49	1154	20.90
1155	21.04	1156	21.12	1157	21.16	1158	21.23	1159	21.16
1160	21.04	1161	20.97	1162	20.90	1163	20.82	1164	20.71
1165	20.42	1166	20.16	1167	19.90	1168	19.60	1169	19.27
1170	18.88	1171	18.49	1172	18.13	1173	17.43	1174	16.77
1175	16.06	1176	15.36	1177	13.23	1178	11.05	1179	8.77
1180	6.42	1181	4.12	1182	3.33	1183	2.82	1184	2.40
1185	2.03	1186	1.61	1187	1.27	1188	1.02	1189	0.60
1190	0.22	1191	0.19	1192	0.18	1193	0.18	1194	0.17
1195	0.17	1196	0.17	1197	0.16	1198	0.16	1199	0.16
1200	0.15	1201	0.15	1202	0.15	1203	0.14	1204	0.14
1205	0.14	1206	0.14	1207	0.14	1208	0.14	1209	0.13
1210	0.13	1211	0.13	1212	0.13	1213	0.13	1214	0.13
1215	0.12	1216	0.12	1217	0.12	1218	0.12	1219	0.12
1220	0.12	1221	0.12	1222	0.12	1223	0.12	1224	0.12
1225	0.12	1226	0.12	1227	0.12	1228	0.12	1229	0.11
1230	0.11	1231	0.11	1232	0.11	1233	0.10	1234	0.10
1235	0.10	1236	0.10	1237	0.10	1238	0.09	1239	0.09
1240	0.09	1241	0.09	1242	0.09	1243	0.09	1244	0.08
1245	0.08	1246	0.08	1247	0.08	1248	0.08	1249	0.07

1250	0.07	1251	0.07	1252	0.07	1253	0.07	1254	0.07
1255	0.07	1256	0.07	1257	0.07	1258	0.07	1259	0.07
1260	0.07	1261	0.07	1262	0.07	1263	0.07	1264	0.07
1265	0.07	1266	0.07	1267	0.07	1268	0.07	1269	0.07
1270	0.07	1271	0.07	1272	0.07	1273	0.07	1274	0.07
1275	0.07	1276	0.07	1277	0.07	1278	0.07	1279	0.07
1280	0.07	1281	0.07	1282	0.07	1283	0.07	1284	0.07
1285	0.07	1286	0.07	1287	0.07	1288	0.07	1289	0.07
1290	0.07	1291	0.07	1292	0.07	1293	0.07	1294	0.07
1295	0.07	1296	0.07	1297	0.07	1298	0.07	1299	0.06
1300	0.06	1310	0.05	1320	0.04	1330	0.04	1340	0.04
1350	0.04	1360	0.04	1370	0.04	1380	0.04	1390	0.04
1400	0.04	1420	0.04	1440	0.04	1460	0.01	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: HUE02.5815 50 yr

Page: 3

VCRat Model Input

Model Lines

```
005     1  001A Header place holder
005     1  002A Header place holder
999
999
006     1  001A 030001003428A97                              G1
006     1  002A 010      099A97                            1  2
999
```

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Modified Rational Model Results Report

Job: 1 Project: HUE02.5815 100 yr
Project Description

VCRat version: 2.64.0.30
VCRain version: 201601
DOS EXE version: PC 2.64-201605
VCRain Curve Set: VCWPD 2016 Revised Curve Set
Curve A: REV2: Oxnard Plain - Nyeland Drain
Curve B: None
Curve C: None
Curve D: None

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: HUE02.5815 100 yr

Model Results

NODE ID	SOIL TYPE	RAIN ZONE	TC (MIN)	% IMP	SUBAREA AREA (AC)	SUBAREA FLOW (CFS)	ACCUMULATED AREA (AC)	ACCUMULATED FLOW (CFS)	ACCUMULATED TIME (MIN)	ROUTING AFTER ACCUMULATION CHANNEL TYPE	LENGTH (FT)	SLOPE (FT/FT)	SIZE (FT)	H:V (Z)	N VALUES CHNL	N VALUES SIDES	VEL (FT/S)	DEPTH (FT)
1A	030	A100	21	1	34	28	34	28	1156	-------	----	-------	---	----	-----	-----	--	--
2A	---	---	--	--	---	---	34	28	1156	-------	----	-------	---	----	-----	-----	--	--

