



# ALLARD ENGINEERING

civil engineering land surveying land planning

**W. Highland Ave. & Palm Avenue  
Residential**

**APN: 0285-211-21 & 0285-211-23**

## **Preliminary Drainage Report**

**October 12, 2021**

**Prepared For:**

**Warmington Residential  
3090 Pullman Street  
Costa Mesa, CA 92626  
Tel: (714) 557-5511**

**Prepared By:**

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**Prepared under the supervision of:**

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**Raymond J Allard, P.E. RCE 36052 Exp. 06-30-22**

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# Discussion

## *Introduction*

The tract at Highland Avenue & Palm Avenue (APN 0285-211-21 & 0285-211-23) comprises the site area of approximately 15.2 acre of the proposed 137-lot residential tract to the existing vacant undeveloped area with an existing residential building located in the City of San Bernardino, County of San Bernardino, State of California. The site lies north of Highland Avenue and west of Palm Avenue. In existing condition, the site drains to the southwest to Highland Avenue. In proposed developed condition the site drains via sheet flow, swales, onsite storm drains and "V" gutter into multiple of proposed Contech chamber system (5-total) and a retention/infiltration basin. The site outlets on surface in the existing condition and via storm drain system in proposed condition at the southwest corner of Highland Avenue and the water then follow the existing drainage pattern to convey to the existing master storm drain system in Highland Avenue and finally drains to the Baldrige Creek Channel (Concrete Channel, EHM).

## *Purpose*

The purpose of this Drainage Report is to assess the existing and proposed quantities and flows that affect the site and provide necessary flood protection.

## *Criteria*

The criteria utilized for hydrologic analysis is the San Bernardino County Hydrology Manual. Unit Hydrograph method was used to quantify the volume and Rational Method Hydrology was used to quantify the flows by utilizing the AES software.

## *Findings*

The site consists of a single drainage area of 15.2 acres, DA-1. During a storm event (upto 100-yr storm), most of the site drains into five proposed Contech chamber systems and a Retention/Infiltration Basin via concrete swale/storm drains/sheet flow at a slope of 1.0% to 2% and conveys to the proposed Contech chamber system and a retention/infiltration basin for low flow water volume (WQ) mitigation via infiltration. The proposed retention/infiltration basin is also use for detention of increase in water volume in developed condition for storm event 2-yr 24-hr. The outflow from retention/infiltration basin will be mitigated to its existing condition runoff flow rate to drain water to the existing master storm drain system (29"x42" conc. rectangular drain). For larger flow event (upto 100-yr 24-hr storm and/or the system failure, the water will overflow the proposed retention/infiltration basin via overflow riser grate and pipe to drains to Master Storm Drain System in Highland Ave which ultimately drains to the Baldrige Creek (Concrete Channel Segment) to the southwest corner of the site.

The proposed Contech Chamber Systems and the retention/infiltration basin were sized to retain & infiltrate the stormwater into subsoil (in 48 hr drawdown period) for the water quality water volume only. The retention/infiltration basin also be used for detention of water volume which is the difference between the generated water volume in developed and existing condition of the site for the

2-year 24-hour storm event (Volume calculated using the Unit Hydrograph method). The flow quantity (volume) calculation was based on the site imperviousness of 10% for existing condition (barren condition with a single existing house) & 60% for developed condition and for the 2-year 24-hour storm event. The proposed Contech Chamber Systems (5-total) and the retention/infiltration basin will retain/infiltrate and detain the quantity of water in excess of existing condition for storm event 2-year 24-hour. The estimated water volume to retain/detain is 57,619 cu-ft. (Difference of water volume between developed and existing condition using unit hydrograph method). The proposed 5 (Five) Contech Chamber System has a combined capacity of up to 31,500 cu-ft and the retention/infiltration basin has a detention capacity of 39,204 cu-ft of water to detain which include 16,411 cu-ft of water to infiltrate.

Therefore, total retention and detention volume provided by the proposed 5-unit Contech system and the basin will be 70,704 cu-ft which more than the required volume of 57,619 cu-ft for 2yr 24hr storm event. By detaining the increase in water volume in developed condition and attenuation of runoff through the basin the outflow from the basin will be mitigated and will remain the same or under as existing condition for 2yr 24hr storm event.

We also calculated the peak flow rate from the site in existing and developed condition for 2-yr storm event. Flow generation in existing and developed condition was calculation as 13.8 CFS & 7.3 CFS. There will be an increase of 6.5 CFS in peak flow which is about 89% of the existing peak flow rate. By building the 5 (five) Contech chamber systems and the retention/infiltration basin at the site which will attenuate the peak flow and to retain/infiltrate/detain will decrease the discharge rate of water in developed condition to its existing condition which will be conveys to the existing master storm drain system (29"x42" conc. rectangular drain) in Highland Avenue. Ultimately water will drain to the Baldrige Creek Channel (Conc. Channel, EHM).

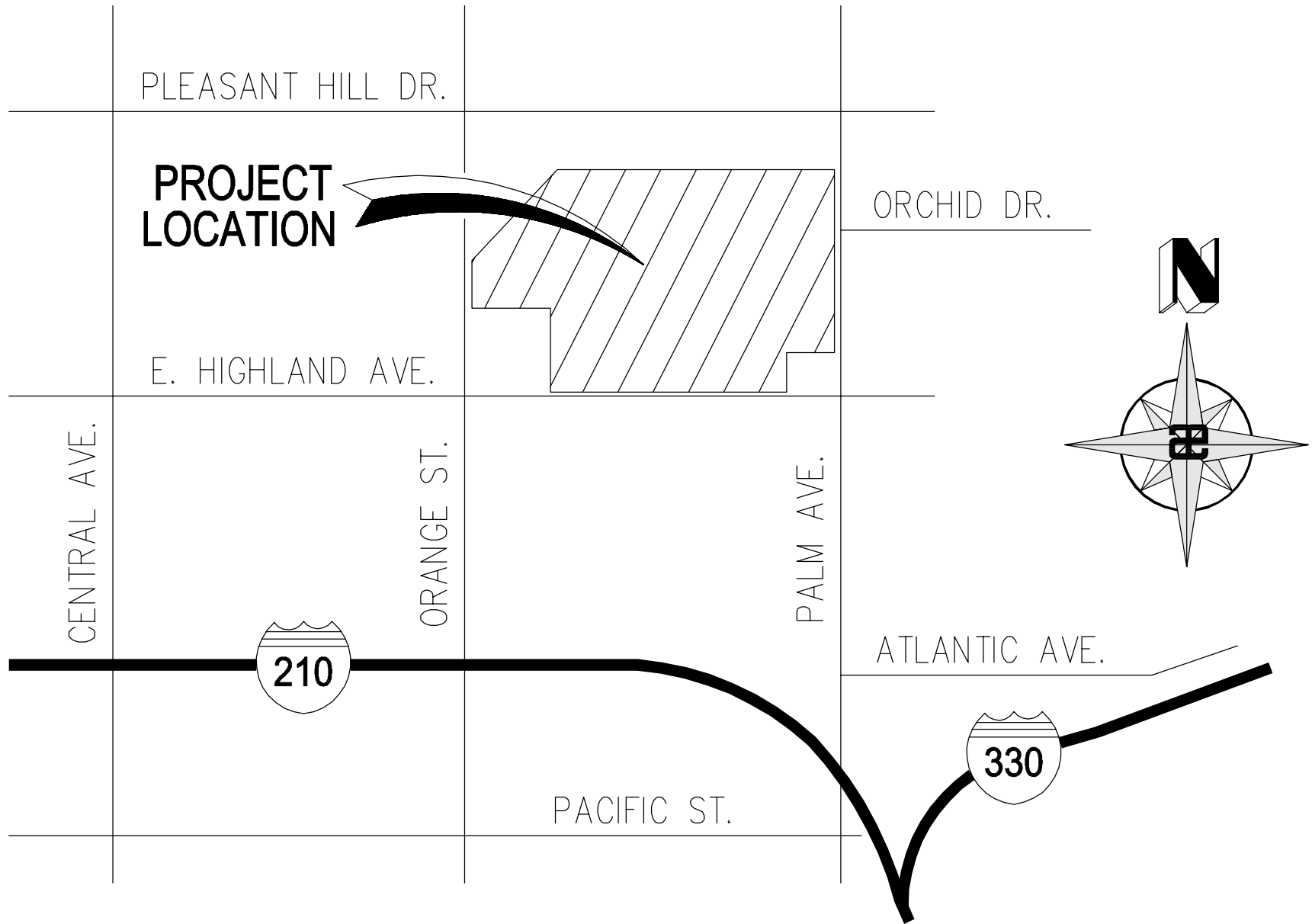
The flow from 100-yr storm will overflow the ret/inf basin-1 and conveys existing master storm drain system (29"x42" conc. rectangular drain) in Highland Avenue via riser grate inlet and pipe. Ultimately water will drain to the Baldrige Creek Channel (Conc. Channel, EHM).

Flow generation in existing and developed condition for 100-yr storm event was calculation as 46.7 CFS & 42.1 CFS. There will be an increase of 4.6 CFS in peak flow which is about 11% of the existing peak flow rate.

The proposed site is located within the tributary area of the Master Storm Drain System and was tabled to drain to the master storm drain system in its future developed condition. Therefore, the hydrologic condition of concern (HCOC) will be eliminated at this site.

See the City of San Bernardino Master Storm Drain Plan (City Map# 39) and the receiving water map.

Calculations and exhibits are attached to support these findings.