Issue/Warning Messages

TYPE	ERR NO	PROCEDURE	LOCATION	MESSAGE

NO ISSUES OR WARNINGS DETECTED

HYDROGRAPH PRINTOUT AT: 2A

TOTAL AREA TO HYDROGRAPH: 34 acres
HYDROGRAPH PEAK: 28 cfs
TIME OF PEAK: 1156 minutes
HYDROGRAPH VOLUME: 1.61 acre-ft

TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)	TIME (min)	FLOW (cfs)
0	0.00	100	0.04	200	0.04	300	0.04	400	0.04
500	0.04	600	0.05	700	0.07	800	0.07	900	0.10
1000	0.14	1050	0.18	1100	1.80	1110	4.04	1120	7.67
1130	9.61	1131	9.86	1132	10.02	1133	10.13	1134	10.28
1135	10.38	1136	10.53	1137	10.63	1138	10.73	1139	10.89
1140	10.99	1141	11.25	1142	11.47	1143	11.65	1144	11.88
1145	12.53	1146	13.23	1147	13.93	1148	14.58	1149	17.31
1150	19.94	1151	22.48	1152	25.02	1153	27.48	1154	28.08
1155	28.13	1156	28.18	1157	28.13	1158	28.18	1159	28.08
1160	27.93	1161	27.83	1162	27.58	1163	27.38	1164	27.18
1165	26.62	1166	25.67	1167	24.67	1168	23.66	1169	22.72
1170	19.76	1171	16.77	1172	13.73	1173	10.61	1174	7.34
1175	6.20	1176	5.63	1177	5.01	1178	4.45	1179	3.83
1180	3.38	1181	2.94	1182	2.43	1183	1.99	1184	1.48
1185	1.03	1186	0.92	1187	0.81	1188	0.70	1189	0.47
1190	0.20	1191	0.19	1192	0.19	1193	0.18	1194	0.18
1195	0.17	1196	0.17	1197	0.16	1198	0.16	1199	0.16
1200	0.16	1201	0.15	1202	0.15	1203	0.15	1204	0.15
1205	0.14	1206	0.14	1207	0.14	1208	0.14	1209	0.13
1210	0.13	1211	0.14	1212	0.14	1213	0.14	1214	0.13
1215	0.13	1216	0.14	1217	0.14	1218	0.13	1219	0.13
1220	0.14	1221	0.14	1222	0.14	1223	0.13	1224	0.13
1225	0.13	1226	0.13	1227	0.13	1228	0.12	1229	0.12
1230	0.12	1231	0.11	1232	0.11	1233	0.11	1234	0.11
1235	0.10	1236	0.10	1237	0.10	1238	0.09	1239	0.09
1240	0.09	1241	0.09	1242	0.08	1243	0.08	1244	0.08
1245	0.07	1246	0.07	1247	0.07	1248	0.07	1249	0.07
1250	0.07	1251	0.07	1252	0.07	1253	0.07	1254	0.07
1255	0.07	1256	0.07	1257	0.07	1258	0.07	1259	0.07

1260	0.07	1261	0.07	1262	0.07	1263	0.07	1264	0.07
1265	0.07	1266	0.07	1267	0.07	1268	0.07	1269	0.07
1270	0.07	1271	0.07	1272	0.07	1273	0.07	1274	0.07
1275	0.07	1276	0.07	1277	0.07	1278	0.07	1279	0.07
1280	0.07	1281	0.07	1282	0.07	1283	0.07	1284	0.07
1285	0.07	1286	0.07	1287	0.07	1288	0.07	1289	0.07
1290	0.07	1291	0.07	1292	0.07	1293	0.07	1294	0.07
1295	0.07	1296	0.07	1297	0.07	1298	0.07	1299	0.07
1300	0.07	1310	0.05	1320	0.04	1330	0.04	1340	0.04
1350	0.04	1360	0.04	1370	0.04	1380	0.04	1390	0.04
1400	0.04	1420	0.04	1440	0.04	1460	0.00	1500	0.00