**PROJECT  
LOCATION**

# VICINITY MAP

NOT TO SCALE



**NOAA Atlas 14, Volume 6, Version 2**  
**Location name: Highland, California, USA\***  
**Latitude: 34.1366°, Longitude: -117.2108°**  
**Elevation: 1378.45 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**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>0.112</b> (0.093-0.137)	<b>0.147</b> (0.122-0.179)	<b>0.195</b> (0.162-0.238)	<b>0.236</b> (0.194-0.290)	<b>0.294</b> (0.233-0.374)	<b>0.342</b> (0.265-0.444)	<b>0.392</b> (0.297-0.523)	<b>0.447</b> (0.329-0.613)	<b>0.525</b> (0.371-0.752)	<b>0.590</b> (0.402-0.875)
<b>10-min</b>	<b>0.161</b> (0.134-0.196)	<b>0.211</b> (0.175-0.257)	<b>0.280</b> (0.232-0.341)	<b>0.338</b> (0.278-0.416)	<b>0.422</b> (0.335-0.537)	<b>0.489</b> (0.380-0.637)	<b>0.562</b> (0.426-0.749)	<b>0.640</b> (0.471-0.878)	<b>0.753</b> (0.531-1.08)	<b>0.846</b> (0.576-1.25)
<b>15-min</b>	<b>0.195</b> (0.162-0.237)	<b>0.255</b> (0.212-0.311)	<b>0.338</b> (0.280-0.413)	<b>0.409</b> (0.336-0.503)	<b>0.510</b> (0.405-0.649)	<b>0.592</b> (0.460-0.770)	<b>0.679</b> (0.515-0.906)	<b>0.774</b> (0.570-1.06)	<b>0.910</b> (0.642-1.30)	<b>1.02</b> (0.697-1.52)
<b>30-min</b>	<b>0.293</b> (0.243-0.356)	<b>0.384</b> (0.319-0.467)	<b>0.508</b> (0.421-0.620)	<b>0.615</b> (0.505-0.756)	<b>0.767</b> (0.608-0.976)	<b>0.890</b> (0.691-1.16)	<b>1.02</b> (0.774-1.36)	<b>1.16</b> (0.857-1.60)	<b>1.37</b> (0.965-1.96)	<b>1.54</b> (1.05-2.28)
<b>60-min</b>	<b>0.430</b> (0.358-0.523)	<b>0.564</b> (0.468-0.686)	<b>0.747</b> (0.618-0.911)	<b>0.903</b> (0.741-1.11)	<b>1.13</b> (0.893-1.43)	<b>1.31</b> (1.01-1.70)	<b>1.50</b> (1.14-2.00)	<b>1.71</b> (1.26-2.35)	<b>2.01</b> (1.42-2.88)	<b>2.26</b> (1.54-3.35)
<b>2-hr</b>	<b>0.619</b> (0.515-0.752)	<b>0.795</b> (0.660-0.967)	<b>1.03</b> (0.853-1.26)	<b>1.23</b> (1.01-1.51)	<b>1.50</b> (1.19-1.91)	<b>1.72</b> (1.34-2.24)	<b>1.95</b> (1.48-2.60)	<b>2.19</b> (1.61-3.00)	<b>2.52</b> (1.78-3.61)	<b>2.79</b> (1.90-4.14)
<b>3-hr</b>	<b>0.760</b> (0.632-0.923)	<b>0.968</b> (0.804-1.18)	<b>1.25</b> (1.03-1.52)	<b>1.48</b> (1.21-1.82)	<b>1.79</b> (1.42-2.28)	<b>2.04</b> (1.59-2.66)	<b>2.30</b> (1.74-3.06)	<b>2.57</b> (1.89-3.52)	<b>2.94</b> (2.07-4.21)	<b>3.23</b> (2.20-4.79)
<b>6-hr</b>	<b>1.06</b> (0.884-1.29)	<b>1.35</b> (1.12-1.64)	<b>1.73</b> (1.43-2.11)	<b>2.03</b> (1.67-2.50)	<b>2.45</b> (1.95-3.12)	<b>2.78</b> (2.16-3.61)	<b>3.11</b> (2.36-4.15)	<b>3.45</b> (2.54-4.74)	<b>3.92</b> (2.77-5.61)	<b>4.28</b> (2.92-6.35)
<b>12-hr</b>	<b>1.41</b> (1.17-1.71)	<b>1.81</b> (1.50-2.20)	<b>2.33</b> (1.93-2.84)	<b>2.75</b> (2.26-3.38)	<b>3.32</b> (2.64-4.23)	<b>3.76</b> (2.92-4.89)	<b>4.20</b> (3.18-5.60)	<b>4.65</b> (3.42-6.38)	<b>5.26</b> (3.71-7.53)	<b>5.73</b> (3.90-8.49)
<b>24-hr</b>	<b>1.90</b> (1.68-2.18)	<b>2.48</b> (2.19-2.86)	<b>3.24</b> (2.86-3.75)	<b>3.86</b> (3.37-4.50)	<b>4.68</b> (3.97-5.64)	<b>5.31</b> (4.41-6.53)	<b>5.95</b> (4.82-7.49)	<b>6.60</b> (5.20-8.54)	<b>7.47</b> (5.65-10.1)	<b>8.15</b> (5.96-11.4)
<b>2-day</b>	<b>2.34</b> (2.07-2.69)	<b>3.09</b> (2.74-3.57)	<b>4.08</b> (3.60-4.72)	<b>4.89</b> (4.28-5.70)	<b>5.99</b> (5.07-7.22)	<b>6.84</b> (5.67-8.41)	<b>7.70</b> (6.24-9.70)	<b>8.59</b> (6.77-11.1)	<b>9.80</b> (7.41-13.2)	<b>10.7</b> (7.85-15.0)
<b>3-day</b>	<b>2.54</b> (2.25-2.93)	<b>3.39</b> (3.00-3.91)	<b>4.51</b> (3.98-5.22)	<b>5.43</b> (4.75-6.33)	<b>6.70</b> (5.67-8.07)	<b>7.68</b> (6.38-9.45)	<b>8.69</b> (7.04-11.0)	<b>9.74</b> (7.68-12.6)	<b>11.2</b> (8.46-15.1)	<b>12.3</b> (9.01-17.2)
<b>4-day</b>	<b>2.73</b> (2.42-3.15)	<b>3.67</b> (3.24-4.23)	<b>4.91</b> (4.33-5.68)	<b>5.94</b> (5.20-6.92)	<b>7.36</b> (6.23-8.86)	<b>8.46</b> (7.02-10.4)	<b>9.61</b> (7.78-12.1)	<b>10.8</b> (8.51-14.0)	<b>12.4</b> (9.41-16.8)	<b>13.7</b> (10.0-19.2)

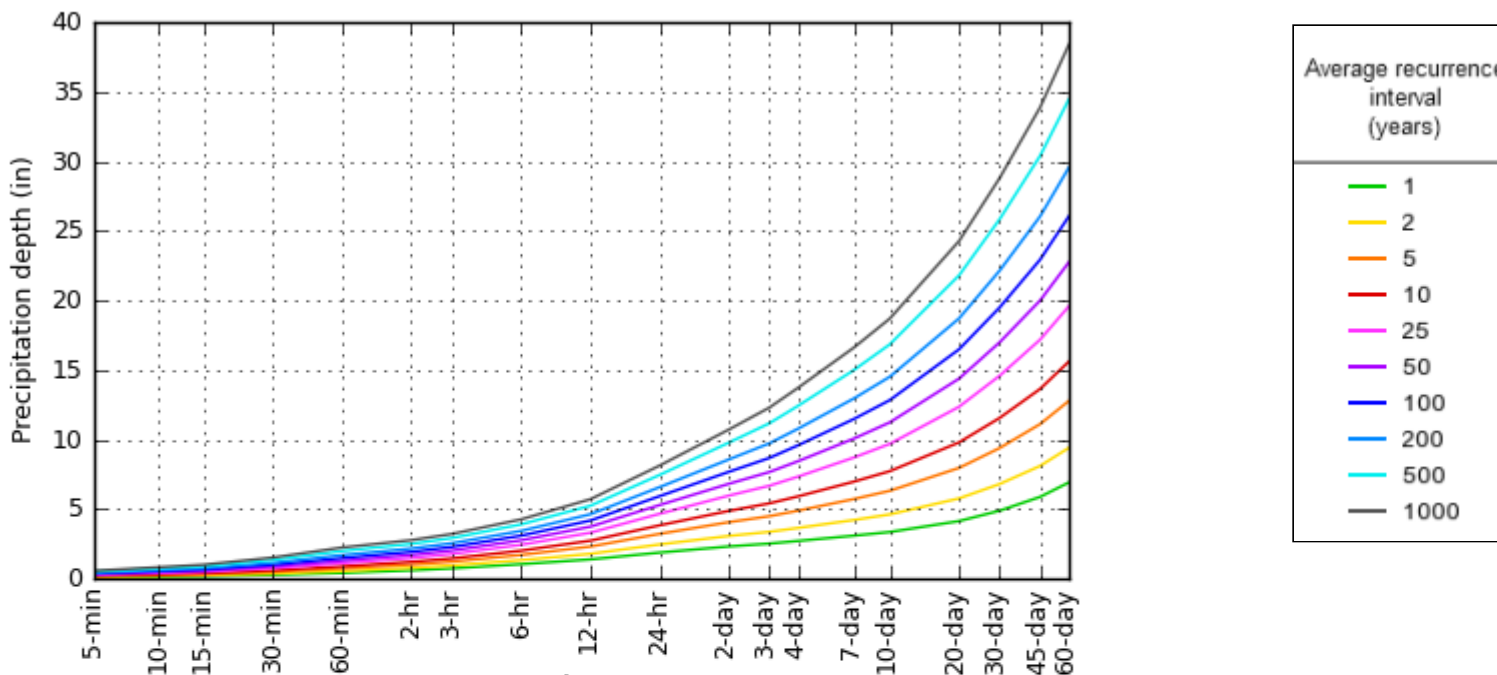
<b>7-day</b>	<b>3.11</b> (2.76-3.59)	<b>4.24</b> (3.75-4.89)	<b>5.75</b> (5.07-6.65)	<b>7.00</b> (6.12-8.16)	<b>8.73</b> (7.40-10.5)	<b>10.1</b> (8.38-12.4)	<b>11.5</b> (9.32-14.5)	<b>13.0</b> (10.2-16.8)	<b>15.0</b> (11.4-20.3)	<b>16.6</b> (12.2-23.2)
<b>10-day</b>	<b>3.37</b> (2.99-3.89)	<b>4.64</b> (4.10-5.35)	<b>6.33</b> (5.59-7.33)	<b>7.74</b> (6.78-9.03)	<b>9.71</b> (8.22-11.7)	<b>11.2</b> (9.33-13.8)	<b>12.8</b> (10.4-16.2)	<b>14.5</b> (11.4-18.8)	<b>16.9</b> (12.8-22.7)	<b>18.7</b> (13.7-26.1)
<b>20-day</b>	<b>4.16</b> (3.68-4.79)	<b>5.79</b> (5.12-6.68)	<b>7.98</b> (7.04-9.23)	<b>9.81</b> (8.59-11.4)	<b>12.4</b> (10.5-14.9)	<b>14.4</b> (11.9-17.7)	<b>16.5</b> (13.4-20.8)	<b>18.7</b> (14.8-24.2)	<b>21.8</b> (16.5-29.4)	<b>24.3</b> (17.8-33.9)
<b>30-day</b>	<b>4.90</b> (4.34-5.65)	<b>6.82</b> (6.03-7.87)	<b>9.40</b> (8.30-10.9)	<b>11.6</b> (10.1-13.5)	<b>14.6</b> (12.4-17.6)	<b>17.0</b> (14.1-20.9)	<b>19.5</b> (15.8-24.6)	<b>22.1</b> (17.5-28.7)	<b>25.8</b> (19.6-34.8)	<b>28.8</b> (21.1-40.2)
<b>45-day</b>	<b>5.90</b> (5.22-6.79)	<b>8.12</b> (7.18-9.37)	<b>11.1</b> (9.82-12.9)	<b>13.7</b> (11.9-15.9)	<b>17.2</b> (14.6-20.7)	<b>20.0</b> (16.6-24.6)	<b>22.9</b> (18.6-28.9)	<b>26.0</b> (20.5-33.7)	<b>30.4</b> (23.0-41.0)	<b>33.9</b> (24.8-47.3)
<b>60-day</b>	<b>6.93</b> (6.14-7.99)	<b>9.42</b> (8.33-10.9)	<b>12.8</b> (11.3-14.8)	<b>15.6</b> (13.7-18.2)	<b>19.6</b> (16.6-23.6)	<b>22.8</b> (18.9-28.0)	<b>26.1</b> (21.1-32.8)	<b>29.6</b> (23.3-38.3)	<b>34.5</b> (26.1-46.5)	<b>38.4</b> (28.1-53.5)

<sup>1</sup> 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

PDS-based depth-duration-frequency (DDF) curves  
Latitude: 34.1366°, Longitude: -117.2108°





## WQMP Project Report

### County of San Bernardino Stormwater Program

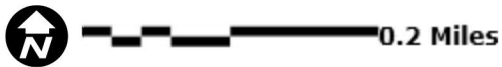
Santa Ana River Watershed Geodatabase

Thursday, July 22, 2021

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

<b>Project Site Parcel Number(s):</b>	028521123, 028521124, 028521105, 028521125, 028521122, 028521114, 028521121
<b>Project Site Acreage:</b>	15.186
<b>HCOC Exempt Area:</b>	No
<b>Closest Receiving Waters:</b> <small>(Applicant to verify based on local drainage facilities and topography.)</small>	<b>System Number - 701</b> <b>Facility Name - Baldrige Creek</b> <b>Owner - SBCFCD</b>
<b>Closest channel segment's susceptibility to Hydromodification:</b>	High
<b>Highest downstream hydromodification susceptibility:</b>	High
<b>Is this drainage segment subject to TMDLs?</b>	No
<b>Are there downstream drainage segments subject to TMDLs?</b>	No
<b>Is this drainage segment a 303d listed stream?</b>	No
<b>Are there 303d listed streams downstream?</b>	Yes
<b>Are there unlined downstream waterbodies?</b>	No
<b>Project Site Onsite Soil Group(s):</b>	A, B
<b>Environmentally Sensitive Areas within 200':</b>	None
<b>Groundwater Depth (FT):</b>	-386
<b>Parcels with potential septic tanks within 1000':</b>	No
<b>Known Groundwater Contamination Plumes within 1000':</b>	No
<b>Studies and Reports Related to Project Site:</b>	<a href="#">CSDP #6 Existing Facilities and Capacities</a> <a href="#">CSDP No. 6 Volume II</a> <a href="#">CSDP No. 6 Deficiency Analysis</a> <a href="#">CSDP No. 6 Deficiency Analysis</a> <a href="#">CSDP No. 6 Existing Facilities</a> <a href="#">CSDP No. 6 Proposed Master Planned Facilities</a> <a href="#">CSDP No. 6 Volume I</a> <a href="#">CSDP No. 7 Storm Drain Systems</a> <a href="#">CSDP No. 7 Storm Drain Systems</a> <a href="#">CSDP No. 7 Storm Drain Systems</a> <a href="#">CSDP No. 7 Storm Drain Hydraulic Design Data</a> <a href="#">SBVMWD High Groundwater / Pressure Zone Area</a>



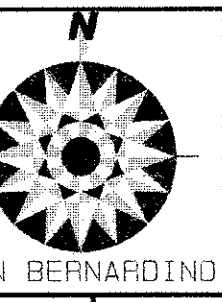


Site Address: [permitrack.sbcounty.gov/wap](http://permitrack.sbcounty.gov/wap)

County of San Bernardino  
 Stormwater Facility Mapping  
 Stormwater Map

STATUS:DRAFT

SEE MAP 31



REPRODUCTIONS AND/OR ALTERATIONS OF THIS MAP CAN BE OBTAINED FROM THE GEOGRAPHIC INFORMATION SYSTEMS DIVISION, DEPARTMENT OF THE CITY OF SAN BERNARDINO.

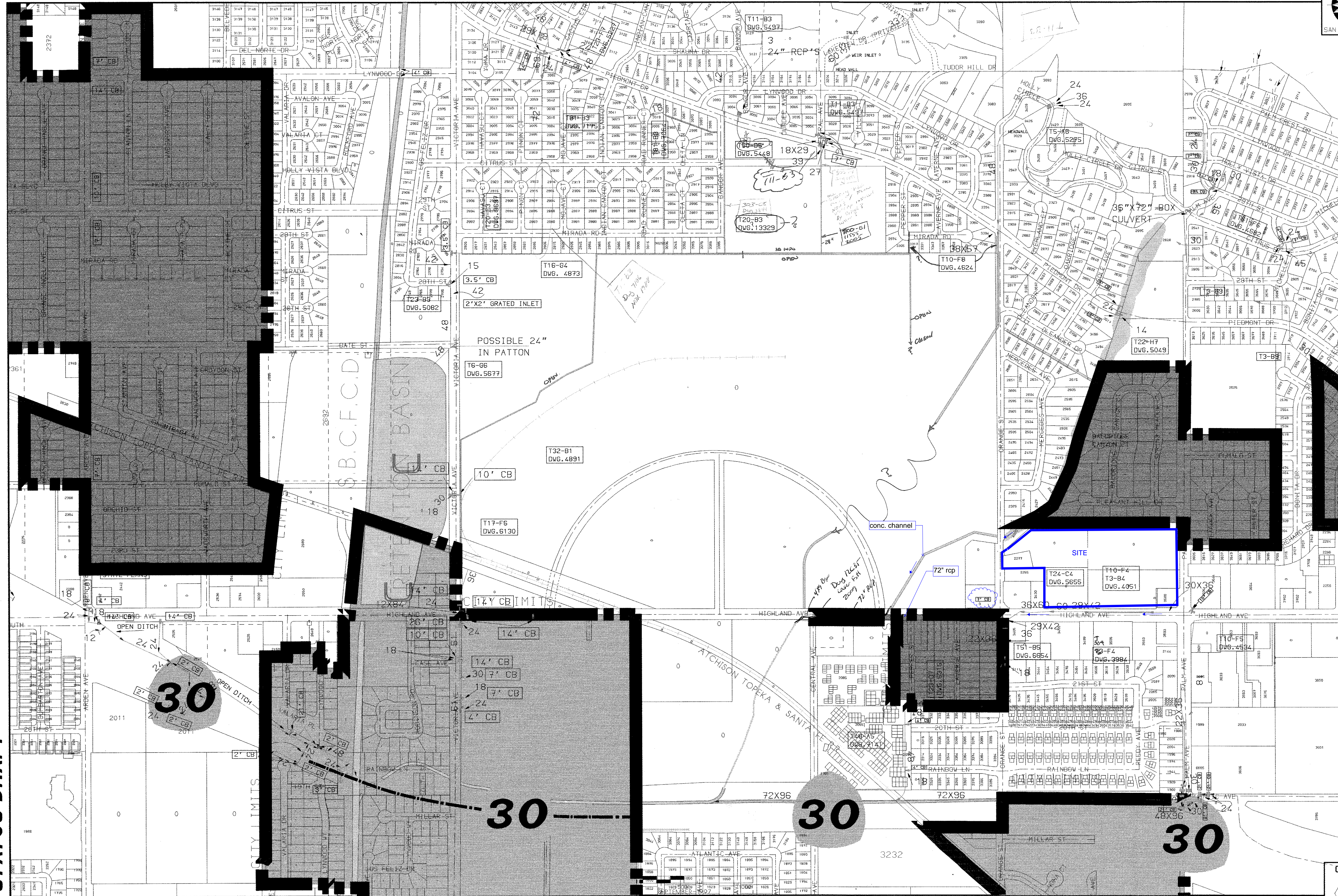
STATUS:DRAFT

SEE MAP 40

THIS MAP IS PROVIDED BY THE CITY OF SAN BERNARDINO. IT IS THE RESULT OF THE BEST AVAILABLE DATA AND SHOULD NOT BE USED FOR ENGINEERING DESIGN OR MEASUREMENT. THE CITY OF SAN BERNARDINO MAKES NO WARRANTY ON THE ACCURACY OR CONTENT OF THE DATA SHOWN ON THE MAP. THE MAP SHALL NOT BE REPRODUCED OR DISTRIBUTED.

CITY MAP

39



SEE MAP 38

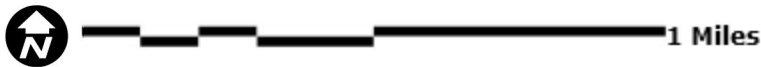
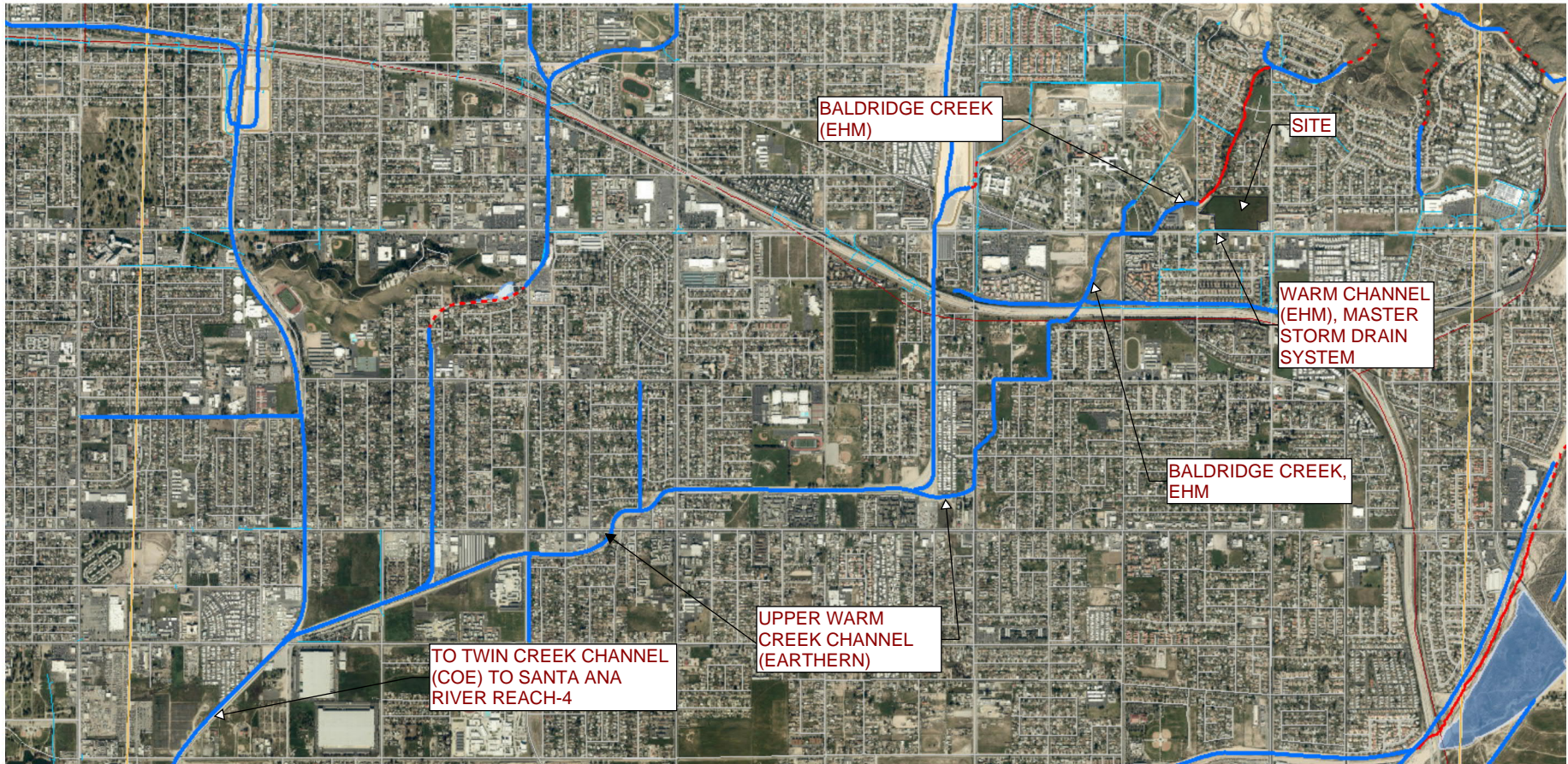
STATUS:DRAFT

24" 24 INCH PIPE

CATCH BASIN

NON-CITY PIPE SEE MAP 47

STORM DRAIN LOCATION MAPS



Site Address: [permitrack.sbcounty.gov/wap](http://permitrack.sbcounty.gov/wap)

County of San Bernardino  
 Stormwater Facility Mapping  
**Stormwater Map**

## HCOC WATER VOLUME CALCULATION 2-YR, 24 HR STORM EVENT

### HCOC Calculation (2-yr 24 hr Storm Event)

Water Volume in Developed Condition: 1.8227 ac-ft ~ 79,397 cu-ft  
Q<sub>peak</sub> (2yr storm) in Developed Condition: 13.8 cfs

Water Volume in Existing Condition: 0.500 ac-ft ~ 21,780 cu-ft  
Q<sub>peak</sub> (2yr storm) in Existing Condition: 7.3 cfs

Detention Volume Required: 57,619 cu-ft (79,397 - 21,780)

Detention Vol provided by 5 unit Contech Chamber System (Via retention/Infiltration): 31,500 cu-ft

Detention Vol provided by Retention/Infiltration Basin: 39,204 cu-ft

Total Detention Volume Provided: 70,704 cu-ft > 57,619 cu-ft required.