Ventura County Watershed Protection District
Modified Rational Method Hydrology Program (VCRat v2.64)

Job: 1 Project: HUE02.5815 100 yr

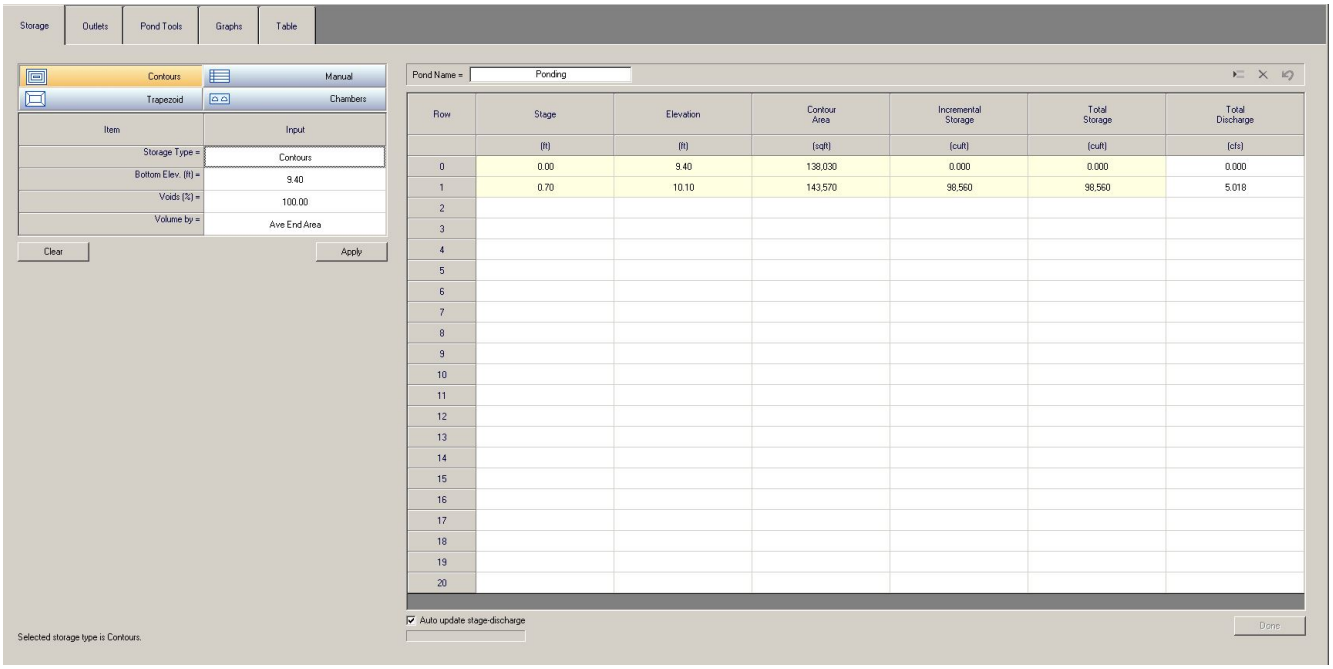
Page: 3

VCRat Model Input

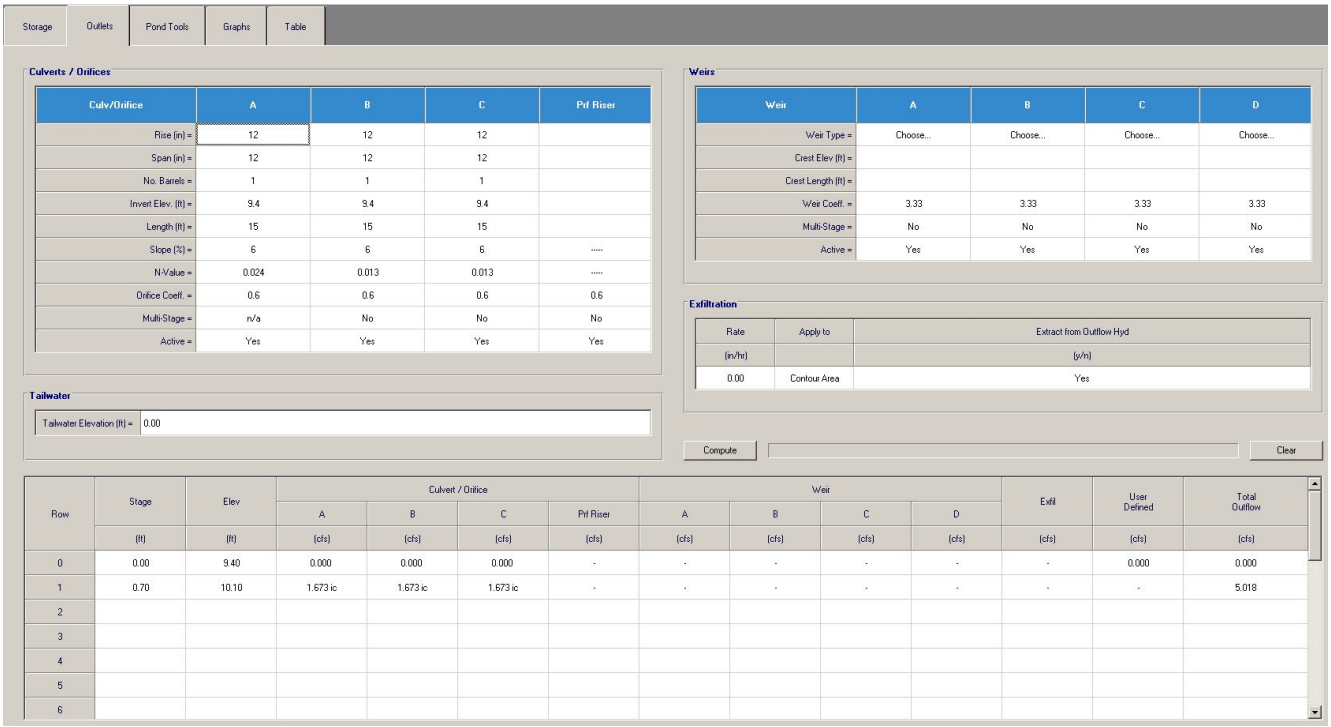
Model Lines

```
005     1  001A Header place holder
005     1  002A Header place holder
999
999
006     1  001A 030001003421A97                              G1
006     1  002A 010      099A97                            1  2
999
```

Detention Pond Input



Outlet Input



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	13.07	1	1157	28,003	----	------	------	<no description>
2	Reservoir	0.489	1	1182	18,791	1	9.59	27,194	<no description>