RATIONAL METHOD HYDROLOGY  
CALCULATION

**Developed Condition: 2-yr Storm Event**

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
(c) Copyright 1983-2016 Advanced Engineering Software (aes)  
Ver. 23.0 Release Date: 07/01/2016 License ID 1400

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* HIGHLAND/PALM AVE RESIDENTIAL \*  
\* 2-YEAR STORM EVENT \*  
\* DEVELOPED CONDITION \*  
\*\*\*\*\*

FILE NAME: PALM.DAT  
TIME/DATE OF STUDY: 15:06 10/08/2021

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000  
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.5640

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

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	WIDTH (FT)	CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

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

\*\*\*\*\*  
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<  
-----

INITIAL SUBAREA FLOW-LENGTH(FEET) = 2005.00  
ELEVATION DATA: UPSTREAM(FEET) = 1415.00 DOWNSTREAM(FEET) = 1366.00

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.448  
\* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.395  
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "8-10 DWELLINGS/ACRE"	A	15.20	0.98	0.400	32	16.45

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.400

SUBAREA RUNOFF(CFS) = 13.75  
TOTAL AREA(ACRES) = 15.20 PEAK FLOW RATE(CFS) = 13.75

=====  
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 15.2 TC(MIN.) = 16.45  
EFFECTIVE AREA(ACRES) = 15.20 AREA-AVERAGED Fm(INCH/HR)= 0.39  
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.400  
PEAK FLOW RATE(CFS) = 13.75

=====  
END OF RATIONAL METHOD ANALYSIS

# Existing Condition: 2-yr Storm Event

\*\*\*\*\*  
 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
 (c) Copyright 1983-2016 Advanced Engineering Software (aes)  
 Ver. 23.0 Release Date: 07/01/2016 License ID 1400

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
 \* HIGHLAND/PALM AVE RESIDENTIAL \*  
 \* 2-YEAR STORM EVENT \*  
 \* EXISTING CONDITION \*  
 \*\*\*\*\*

FILE NAME: PALM.DAT  
 TIME/DATE OF STUDY: 15:00 10/08/2021

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00  
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00  
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  
 \*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000  
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.5640

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

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	WIDTH (FT)	CROSSFALL (FT)	STREET- / SIDE / SIDE / WAY	CURB / IN- / OUT- / PARK- / HEIGHT (FT)	GUTTER / WIDTH (FT)	GEOMETRIES / LIP (FT)	MANNING / HIKE (FT)	FACTOR / (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:  
 1. Relative Flow-Depth = 0.00 FEET  
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)  
 2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*  
 \*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

-----  
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1331.00  
 ELEVATION DATA: UPSTREAM(FEET) = 1417.00 DOWNSTREAM(FEET) = 1360.00

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.250  
 \* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.407  
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL ".4 DWELLING/ACRE"	A	15.20	0.98	0.900	32	16.25

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.98  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.900



SUBAREA RUNOFF(CFS) = 7.25  
TOTAL AREA(ACRES) = 15.20 PEAK FLOW RATE(CFS) = 7.25

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 15.2 TC(MIN.) = 16.25  
EFFECTIVE AREA(ACRES) = 15.20 AREA-AVERAGED Fm(INCH/HR)= 0.88  
AREA-AVERAGED Fp(INCH/HR) = 0.98 AREA-AVERAGED Ap = 0.900  
PEAK FLOW RATE(CFS) = 7.25

=====

END OF RATIONAL METHOD ANALYSIS

UNIT HYDROGRAPH METHOD  
CALCULATION

**Developed Condition: 2-yr 24-HR Storm Event**

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0

Study date 10/08/21

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San Bernardino County Synthetic Unit Hydrology Method  
Manual date - August 1986

Program License Serial Number 6484

-----  
UH METHOD  
2YR 24HR DURATION STORM  
DEVELOPED CONDITION  
-----

Storm Event Year = 2

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:  
Sub-Area            Duration            Isohyetal  
(Ac.)                (hours)                (In)  
Rainfall data for year 2  
          15.20                1                0.56

-----  
Rainfall data for year 2  
          15.20                6                1.35

-----  
Rainfall data for year 2  
          15.20                24                2.48  
-----

+++++

\*\*\*\*\* Area-averaged max loss rate, Fm \*\*\*\*\*

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	15.20	1.000	0.978	0.400	0.391

Area-averaged adjusted loss rate Fm (In/Hr) = 0.391

\*\*\*\*\* Area-Averaged low loss rate fraction, Yb \*\*\*\*\*

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
6.08	0.400	32.0	32.0	12.40	0.000
9.12	0.600	98.0	98.0	0.20	0.908

Area-averaged catchment yield fraction, Y = 0.545

Area-averaged low loss fraction, Yb = 0.455

Direct entry of lag time by user

+++++

Watershed area = 15.20(Ac.)  
 Catchment Lag time = 0.219 hours  
 Unit interval = 5.000 minutes  
 Unit interval percentage of lag time = 38.0518  
 Hydrograph baseflow = 0.00(CFS)  
 Average maximum watershed loss rate(Fm) = 0.391(In/Hr)  
 Average low loss rate fraction (Yb) = 0.455 (decimal)  
 VALLEY DEVELOPED S-Graph Selected  
 Computed peak 5-minute rainfall = 0.268(In)  
 Computed peak 30-minute rainfall = 0.458(In)  
 Specified peak 1-hour rainfall = 0.564(In)  
 Computed peak 3-hour rainfall = 0.963(In)  
 Specified peak 6-hour rainfall = 1.350(In)  
 Specified peak 24-hour rainfall = 2.480(In)

Rainfall depth area reduction factors:

Using a total area of 15.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.267(In)
30-minute factor = 0.999	Adjusted rainfall = 0.458(In)
1-hour factor = 0.999	Adjusted rainfall = 0.564(In)
3-hour factor = 1.000	Adjusted rainfall = 0.963(In)
6-hour factor = 1.000	Adjusted rainfall = 1.350(In)
24-hour factor = 1.000	Adjusted rainfall = 2.480(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 183.82 (CFS))		
1	2.799	5.146
2	17.778	27.535
3	45.354	50.691
4	74.454	53.493
5	89.282	27.258
6	95.700	11.797
7	98.186	4.570
8	98.937	1.381
9	99.620	1.256
10	100.000	0.698

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2674	0.2674
2	0.3292	0.0618
3	0.3718	0.0426
4	0.4054	0.0335
5	0.4334	0.0281
6	0.4578	0.0244
7	0.4795	0.0217
8	0.4990	0.0196
9	0.5170	0.0179
10	0.5336	0.0166
11	0.5491	0.0155
12	0.5636	0.0145
13	0.5860	0.0224
14	0.6076	0.0216
15	0.6284	0.0208
16	0.6485	0.0201
17	0.6679	0.0195
18	0.6868	0.0189
19	0.7052	0.0184
20	0.7230	0.0179
21	0.7405	0.0174
22	0.7574	0.0170
23	0.7740	0.0166
24	0.7903	0.0162

25	0.8062	0.0159
26	0.8217	0.0156
27	0.8370	0.0153
28	0.8520	0.0150
29	0.8667	0.0147
30	0.8811	0.0144
31	0.8953	0.0142
32	0.9093	0.0140
33	0.9231	0.0137
34	0.9366	0.0135
35	0.9499	0.0133
36	0.9631	0.0131
37	0.9760	0.0129
38	0.9888	0.0128
39	1.0014	0.0126
40	1.0138	0.0124
41	1.0261	0.0123
42	1.0382	0.0121
43	1.0501	0.0120
44	1.0620	0.0118
45	1.0737	0.0117
46	1.0852	0.0116
47	1.0967	0.0114
48	1.1080	0.0113
49	1.1191	0.0112
50	1.1302	0.0111
51	1.1412	0.0110
52	1.1520	0.0108
53	1.1628	0.0107
54	1.1734	0.0106
55	1.1839	0.0105
56	1.1944	0.0104
57	1.2047	0.0103
58	1.2150	0.0103
59	1.2251	0.0102
60	1.2352	0.0101
61	1.2452	0.0100
62	1.2551	0.0099
63	1.2649	0.0098
64	1.2747	0.0097
65	1.2843	0.0097
66	1.2939	0.0096
67	1.3034	0.0095
68	1.3129	0.0094
69	1.3222	0.0094
70	1.3315	0.0093
71	1.3408	0.0092
72	1.3499	0.0092
73	1.3581	0.0082
74	1.3663	0.0081
75	1.3743	0.0081
76	1.3823	0.0080
77	1.3903	0.0080
78	1.3982	0.0079
79	1.4060	0.0078
80	1.4138	0.0078
81	1.4215	0.0077
82	1.4292	0.0077
83	1.4368	0.0076
84	1.4444	0.0076
85	1.4519	0.0075
86	1.4594	0.0075
87	1.4668	0.0074
88	1.4742	0.0074
89	1.4815	0.0073
90	1.4888	0.0073
91	1.4960	0.0072
92	1.5032	0.0072
93	1.5103	0.0071
94	1.5174	0.0071
95	1.5245	0.0071

96	1.5315	0.0070
97	1.5385	0.0070
98	1.5454	0.0069
99	1.5523	0.0069
100	1.5592	0.0069
101	1.5660	0.0068
102	1.5728	0.0068
103	1.5796	0.0067
104	1.5863	0.0067
105	1.5929	0.0067
106	1.5996	0.0066
107	1.6062	0.0066
108	1.6127	0.0066
109	1.6193	0.0065
110	1.6258	0.0065
111	1.6322	0.0065
112	1.6387	0.0064
113	1.6451	0.0064
114	1.6515	0.0064
115	1.6578	0.0063
116	1.6641	0.0063
117	1.6704	0.0063
118	1.6766	0.0062
119	1.6829	0.0062
120	1.6890	0.0062
121	1.6952	0.0062
122	1.7013	0.0061
123	1.7074	0.0061
124	1.7135	0.0061
125	1.7196	0.0060
126	1.7256	0.0060
127	1.7316	0.0060
128	1.7375	0.0060
129	1.7435	0.0059
130	1.7494	0.0059
131	1.7553	0.0059
132	1.7612	0.0059
133	1.7670	0.0058
134	1.7728	0.0058
135	1.7786	0.0058
136	1.7844	0.0058
137	1.7901	0.0057
138	1.7958	0.0057
139	1.8015	0.0057
140	1.8072	0.0057
141	1.8129	0.0057
142	1.8185	0.0056
143	1.8241	0.0056
144	1.8297	0.0056
145	1.8353	0.0056
146	1.8408	0.0055
147	1.8463	0.0055
148	1.8518	0.0055
149	1.8573	0.0055
150	1.8628	0.0055
151	1.8682	0.0054
152	1.8736	0.0054
153	1.8790	0.0054
154	1.8844	0.0054
155	1.8897	0.0054
156	1.8951	0.0053
157	1.9004	0.0053
158	1.9057	0.0053
159	1.9110	0.0053
160	1.9163	0.0053
161	1.9215	0.0052
162	1.9267	0.0052
163	1.9319	0.0052
164	1.9371	0.0052
165	1.9423	0.0052
166	1.9475	0.0052

167	1.9526	0.0051
168	1.9577	0.0051
169	1.9628	0.0051
170	1.9679	0.0051
171	1.9730	0.0051
172	1.9780	0.0051
173	1.9831	0.0050
174	1.9881	0.0050
175	1.9931	0.0050
176	1.9981	0.0050
177	2.0030	0.0050
178	2.0080	0.0050
179	2.0129	0.0049
180	2.0179	0.0049
181	2.0228	0.0049
182	2.0277	0.0049
183	2.0326	0.0049
184	2.0374	0.0049
185	2.0423	0.0049
186	2.0471	0.0048
187	2.0519	0.0048
188	2.0567	0.0048
189	2.0615	0.0048
190	2.0663	0.0048
191	2.0711	0.0048
192	2.0758	0.0048
193	2.0806	0.0047
194	2.0853	0.0047
195	2.0900	0.0047
196	2.0947	0.0047
197	2.0994	0.0047
198	2.1040	0.0047
199	2.1087	0.0047
200	2.1133	0.0046
201	2.1180	0.0046
202	2.1226	0.0046
203	2.1272	0.0046
204	2.1318	0.0046
205	2.1364	0.0046
206	2.1409	0.0046
207	2.1455	0.0046
208	2.1500	0.0045
209	2.1545	0.0045
210	2.1591	0.0045
211	2.1636	0.0045
212	2.1681	0.0045
213	2.1725	0.0045
214	2.1770	0.0045
215	2.1815	0.0045
216	2.1859	0.0044
217	2.1903	0.0044
218	2.1948	0.0044
219	2.1992	0.0044
220	2.2036	0.0044
221	2.2080	0.0044
222	2.2123	0.0044
223	2.2167	0.0044
224	2.2211	0.0044
225	2.2254	0.0043
226	2.2297	0.0043
227	2.2341	0.0043
228	2.2384	0.0043
229	2.2427	0.0043
230	2.2470	0.0043
231	2.2512	0.0043
232	2.2555	0.0043
233	2.2598	0.0043
234	2.2640	0.0042
235	2.2683	0.0042
236	2.2725	0.0042
237	2.2767	0.0042

238	2.2809	0.0042
239	2.2851	0.0042
240	2.2893	0.0042
241	2.2935	0.0042
242	2.2977	0.0042
243	2.3018	0.0042
244	2.3060	0.0042
245	2.3101	0.0041
246	2.3143	0.0041
247	2.3184	0.0041
248	2.3225	0.0041
249	2.3266	0.0041
250	2.3307	0.0041
251	2.3348	0.0041
252	2.3388	0.0041
253	2.3429	0.0041
254	2.3470	0.0041
255	2.3510	0.0040
256	2.3551	0.0040
257	2.3591	0.0040
258	2.3631	0.0040
259	2.3671	0.0040
260	2.3711	0.0040
261	2.3751	0.0040
262	2.3791	0.0040
263	2.3831	0.0040
264	2.3871	0.0040
265	2.3910	0.0040
266	2.3950	0.0040
267	2.3989	0.0039
268	2.4029	0.0039
269	2.4068	0.0039
270	2.4107	0.0039
271	2.4146	0.0039
272	2.4185	0.0039
273	2.4224	0.0039
274	2.4263	0.0039
275	2.4302	0.0039
276	2.4341	0.0039
277	2.4379	0.0039
278	2.4418	0.0039
279	2.4457	0.0038
280	2.4495	0.0038
281	2.4533	0.0038
282	2.4572	0.0038
283	2.4610	0.0038
284	2.4648	0.0038
285	2.4686	0.0038
286	2.4724	0.0038
287	2.4762	0.0038
288	2.4800	0.0038

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0038	0.0017	0.0021
2	0.0038	0.0017	0.0021
3	0.0038	0.0017	0.0021
4	0.0038	0.0017	0.0021
5	0.0038	0.0017	0.0021
6	0.0038	0.0017	0.0021
7	0.0038	0.0018	0.0021
8	0.0039	0.0018	0.0021
9	0.0039	0.0018	0.0021
10	0.0039	0.0018	0.0021
11	0.0039	0.0018	0.0021
12	0.0039	0.0018	0.0021
13	0.0039	0.0018	0.0021
14	0.0039	0.0018	0.0021
15	0.0039	0.0018	0.0021



16	0.0040	0.0018	0.0022
17	0.0040	0.0018	0.0022
18	0.0040	0.0018	0.0022
19	0.0040	0.0018	0.0022
20	0.0040	0.0018	0.0022
21	0.0040	0.0018	0.0022
22	0.0040	0.0018	0.0022
23	0.0040	0.0018	0.0022
24	0.0041	0.0018	0.0022
25	0.0041	0.0019	0.0022
26	0.0041	0.0019	0.0022
27	0.0041	0.0019	0.0022
28	0.0041	0.0019	0.0022
29	0.0041	0.0019	0.0023
30	0.0041	0.0019	0.0023
31	0.0042	0.0019	0.0023
32	0.0042	0.0019	0.0023
33	0.0042	0.0019	0.0023
34	0.0042	0.0019	0.0023
35	0.0042	0.0019	0.0023
36	0.0042	0.0019	0.0023
37	0.0042	0.0019	0.0023
38	0.0043	0.0019	0.0023
39	0.0043	0.0019	0.0023
40	0.0043	0.0020	0.0023
41	0.0043	0.0020	0.0023
42	0.0043	0.0020	0.0024
43	0.0043	0.0020	0.0024
44	0.0044	0.0020	0.0024
45	0.0044	0.0020	0.0024
46	0.0044	0.0020	0.0024
47	0.0044	0.0020	0.0024
48	0.0044	0.0020	0.0024
49	0.0044	0.0020	0.0024
50	0.0045	0.0020	0.0024
51	0.0045	0.0020	0.0024
52	0.0045	0.0020	0.0024
53	0.0045	0.0021	0.0025
54	0.0045	0.0021	0.0025
55	0.0046	0.0021	0.0025
56	0.0046	0.0021	0.0025
57	0.0046	0.0021	0.0025
58	0.0046	0.0021	0.0025
59	0.0046	0.0021	0.0025
60	0.0046	0.0021	0.0025
61	0.0047	0.0021	0.0025
62	0.0047	0.0021	0.0025
63	0.0047	0.0021	0.0026
64	0.0047	0.0022	0.0026
65	0.0048	0.0022	0.0026
66	0.0048	0.0022	0.0026
67	0.0048	0.0022	0.0026
68	0.0048	0.0022	0.0026
69	0.0048	0.0022	0.0026
70	0.0049	0.0022	0.0026
71	0.0049	0.0022	0.0027
72	0.0049	0.0022	0.0027
73	0.0049	0.0022	0.0027
74	0.0049	0.0023	0.0027
75	0.0050	0.0023	0.0027
76	0.0050	0.0023	0.0027
77	0.0050	0.0023	0.0027
78	0.0050	0.0023	0.0027
79	0.0051	0.0023	0.0028
80	0.0051	0.0023	0.0028
81	0.0051	0.0023	0.0028
82	0.0051	0.0023	0.0028
83	0.0052	0.0024	0.0028
84	0.0052	0.0024	0.0028
85	0.0052	0.0024	0.0028
86	0.0052	0.0024	0.0029

87	0.0053	0.0024	0.0029
88	0.0053	0.0024	0.0029
89	0.0053	0.0024	0.0029
90	0.0054	0.0024	0.0029
91	0.0054	0.0025	0.0029
92	0.0054	0.0025	0.0030
93	0.0055	0.0025	0.0030
94	0.0055	0.0025	0.0030
95	0.0055	0.0025	0.0030
96	0.0055	0.0025	0.0030
97	0.0056	0.0025	0.0030
98	0.0056	0.0026	0.0031
99	0.0057	0.0026	0.0031
100	0.0057	0.0026	0.0031
101	0.0057	0.0026	0.0031
102	0.0057	0.0026	0.0031
103	0.0058	0.0026	0.0032
104	0.0058	0.0026	0.0032
105	0.0059	0.0027	0.0032
106	0.0059	0.0027	0.0032
107	0.0059	0.0027	0.0032
108	0.0060	0.0027	0.0033
109	0.0060	0.0027	0.0033
110	0.0060	0.0028	0.0033
111	0.0061	0.0028	0.0033
112	0.0061	0.0028	0.0033
113	0.0062	0.0028	0.0034
114	0.0062	0.0028	0.0034
115	0.0063	0.0029	0.0034
116	0.0063	0.0029	0.0034
117	0.0064	0.0029	0.0035
118	0.0064	0.0029	0.0035
119	0.0065	0.0029	0.0035
120	0.0065	0.0030	0.0035
121	0.0066	0.0030	0.0036
122	0.0066	0.0030	0.0036
123	0.0067	0.0030	0.0036
124	0.0067	0.0031	0.0037
125	0.0068	0.0031	0.0037
126	0.0068	0.0031	0.0037
127	0.0069	0.0031	0.0038
128	0.0069	0.0032	0.0038
129	0.0070	0.0032	0.0038
130	0.0071	0.0032	0.0038
131	0.0071	0.0033	0.0039
132	0.0072	0.0033	0.0039
133	0.0073	0.0033	0.0040
134	0.0073	0.0033	0.0040
135	0.0074	0.0034	0.0040
136	0.0075	0.0034	0.0041
137	0.0076	0.0034	0.0041
138	0.0076	0.0035	0.0041
139	0.0077	0.0035	0.0042
140	0.0078	0.0035	0.0042
141	0.0079	0.0036	0.0043
142	0.0080	0.0036	0.0043
143	0.0081	0.0037	0.0044
144	0.0081	0.0037	0.0044
145	0.0092	0.0042	0.0050
146	0.0092	0.0042	0.0050
147	0.0094	0.0043	0.0051
148	0.0094	0.0043	0.0051
149	0.0096	0.0044	0.0052
150	0.0097	0.0044	0.0053
151	0.0098	0.0045	0.0053
152	0.0099	0.0045	0.0054
153	0.0101	0.0046	0.0055
154	0.0102	0.0046	0.0055
155	0.0103	0.0047	0.0056
156	0.0104	0.0048	0.0057
157	0.0106	0.0048	0.0058

158	0.0107	0.0049	0.0058
159	0.0110	0.0050	0.0060
160	0.0111	0.0050	0.0060
161	0.0113	0.0051	0.0062
162	0.0114	0.0052	0.0062
163	0.0117	0.0053	0.0064
164	0.0118	0.0054	0.0064
165	0.0121	0.0055	0.0066
166	0.0123	0.0056	0.0067
167	0.0126	0.0057	0.0069
168	0.0128	0.0058	0.0070
169	0.0131	0.0060	0.0072
170	0.0133	0.0061	0.0073
171	0.0137	0.0063	0.0075
172	0.0140	0.0064	0.0076
173	0.0144	0.0066	0.0079
174	0.0147	0.0067	0.0080
175	0.0153	0.0070	0.0083
176	0.0156	0.0071	0.0085
177	0.0162	0.0074	0.0088
178	0.0166	0.0076	0.0090
179	0.0174	0.0079	0.0095
180	0.0179	0.0081	0.0097
181	0.0189	0.0086	0.0103
182	0.0195	0.0089	0.0106
183	0.0208	0.0095	0.0113
184	0.0216	0.0098	0.0117
185	0.0145	0.0066	0.0079
186	0.0155	0.0070	0.0084
187	0.0179	0.0082	0.0098
188	0.0196	0.0089	0.0107
189	0.0244	0.0111	0.0133
190	0.0281	0.0128	0.0153
191	0.0426	0.0194	0.0232
192	0.0618	0.0282	0.0337
193	0.2674	0.0326	0.2348
194	0.0335	0.0153	0.0183
195	0.0217	0.0099	0.0118
196	0.0166	0.0076	0.0090
197	0.0224	0.0102	0.0122
198	0.0201	0.0092	0.0109
199	0.0184	0.0084	0.0100
200	0.0170	0.0077	0.0093
201	0.0159	0.0072	0.0087
202	0.0150	0.0068	0.0082
203	0.0142	0.0065	0.0077
204	0.0135	0.0062	0.0074
205	0.0129	0.0059	0.0070
206	0.0124	0.0057	0.0068
207	0.0120	0.0055	0.0065
208	0.0116	0.0053	0.0063
209	0.0112	0.0051	0.0061
210	0.0108	0.0049	0.0059
211	0.0105	0.0048	0.0057
212	0.0103	0.0047	0.0056
213	0.0100	0.0045	0.0054
214	0.0097	0.0044	0.0053
215	0.0095	0.0043	0.0052
216	0.0093	0.0042	0.0051
217	0.0082	0.0037	0.0045
218	0.0080	0.0036	0.0044
219	0.0078	0.0036	0.0043
220	0.0077	0.0035	0.0042
221	0.0075	0.0034	0.0041
222	0.0074	0.0034	0.0040
223	0.0072	0.0033	0.0039
224	0.0071	0.0032	0.0039
225	0.0070	0.0032	0.0038
226	0.0069	0.0031	0.0037
227	0.0067	0.0031	0.0037
228	0.0066	0.0030	0.0036

229	0.0065	0.0030	0.0036
230	0.0064	0.0029	0.0035
231	0.0063	0.0029	0.0035
232	0.0062	0.0028	0.0034
233	0.0062	0.0028	0.0034
234	0.0061	0.0028	0.0033
235	0.0060	0.0027	0.0033
236	0.0059	0.0027	0.0032
237	0.0058	0.0027	0.0032
238	0.0058	0.0026	0.0031
239	0.0057	0.0026	0.0031
240	0.0056	0.0026	0.0031
241	0.0056	0.0025	0.0030
242	0.0055	0.0025	0.0030
243	0.0054	0.0025	0.0030
244	0.0054	0.0024	0.0029
245	0.0053	0.0024	0.0029
246	0.0053	0.0024	0.0029
247	0.0052	0.0024	0.0028
248	0.0052	0.0023	0.0028
249	0.0051	0.0023	0.0028
250	0.0051	0.0023	0.0028
251	0.0050	0.0023	0.0027
252	0.0050	0.0023	0.0027
253	0.0049	0.0022	0.0027
254	0.0049	0.0022	0.0026
255	0.0048	0.0022	0.0026
256	0.0048	0.0022	0.0026
257	0.0047	0.0022	0.0026
258	0.0047	0.0021	0.0026
259	0.0047	0.0021	0.0025
260	0.0046	0.0021	0.0025
261	0.0046	0.0021	0.0025
262	0.0045	0.0021	0.0025
263	0.0045	0.0021	0.0025
264	0.0045	0.0020	0.0024
265	0.0044	0.0020	0.0024
266	0.0044	0.0020	0.0024
267	0.0044	0.0020	0.0024
268	0.0043	0.0020	0.0024
269	0.0043	0.0020	0.0023
270	0.0043	0.0019	0.0023
271	0.0042	0.0019	0.0023
272	0.0042	0.0019	0.0023
273	0.0042	0.0019	0.0023
274	0.0042	0.0019	0.0023
275	0.0041	0.0019	0.0022
276	0.0041	0.0019	0.0022
277	0.0041	0.0019	0.0022
278	0.0040	0.0018	0.0022
279	0.0040	0.0018	0.0022
280	0.0040	0.0018	0.0022
281	0.0040	0.0018	0.0022
282	0.0039	0.0018	0.0021
283	0.0039	0.0018	0.0021
284	0.0039	0.0018	0.0021
285	0.0039	0.0018	0.0021
286	0.0038	0.0017	0.0021
287	0.0038	0.0017	0.0021
288	0.0038	0.0017	0.0021