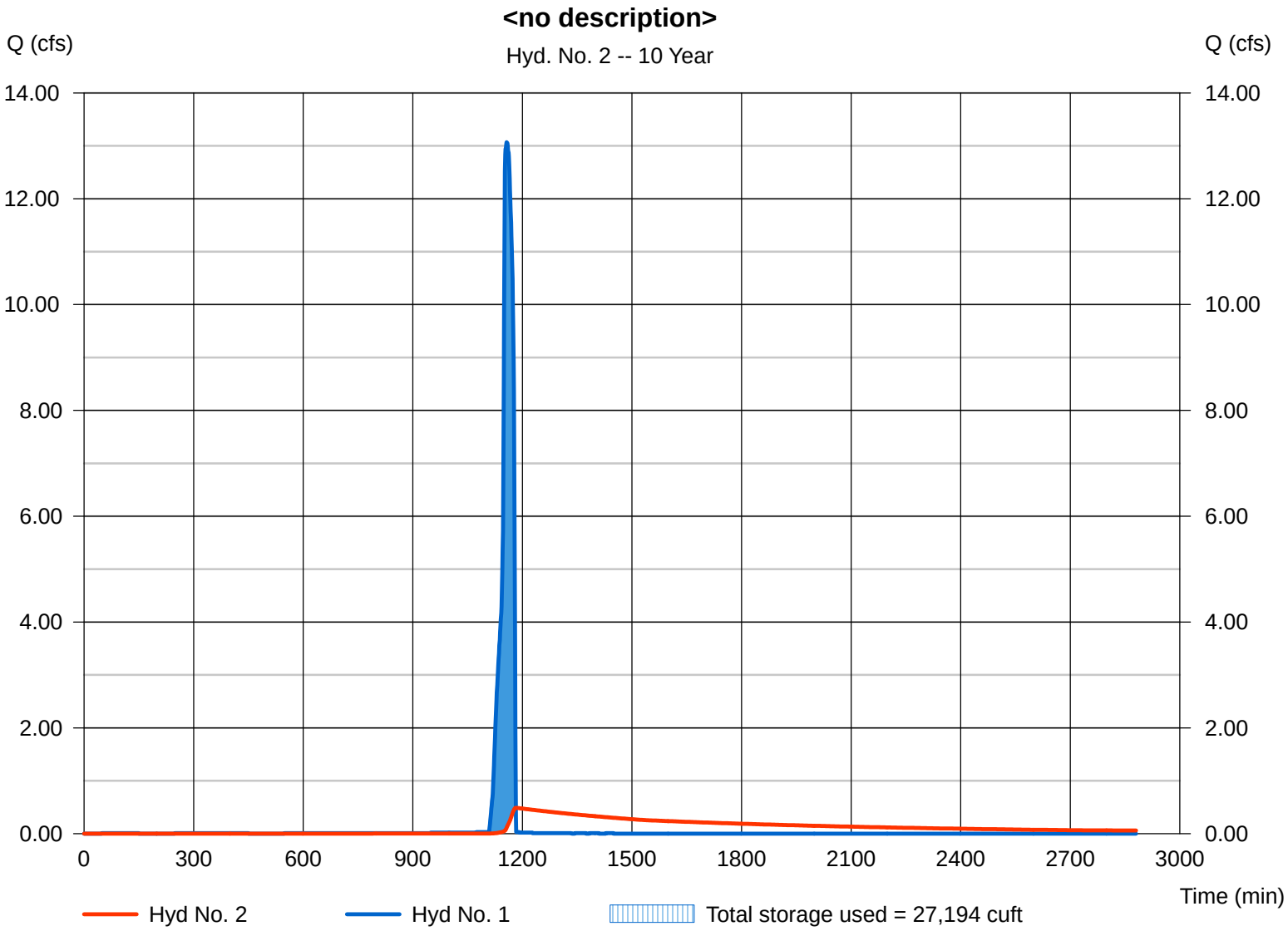
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	0.489 cfs
Storm frequency	=	10 yrs	Time to peak	=	1182 min
Time interval	=	1 min	Hyd. volume	=	18,791 cuft
Inflow hyd. No.	=	1 - <no description>	Max. Elevation	=	9.59 ft
Reservoir name	=	Ponding	Max. Storage	=	27,194 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	21.23	1	1157	57,930	----	------	------	<no description>
2	Reservoir	1.730	1	1185	46,585	1	9.78	53,383	<no description>