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Total soil rain loss = 1.04(In)  
Total effective rainfall = 1.44(In)  
Peak flow rate in flood hydrograph = 15.17(CFS)  
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24 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0001		0.01	Q				
0+10	0.0005		0.07	Q				
0+15	0.0017		0.17	Q				
0+20	0.0037		0.28	Q				
0+25	0.0060		0.34	Q				
0+30	0.0085		0.36	Q				
0+35	0.0111		0.38	Q				
0+40	0.0137		0.38	Q				
0+45	0.0163		0.38	Q				
0+50	0.0190		0.39	Q				
0+55	0.0217		0.39	Q				
1+ 0	0.0243		0.39	Q				
1+ 5	0.0270		0.39	Q				
1+10	0.0297		0.39	Q				
1+15	0.0324		0.39	Q				
1+20	0.0351		0.39	Q				
1+25	0.0378		0.39	Q				
1+30	0.0405		0.40	Q				
1+35	0.0433		0.40	Q				
1+40	0.0460		0.40	QV				
1+45	0.0487		0.40	QV				
1+50	0.0515		0.40	QV				
1+55	0.0543		0.40	QV				
2+ 0	0.0570		0.40	QV				
2+ 5	0.0598		0.40	QV				
2+10	0.0626		0.41	QV				
2+15	0.0654		0.41	QV				
2+20	0.0682		0.41	QV				
2+25	0.0710		0.41	QV				
2+30	0.0739		0.41	QV				
2+35	0.0767		0.41	QV				
2+40	0.0796		0.41	QV				
2+45	0.0824		0.42	QV				
2+50	0.0853		0.42	QV				
2+55	0.0882		0.42	QV				
3+ 0	0.0911		0.42	QV				
3+ 5	0.0940		0.42	Q V				
3+10	0.0969		0.42	Q V				
3+15	0.0998		0.42	Q V				
3+20	0.1027		0.43	Q V				
3+25	0.1057		0.43	Q V				
3+30	0.1086		0.43	Q V				
3+35	0.1116		0.43	Q V				
3+40	0.1146		0.43	Q V				
3+45	0.1175		0.43	Q V				
3+50	0.1205		0.44	Q V				
3+55	0.1235		0.44	Q V				
4+ 0	0.1266		0.44	Q V				
4+ 5	0.1296		0.44	Q V				
4+10	0.1326		0.44	Q V				
4+15	0.1357		0.44	Q V				
4+20	0.1388		0.45	Q V				
4+25	0.1418		0.45	Q V				
4+30	0.1449		0.45	Q V				
4+35	0.1480		0.45	Q V				
4+40	0.1511		0.45	Q V				
4+45	0.1543		0.45	Q V				
4+50	0.1574		0.46	Q V				
4+55	0.1606		0.46	Q V				
5+ 0	0.1637		0.46	Q V				
5+ 5	0.1669		0.46	Q V				
5+10	0.1701		0.46	Q V				
5+15	0.1733		0.47	Q V				
5+20	0.1765		0.47	Q V				
5+25	0.1798		0.47	Q V				
5+30	0.1830		0.47	Q V				
5+35	0.1863		0.47	Q V				

5+40	0.1895	0.48	Q	V
5+45	0.1928	0.48	Q	V
5+50	0.1961	0.48	Q	V
5+55	0.1995	0.48	Q	V
6+ 0	0.2028	0.48	Q	V
6+ 5	0.2061	0.49	Q	V
6+10	0.2095	0.49	Q	V
6+15	0.2129	0.49	Q	V
6+20	0.2163	0.49	Q	V
6+25	0.2197	0.50	Q	V
6+30	0.2231	0.50	Q	V
6+35	0.2266	0.50	Q	V
6+40	0.2300	0.50	Q	V
6+45	0.2335	0.51	Q	V
6+50	0.2370	0.51	Q	V
6+55	0.2405	0.51	Q	V
7+ 0	0.2441	0.51	Q	V
7+ 5	0.2476	0.52	Q	V
7+10	0.2512	0.52	Q	V
7+15	0.2548	0.52	Q	V
7+20	0.2584	0.52	Q	V
7+25	0.2620	0.53	Q	V
7+30	0.2656	0.53	Q	V
7+35	0.2693	0.53	Q	V
7+40	0.2730	0.53	Q	V
7+45	0.2767	0.54	Q	V
7+50	0.2804	0.54	Q	V
7+55	0.2841	0.54	Q	V
8+ 0	0.2879	0.55	Q	V
8+ 5	0.2917	0.55	Q	V
8+10	0.2955	0.55	Q	V
8+15	0.2993	0.56	Q	V
8+20	0.3032	0.56	Q	V
8+25	0.3071	0.56	Q	V
8+30	0.3110	0.57	Q	V
8+35	0.3149	0.57	Q	V
8+40	0.3188	0.57	Q	V
8+45	0.3228	0.58	Q	V
8+50	0.3268	0.58	Q	V
8+55	0.3308	0.58	Q	V
9+ 0	0.3349	0.59	Q	V
9+ 5	0.3389	0.59	Q	V
9+10	0.3430	0.60	Q	V
9+15	0.3472	0.60	Q	V
9+20	0.3513	0.60	Q	V
9+25	0.3555	0.61	Q	V
9+30	0.3597	0.61	Q	V
9+35	0.3639	0.62	Q	V
9+40	0.3682	0.62	Q	V
9+45	0.3725	0.62	Q	V
9+50	0.3768	0.63	Q	V
9+55	0.3812	0.63	Q	V
10+ 0	0.3856	0.64	Q	V
10+ 5	0.3900	0.64	Q	V
10+10	0.3945	0.65	Q	V
10+15	0.3990	0.65	Q	V
10+20	0.4035	0.66	Q	V
10+25	0.4081	0.66	Q	V
10+30	0.4127	0.67	Q	V
10+35	0.4173	0.67	Q	V
10+40	0.4220	0.68	Q	V
10+45	0.4267	0.69	Q	V
10+50	0.4315	0.69	Q	V
10+55	0.4363	0.70	Q	V
11+ 0	0.4411	0.70	Q	V
11+ 5	0.4460	0.71	Q	V
11+10	0.4509	0.72	Q	V
11+15	0.4559	0.72	Q	V
11+20	0.4609	0.73	Q	V
11+25	0.4660	0.74	Q	V
11+30	0.4711	0.74	Q	V

11+35	0.4763	0.75	Q	V				
11+40	0.4815	0.76	Q	V				
11+45	0.4868	0.77	Q	V				
11+50	0.4921	0.77	Q	V				
11+55	0.4975	0.78	Q	V				
12+ 0	0.5030	0.79	Q	V				
12+ 5	0.5085	0.80	Q	V				
12+10	0.5142	0.82	Q	V				
12+15	0.5201	0.86	Q	V				
12+20	0.5263	0.90	Q	V				
12+25	0.5326	0.92	Q	V				
12+30	0.5390	0.94	Q	V				
12+35	0.5456	0.95	Q	V				
12+40	0.5522	0.96	Q	V				
12+45	0.5589	0.97	Q	V				
12+50	0.5656	0.98	Q	V				
12+55	0.5725	1.00	Q	V				
13+ 0	0.5795	1.01	Q	V				
13+ 5	0.5865	1.02	Q	V				
13+10	0.5936	1.04	Q	V				
13+15	0.6009	1.05	Q	V				
13+20	0.6082	1.07	Q	V				
13+25	0.6157	1.08	Q	V				
13+30	0.6232	1.10	Q	V				
13+35	0.6309	1.12	Q	V				
13+40	0.6387	1.13	Q	V				
13+45	0.6467	1.15	Q	V				
13+50	0.6547	1.17	Q	V				
13+55	0.6630	1.19	Q	V				
14+ 0	0.6713	1.22	Q	V				
14+ 5	0.6799	1.24	Q	V				
14+10	0.6886	1.26	Q	V				
14+15	0.6975	1.29	Q	V				
14+20	0.7065	1.32	Q	V				
14+25	0.7158	1.35	Q	V				
14+30	0.7253	1.38	Q	V				
14+35	0.7351	1.41	Q	V				
14+40	0.7451	1.45	Q	V				
14+45	0.7553	1.49	Q	V				
14+50	0.7659	1.53	Q	V				
14+55	0.7768	1.58	Q	V				
15+ 0	0.7881	1.63	Q	V				
15+ 5	0.7997	1.69	Q	V				
15+10	0.8118	1.75	Q	V				
15+15	0.8243	1.82	Q	V				
15+20	0.8375	1.91	Q	V				
15+25	0.8511	1.97	Q	V				
15+30	0.8645	1.95	Q	V				
15+35	0.8770	1.82	Q	V				
15+40	0.8888	1.71	Q	V				
15+45	0.9008	1.75	Q	V				
15+50	0.9141	1.92	Q	V				
15+55	0.9294	2.22	Q	V				
16+ 0	0.9485	2.77	Q	V				
16+ 5	0.9808	4.69	Q	V				
16+10	1.0508	10.16	Q	V				
16+15	1.1553	15.17		V				Q
16+20	1.2597	15.16		V				Q
16+25	1.3205	8.84		Q				V
16+30	1.3547	4.96		Q				V
16+35	1.3764	3.15	Q					V
16+40	1.3928	2.38	Q					V
16+45	1.4082	2.23	Q					V
16+50	1.4217	1.97	Q					V
16+55	1.4334	1.70	Q					V
17+ 0	1.4443	1.58	Q					V
17+ 5	1.4546	1.50	Q					V
17+10	1.4644	1.42	Q					V
17+15	1.4737	1.35	Q					V
17+20	1.4826	1.29	Q					V
17+25	1.4911	1.24	Q					V

17+30	1.4994	1.19	Q			V	
17+35	1.5073	1.15	Q			V	
17+40	1.5150	1.12	Q			V	
17+45	1.5224	1.08	Q			V	
17+50	1.5297	1.05	Q			V	
17+55	1.5367	1.02	Q			V	
18+ 0	1.5436	1.00	Q			V	
18+ 5	1.5503	0.97	Q			V	
18+10	1.5567	0.93	Q			V	
18+15	1.5628	0.89	Q			V	
18+20	1.5686	0.84	Q			V	
18+25	1.5742	0.81	Q			V	
18+30	1.5796	0.79	Q			V	
18+35	1.5849	0.77	Q			V	
18+40	1.5900	0.75	Q			V	
18+45	1.5951	0.74	Q			V	
18+50	1.6001	0.72	Q			V	
18+55	1.6050	0.71	Q			V	
19+ 0	1.6098	0.70	Q			V	
19+ 5	1.6145	0.68	Q			V	
19+10	1.6191	0.67	Q			V	
19+15	1.6237	0.66	Q			V	
19+20	1.6282	0.65	Q			V	
19+25	1.6326	0.64	Q			V	
19+30	1.6369	0.63	Q			V	
19+35	1.6412	0.62	Q			V	
19+40	1.6455	0.62	Q			V	
19+45	1.6497	0.61	Q			V	
19+50	1.6538	0.60	Q			V	
19+55	1.6578	0.59	Q			V	
20+ 0	1.6619	0.58	Q			V	
20+ 5	1.6658	0.58	Q			V	
20+10	1.6698	0.57	Q			V	
20+15	1.6736	0.56	Q			V	
20+20	1.6775	0.56	Q			V	
20+25	1.6812	0.55	Q			V	
20+30	1.6850	0.54	Q			V	
20+35	1.6887	0.54	Q			V	
20+40	1.6923	0.53	Q			V	
20+45	1.6960	0.53	Q			V	
20+50	1.6995	0.52	Q			V	
20+55	1.7031	0.52	Q			V	
21+ 0	1.7066	0.51	Q			V	
21+ 5	1.7101	0.50	Q			V	
21+10	1.7135	0.50	Q			V	
21+15	1.7169	0.50	Q			V	
21+20	1.7203	0.49	Q			V	
21+25	1.7237	0.49	Q			V	
21+30	1.7270	0.48	Q			V	
21+35	1.7303	0.48	Q			V	
21+40	1.7335	0.47	Q			V	
21+45	1.7368	0.47	Q			V	
21+50	1.7400	0.47	Q			V	
21+55	1.7431	0.46	Q			V	
22+ 0	1.7463	0.46	Q			V	
22+ 5	1.7494	0.45	Q			V	
22+10	1.7525	0.45	Q			V	
22+15	1.7556	0.45	Q			V	
22+20	1.7586	0.44	Q			V	
22+25	1.7617	0.44	Q			V	
22+30	1.7647	0.44	Q			V	
22+35	1.7677	0.43	Q			V	
22+40	1.7706	0.43	Q			V	
22+45	1.7736	0.43	Q			V	
22+50	1.7765	0.42	Q			V	
22+55	1.7794	0.42	Q			V	
23+ 0	1.7823	0.42	Q			V	
23+ 5	1.7851	0.41	Q			V	
23+10	1.7880	0.41	Q			V	
23+15	1.7908	0.41	Q			V	
23+20	1.7936	0.41	Q			V	



23+25	1.7964	0.40	Q				V
23+30	1.7991	0.40	Q				V
23+35	1.8019	0.40	Q				V
23+40	1.8046	0.40	Q				V
23+45	1.8073	0.39	Q				V
23+50	1.8100	0.39	Q				V
23+55	1.8127	0.39	Q				V
24+ 0	1.8153	0.39	Q				V
24+ 5	1.8179	0.37	Q				V
24+10	1.8201	0.31	Q				V
24+15	1.8215	0.21	Q				V
24+20	1.8222	0.10	Q				V
24+25	1.8225	0.04	Q				V
24+30	1.8226	0.02	Q				V
24+35	1.8226	0.01	Q				V
24+40	1.8227	0.00	Q				V
24+45	1.8227	0.00	Q				V

~ 79,397 CF

Existing Condition: 2-yr 24-HR Storm Event

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0

Study date 10/08/21

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San Bernardino County Synthetic Unit Hydrology Method  
 Manual date - August 1986

Program License Serial Number 6484

-----  
 UH METHOD  
 2YR 24HR DURATION STORM  
 EXISTING CONDITION  
 -----

Storm Event Year = 2

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 2		
15.20	1	0.56

-----		
Rainfall data for year 2		
15.20	6	1.35

-----		
Rainfall data for year 2		
15.20	24	2.48

-----  
 +-----

\*\*\*\*\* Area-averaged max loss rate, Fm \*\*\*\*\*

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	32.0	15.20	1.000	0.978	0.900	0.880

Area-averaged adjusted loss rate Fm (In/Hr) = 0.880

\*\*\*\*\* Area-Averaged low loss rate fraction, Yb \*\*\*\*\*

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
13.68	0.900	32.0	32.0	12.40	0.000
1.52	0.100	98.0	98.0	0.20	0.908

Area-averaged catchment yield fraction, Y = 0.091

Area-averaged low loss fraction, Yb = 0.909

Direct entry of lag time by user

-----  
 +-----

Watershed area = 15.20(Ac.)  
 Catchment Lag time = 0.217 hours  
 Unit interval = 5.000 minutes  
 Unit interval percentage of lag time = 38.4025  
 Hydrograph baseflow = 0.00(CFS)  
 Average maximum watershed loss rate(Fm) = 0.880(In/Hr)  
 Average low loss rate fraction (Yb) = 0.909 (decimal)  
 VALLEY DEVELOPED S-Graph Selected  
 Computed peak 5-minute rainfall = 0.268(In)  
 Computed peak 30-minute rainfall = 0.458(In)  
 Specified peak 1-hour rainfall = 0.564(In)  
 Computed peak 3-hour rainfall = 0.963(In)  
 Specified peak 6-hour rainfall = 1.350(In)  
 Specified peak 24-hour rainfall = 2.480(In)

Rainfall depth area reduction factors:

Using a total area of 15.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.267(In)
30-minute factor = 0.999	Adjusted rainfall = 0.458(In)
1-hour factor = 0.999	Adjusted rainfall = 0.564(In)
3-hour factor = 1.000	Adjusted rainfall = 0.963(In)
6-hour factor = 1.000	Adjusted rainfall = 1.350(In)
24-hour factor = 1.000	Adjusted rainfall = 2.480(In)

U n i t H y d r o g r a p h

+-----+  
 Interval            'S' Graph            Unit Hydrograph  
 Number            Mean values            ((CFS))  
 -----+

(K = 183.82 (CFS))

1	2.841	5.223
2	18.097	28.044
3	46.118	51.509
4	75.108	53.291
5	89.671	26.771
6	95.903	11.456
7	98.251	4.316
8	98.984	1.348
9	99.670	1.261
10	100.000	0.606

Peak Unit    Adjusted mass rainfall    Unit rainfall  
 Number            (In)                            (In)

1	0.2674	0.2674
2	0.3292	0.0618
3	0.3718	0.0426
4	0.4054	0.0335
5	0.4334	0.0281
6	0.4578	0.0244
7	0.4795	0.0217
8	0.4990	0.0196
9	0.5170	0.0179
10	0.5336	0.0166
11	0.5491	0.0155
12	0.5636	0.0145
13	0.5860	0.0224
14	0.6076	0.0216
15	0.6284	0.0208
16	0.6485	0.0201
17	0.6679	0.0195
18	0.6868	0.0189
19	0.7052	0.0184
20	0.7230	0.0179
21	0.7405	0.0174
22	0.7574	0.0170
23	0.7740	0.0166
24	0.7903	0.0162

25	0.8062	0.0159
26	0.8217	0.0156
27	0.8370	0.0153
28	0.8520	0.0150
29	0.8667	0.0147
30	0.8811	0.0144
31	0.8953	0.0142
32	0.9093	0.0140
33	0.9231	0.0137
34	0.9366	0.0135
35	0.9499	0.0133
36	0.9631	0.0131
37	0.9760	0.0129
38	0.9888	0.0128
39	1.0014	0.0126
40	1.0138	0.0124
41	1.0261	0.0123
42	1.0382	0.0121
43	1.0501	0.0120
44	1.0620	0.0118
45	1.0737	0.0117
46	1.0852	0.0116
47	1.0967	0.0114
48	1.1080	0.0113
49	1.1191	0.0112
50	1.1302	0.0111
51	1.1412	0.0110
52	1.1520	0.0108
53	1.1628	0.0107
54	1.1734	0.0106
55	1.1839	0.0105
56	1.1944	0.0104
57	1.2047	0.0103
58	1.2150	0.0103
59	1.2251	0.0102
60	1.2352	0.0101
61	1.2452	0.0100
62	1.2551	0.0099
63	1.2649	0.0098
64	1.2747	0.0097
65	1.2843	0.0097
66	1.2939	0.0096
67	1.3034	0.0095
68	1.3129	0.0094
69	1.3222	0.0094
70	1.3315	0.0093
71	1.3408	0.0092
72	1.3499	0.0092
73	1.3581	0.0082
74	1.3663	0.0081
75	1.3743	0.0081
76	1.3823	0.0080
77	1.3903	0.0080
78	1.3982	0.0079
79	1.4060	0.0078
80	1.4138	0.0078
81	1.4215	0.0077
82	1.4292	0.0077
83	1.4368	0.0076
84	1.4444	0.0076
85	1.4519	0.0075
86	1.4594	0.0075
87	1.4668	0.0074
88	1.4742	0.0074
89	1.4815	0.0073
90	1.4888	0.0073
91	1.4960	0.0072
92	1.5032	0.0072
93	1.5103	0.0071
94	1.5174	0.0071
95	1.5245	0.0071

96	1.5315	0.0070
97	1.5385	0.0070
98	1.5454	0.0069
99	1.5523	0.0069
100	1.5592	0.0069
101	1.5660	0.0068
102	1.5728	0.0068
103	1.5796	0.0067
104	1.5863	0.0067
105	1.5929	0.0067
106	1.5996	0.0066
107	1.6062	0.0066
108	1.6127	0.0066
109	1.6193	0.0065
110	1.6258	0.0065
111	1.6322	0.0065
112	1.6387	0.0064
113	1.6451	0.0064
114	1.6515	0.0064
115	1.6578	0.0063
116	1.6641	0.0063
117	1.6704	0.0063
118	1.6766	0.0062
119	1.6829	0.0062
120	1.6890	0.0062
121	1.6952	0.0062
122	1.7013	0.0061
123	1.7074	0.0061
124	1.7135	0.0061
125	1.7196	0.0060
126	1.7256	0.0060
127	1.7316	0.0060
128	1.7375	0.0060
129	1.7435	0.0059
130	1.7494	0.0059
131	1.7553	0.0059
132	1.7612	0.0059
133	1.7670	0.0058
134	1.7728	0.0058
135	1.7786	0.0058
136	1.7844	0.0058
137	1.7901	0.0057
138	1.7958	0.0057
139	1.8015	0.0057
140	1.8072	0.0057
141	1.8129	0.0057
142	1.8185	0.0056
143	1.8241	0.0056
144	1.8297	0.0056
145	1.8353	0.0056
146	1.8408	0.0055
147	1.8463	0.0055
148	1.8518	0.0055
149	1.8573	0.0055
150	1.8628	0.0055
151	1.8682	0.0054
152	1.8736	0.0054
153	1.8790	0.0054
154	1.8844	0.0054
155	1.8897	0.0054
156	1.8951	0.0053
157	1.9004	0.0053
158	1.9057	0.0053
159	1.9110	0.0053
160	1.9163	0.0053
161	1.9215	0.0052
162	1.9267	0.0052
163	1.9319	0.0052
164	1.9371	0.0052
165	1.9423	0.0052
166	1.9475	0.0052

167	1.9526	0.0051
168	1.9577	0.0051
169	1.9628	0.0051
170	1.9679	0.0051
171	1.9730	0.0051
172	1.9780	0.0051
173	1.9831	0.0050
174	1.9881	0.0050
175	1.9931	0.0050
176	1.9981	0.0050
177	2.0030	0.0050
178	2.0080	0.0050
179	2.0129	0.0049
180	2.0179	0.0049
181	2.0228	0.0049
182	2.0277	0.0049
183	2.0326	0.0049
184	2.0374	0.0049
185	2.0423	0.0049
186	2.0471	0.0048
187	2.0519	0.0048
188	2.0567	0.0048
189	2.0615	0.0048
190	2.0663	0.0048
191	2.0711	0.0048
192	2.0758	0.0048
193	2.0806	0.0047
194	2.0853	0.0047
195	2.0900	0.0047
196	2.0947	0.0047
197	2.0994	0.0047
198	2.1040	0.0047
199	2.1087	0.0047
200	2.1133	0.0046
201	2.1180	0.0046
202	2.1226	0.0046
203	2.1272	0.0046
204	2.1318	0.0046
205	2.1364	0.0046
206	2.1409	0.0046
207	2.1455	0.0046
208	2.1500	0.0045
209	2.1545	0.0045
210	2.1591	0.0045
211	2.1636	0.0045
212	2.1681	0.0045
213	2.1725	0.0045
214	2.1770	0.0045
215	2.1815	0.0045
216	2.1859	0.0044
217	2.1903	0.0044
218	2.1948	0.0044
219	2.1992	0.0044
220	2.2036	0.0044
221	2.2080	0.0044
222	2.2123	0.0044
223	2.2167	0.0044
224	2.2211	0.0044
225	2.2254	0.0043
226	2.2297	0.0043
227	2.2341	0.0043
228	2.2384	0.0043
229	2.2427	0.0043
230	2.2470	0.0043
231	2.2512	0.0043
232	2.2555	0.0043
233	2.2598	0.0043
234	2.2640	0.0042
235	2.2683	0.0042
236	2.2725	0.0042
237	2.2767	0.0042