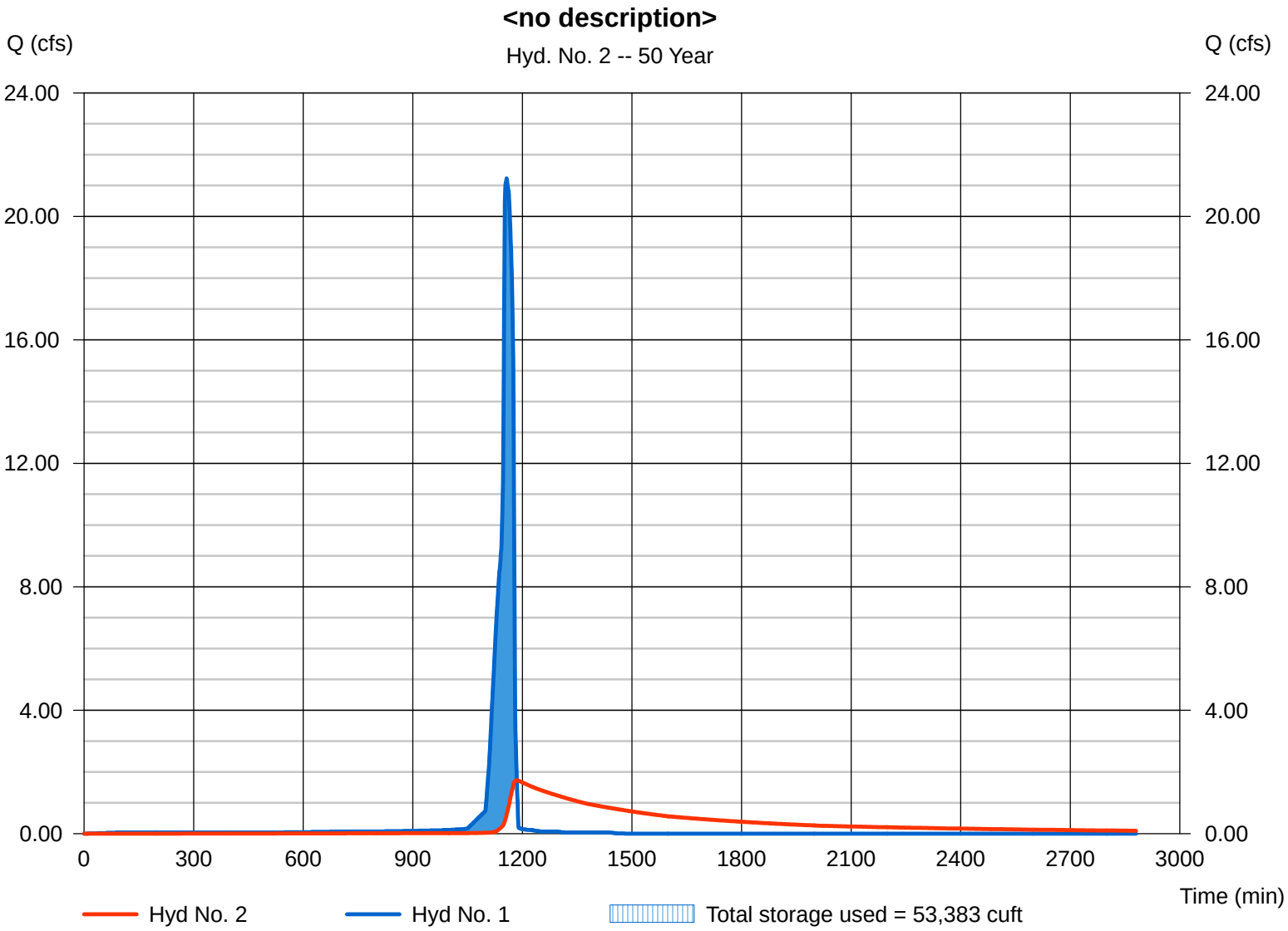
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	1.730 cfs
Storm frequency	=	50 yrs	Time to peak	=	1185 min
Time interval	=	1 min	Hyd. volume	=	46,585 cuft
Inflow hyd. No.	=	1 - <no description>	Max. Elevation	=	9.78 ft
Reservoir name	=	Ponding	Max. Storage	=	53,383 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Manual	28.18	1	1155	69,997	----	------	------	<no description>
2	Reservoir	2.402	1	1181	58,174	1	9.85	63,985	<no description>

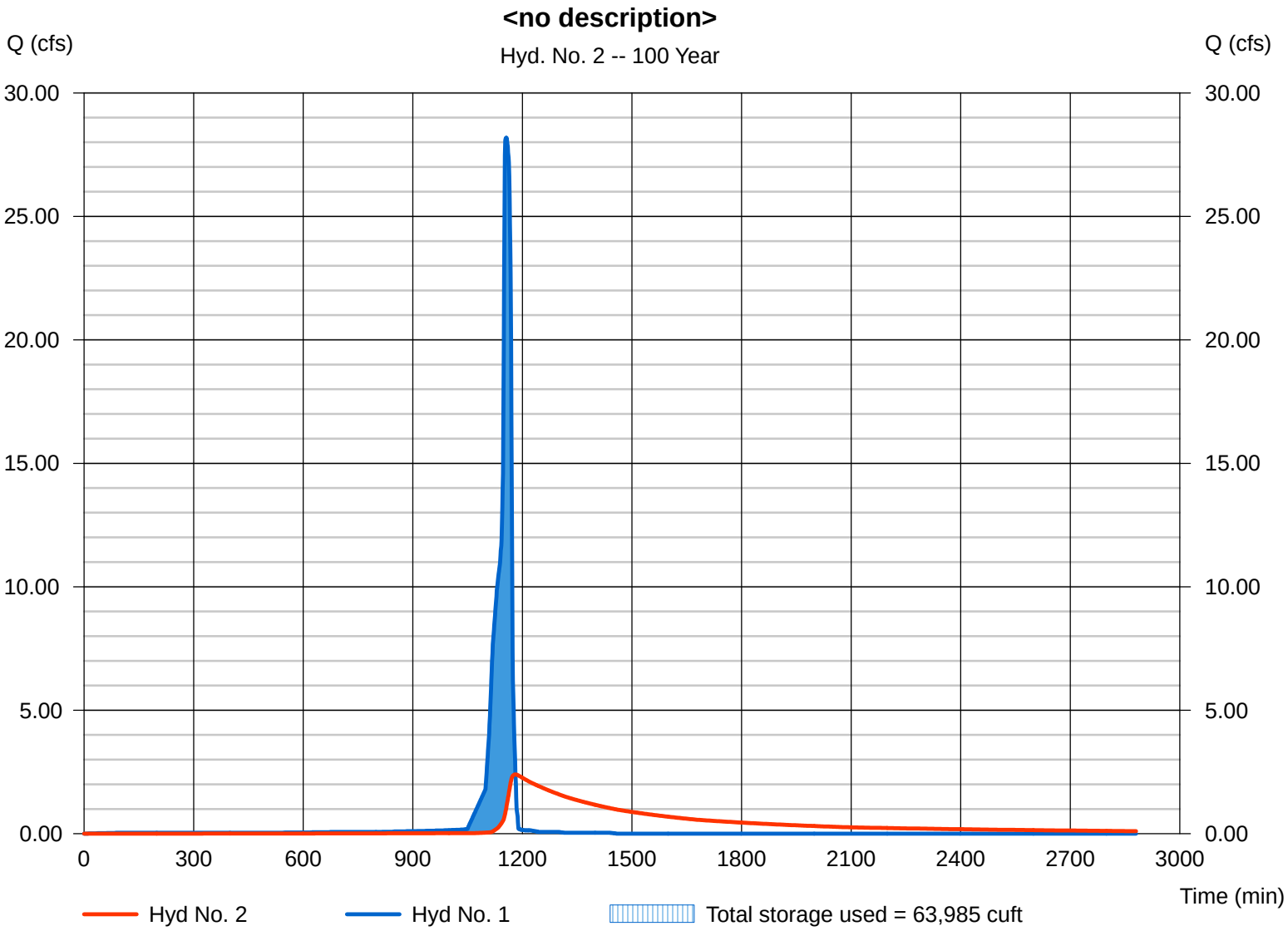
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	2.402 cfs
Storm frequency	=	100 yrs	Time to peak	=	1181 min
Time interval	=	1 min	Hyd. volume	=	58,174 cuft
Inflow hyd. No.	=	1 - <no description>	Max. Elevation	=	9.85 ft
Reservoir name	=	Ponding	Max. Storage	=	63,985 cuft

Storage Indication method used.

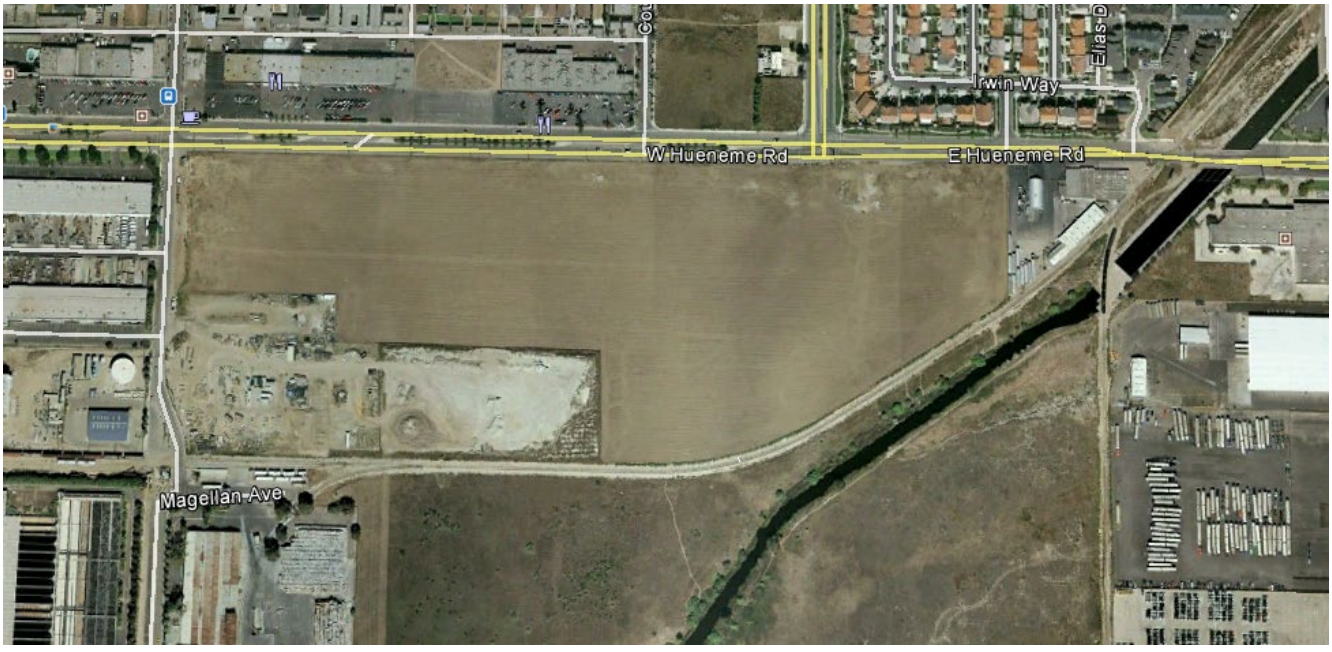


APPENDIX D

HISTORICAL PHOTOS

Aerial Photograph: April 2011

Aerial Photograph: October 2007



APPENDIX E

FEMA MAP

National Flood Hazard Layer FIRMette

FEMA

34°9'1.53"N

119°11'4.79"W

119°10'27.34"W

34°8'31.76"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/19/2019 at 12:42:41 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.