238	2.2809	0.0042
239	2.2851	0.0042
240	2.2893	0.0042
241	2.2935	0.0042
242	2.2977	0.0042
243	2.3018	0.0042
244	2.3060	0.0042
245	2.3101	0.0041
246	2.3143	0.0041
247	2.3184	0.0041
248	2.3225	0.0041
249	2.3266	0.0041
250	2.3307	0.0041
251	2.3348	0.0041
252	2.3388	0.0041
253	2.3429	0.0041
254	2.3470	0.0041
255	2.3510	0.0040
256	2.3551	0.0040
257	2.3591	0.0040
258	2.3631	0.0040
259	2.3671	0.0040
260	2.3711	0.0040
261	2.3751	0.0040
262	2.3791	0.0040
263	2.3831	0.0040
264	2.3871	0.0040
265	2.3910	0.0040
266	2.3950	0.0040
267	2.3989	0.0039
268	2.4029	0.0039
269	2.4068	0.0039
270	2.4107	0.0039
271	2.4146	0.0039
272	2.4185	0.0039
273	2.4224	0.0039
274	2.4263	0.0039
275	2.4302	0.0039
276	2.4341	0.0039
277	2.4379	0.0039
278	2.4418	0.0039
279	2.4457	0.0038
280	2.4495	0.0038
281	2.4533	0.0038
282	2.4572	0.0038
283	2.4610	0.0038
284	2.4648	0.0038
285	2.4686	0.0038
286	2.4724	0.0038
287	2.4762	0.0038
288	2.4800	0.0038

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0038	0.0034	0.0003
2	0.0038	0.0034	0.0003
3	0.0038	0.0035	0.0003
4	0.0038	0.0035	0.0003
5	0.0038	0.0035	0.0003
6	0.0038	0.0035	0.0003
7	0.0038	0.0035	0.0003
8	0.0039	0.0035	0.0004
9	0.0039	0.0035	0.0004
10	0.0039	0.0035	0.0004
11	0.0039	0.0035	0.0004
12	0.0039	0.0036	0.0004
13	0.0039	0.0036	0.0004
14	0.0039	0.0036	0.0004
15	0.0039	0.0036	0.0004

16	0.0040	0.0036	0.0004
17	0.0040	0.0036	0.0004
18	0.0040	0.0036	0.0004
19	0.0040	0.0036	0.0004
20	0.0040	0.0036	0.0004
21	0.0040	0.0037	0.0004
22	0.0040	0.0037	0.0004
23	0.0040	0.0037	0.0004
24	0.0041	0.0037	0.0004
25	0.0041	0.0037	0.0004
26	0.0041	0.0037	0.0004
27	0.0041	0.0037	0.0004
28	0.0041	0.0037	0.0004
29	0.0041	0.0038	0.0004
30	0.0041	0.0038	0.0004
31	0.0042	0.0038	0.0004
32	0.0042	0.0038	0.0004
33	0.0042	0.0038	0.0004
34	0.0042	0.0038	0.0004
35	0.0042	0.0038	0.0004
36	0.0042	0.0038	0.0004
37	0.0042	0.0039	0.0004
38	0.0043	0.0039	0.0004
39	0.0043	0.0039	0.0004
40	0.0043	0.0039	0.0004
41	0.0043	0.0039	0.0004
42	0.0043	0.0039	0.0004
43	0.0043	0.0040	0.0004
44	0.0044	0.0040	0.0004
45	0.0044	0.0040	0.0004
46	0.0044	0.0040	0.0004
47	0.0044	0.0040	0.0004
48	0.0044	0.0040	0.0004
49	0.0044	0.0040	0.0004
50	0.0045	0.0041	0.0004
51	0.0045	0.0041	0.0004
52	0.0045	0.0041	0.0004
53	0.0045	0.0041	0.0004
54	0.0045	0.0041	0.0004
55	0.0046	0.0041	0.0004
56	0.0046	0.0042	0.0004
57	0.0046	0.0042	0.0004
58	0.0046	0.0042	0.0004
59	0.0046	0.0042	0.0004
60	0.0046	0.0042	0.0004
61	0.0047	0.0042	0.0004
62	0.0047	0.0043	0.0004
63	0.0047	0.0043	0.0004
64	0.0047	0.0043	0.0004
65	0.0048	0.0043	0.0004
66	0.0048	0.0043	0.0004
67	0.0048	0.0044	0.0004
68	0.0048	0.0044	0.0004
69	0.0048	0.0044	0.0004
70	0.0049	0.0044	0.0004
71	0.0049	0.0044	0.0004
72	0.0049	0.0045	0.0004
73	0.0049	0.0045	0.0004
74	0.0049	0.0045	0.0004
75	0.0050	0.0045	0.0005
76	0.0050	0.0045	0.0005
77	0.0050	0.0046	0.0005
78	0.0050	0.0046	0.0005
79	0.0051	0.0046	0.0005
80	0.0051	0.0046	0.0005
81	0.0051	0.0047	0.0005
82	0.0051	0.0047	0.0005
83	0.0052	0.0047	0.0005
84	0.0052	0.0047	0.0005
85	0.0052	0.0048	0.0005
86	0.0052	0.0048	0.0005



87	0.0053	0.0048	0.0005
88	0.0053	0.0048	0.0005
89	0.0053	0.0049	0.0005
90	0.0054	0.0049	0.0005
91	0.0054	0.0049	0.0005
92	0.0054	0.0049	0.0005
93	0.0055	0.0050	0.0005
94	0.0055	0.0050	0.0005
95	0.0055	0.0050	0.0005
96	0.0055	0.0050	0.0005
97	0.0056	0.0051	0.0005
98	0.0056	0.0051	0.0005
99	0.0057	0.0051	0.0005
100	0.0057	0.0052	0.0005
101	0.0057	0.0052	0.0005
102	0.0057	0.0052	0.0005
103	0.0058	0.0053	0.0005
104	0.0058	0.0053	0.0005
105	0.0059	0.0053	0.0005
106	0.0059	0.0054	0.0005
107	0.0059	0.0054	0.0005
108	0.0060	0.0054	0.0005
109	0.0060	0.0055	0.0005
110	0.0060	0.0055	0.0005
111	0.0061	0.0055	0.0006
112	0.0061	0.0056	0.0006
113	0.0062	0.0056	0.0006
114	0.0062	0.0057	0.0006
115	0.0063	0.0057	0.0006
116	0.0063	0.0057	0.0006
117	0.0064	0.0058	0.0006
118	0.0064	0.0058	0.0006
119	0.0065	0.0059	0.0006
120	0.0065	0.0059	0.0006
121	0.0066	0.0060	0.0006
122	0.0066	0.0060	0.0006
123	0.0067	0.0061	0.0006
124	0.0067	0.0061	0.0006
125	0.0068	0.0062	0.0006
126	0.0068	0.0062	0.0006
127	0.0069	0.0063	0.0006
128	0.0069	0.0063	0.0006
129	0.0070	0.0064	0.0006
130	0.0071	0.0064	0.0006
131	0.0071	0.0065	0.0006
132	0.0072	0.0065	0.0007
133	0.0073	0.0066	0.0007
134	0.0073	0.0067	0.0007
135	0.0074	0.0067	0.0007
136	0.0075	0.0068	0.0007
137	0.0076	0.0069	0.0007
138	0.0076	0.0069	0.0007
139	0.0077	0.0070	0.0007
140	0.0078	0.0071	0.0007
141	0.0079	0.0072	0.0007
142	0.0080	0.0072	0.0007
143	0.0081	0.0073	0.0007
144	0.0081	0.0074	0.0007
145	0.0092	0.0083	0.0008
146	0.0092	0.0084	0.0008
147	0.0094	0.0085	0.0009
148	0.0094	0.0086	0.0009
149	0.0096	0.0087	0.0009
150	0.0097	0.0088	0.0009
151	0.0098	0.0089	0.0009
152	0.0099	0.0090	0.0009
153	0.0101	0.0092	0.0009
154	0.0102	0.0092	0.0009
155	0.0103	0.0094	0.0009
156	0.0104	0.0095	0.0009
157	0.0106	0.0097	0.0010

158	0.0107	0.0098	0.0010
159	0.0110	0.0100	0.0010
160	0.0111	0.0101	0.0010
161	0.0113	0.0103	0.0010
162	0.0114	0.0104	0.0010
163	0.0117	0.0106	0.0011
164	0.0118	0.0108	0.0011
165	0.0121	0.0110	0.0011
166	0.0123	0.0112	0.0011
167	0.0126	0.0114	0.0011
168	0.0128	0.0116	0.0012
169	0.0131	0.0119	0.0012
170	0.0133	0.0121	0.0012
171	0.0137	0.0125	0.0012
172	0.0140	0.0127	0.0013
173	0.0144	0.0131	0.0013
174	0.0147	0.0134	0.0013
175	0.0153	0.0139	0.0014
176	0.0156	0.0142	0.0014
177	0.0162	0.0148	0.0015
178	0.0166	0.0151	0.0015
179	0.0174	0.0158	0.0016
180	0.0179	0.0162	0.0016
181	0.0189	0.0172	0.0017
182	0.0195	0.0177	0.0018
183	0.0208	0.0189	0.0019
184	0.0216	0.0196	0.0020
185	0.0145	0.0132	0.0013
186	0.0155	0.0141	0.0014
187	0.0179	0.0163	0.0016
188	0.0196	0.0178	0.0018
189	0.0244	0.0222	0.0022
190	0.0281	0.0255	0.0025
191	0.0426	0.0387	0.0039
192	0.0618	0.0562	0.0056
193	0.2674	0.0733	0.1941
194	0.0335	0.0305	0.0030
195	0.0217	0.0197	0.0020
196	0.0166	0.0151	0.0015
197	0.0224	0.0204	0.0020
198	0.0201	0.0183	0.0018
199	0.0184	0.0167	0.0017
200	0.0170	0.0154	0.0015
201	0.0159	0.0144	0.0014
202	0.0150	0.0136	0.0014
203	0.0142	0.0129	0.0013
204	0.0135	0.0123	0.0012
205	0.0129	0.0118	0.0012
206	0.0124	0.0113	0.0011
207	0.0120	0.0109	0.0011
208	0.0116	0.0105	0.0010
209	0.0112	0.0102	0.0010
210	0.0108	0.0099	0.0010
211	0.0105	0.0096	0.0010
212	0.0103	0.0093	0.0009
213	0.0100	0.0091	0.0009
214	0.0097	0.0089	0.0009
215	0.0095	0.0087	0.0009
216	0.0093	0.0085	0.0008
217	0.0082	0.0074	0.0007
218	0.0080	0.0073	0.0007
219	0.0078	0.0071	0.0007
220	0.0077	0.0070	0.0007
221	0.0075	0.0068	0.0007
222	0.0074	0.0067	0.0007
223	0.0072	0.0066	0.0007
224	0.0071	0.0065	0.0006
225	0.0070	0.0063	0.0006
226	0.0069	0.0062	0.0006
227	0.0067	0.0061	0.0006
228	0.0066	0.0060	0.0006

229	0.0065	0.0059	0.0006
230	0.0064	0.0059	0.0006
231	0.0063	0.0058	0.0006
232	0.0062	0.0057	0.0006
233	0.0062	0.0056	0.0006
234	0.0061	0.0055	0.0006
235	0.0060	0.0055	0.0005
236	0.0059	0.0054	0.0005
237	0.0058	0.0053	0.0005
238	0.0058	0.0052	0.0005
239	0.0057	0.0052	0.0005
240	0.0056	0.0051	0.0005
241	0.0056	0.0051	0.0005
242	0.0055	0.0050	0.0005
243	0.0054	0.0049	0.0005
244	0.0054	0.0049	0.0005
245	0.0053	0.0048	0.0005
246	0.0053	0.0048	0.0005
247	0.0052	0.0047	0.0005
248	0.0052	0.0047	0.0005
249	0.0051	0.0046	0.0005
250	0.0051	0.0046	0.0005
251	0.0050	0.0046	0.0005
252	0.0050	0.0045	0.0004
253	0.0049	0.0045	0.0004
254	0.0049	0.0044	0.0004
255	0.0048	0.0044	0.0004
256	0.0048	0.0043	0.0004
257	0.0047	0.0043	0.0004
258	0.0047	0.0043	0.0004
259	0.0047	0.0042	0.0004
260	0.0046	0.0042	0.0004
261	0.0046	0.0042	0.0004
262	0.0045	0.0041	0.0004
263	0.0045	0.0041	0.0004
264	0.0045	0.0041	0.0004
265	0.0044	0.0040	0.0004
266	0.0044	0.0040	0.0004
267	0.0044	0.0040	0.0004
268	0.0043	0.0039	0.0004
269	0.0043	0.0039	0.0004
270	0.0043	0.0039	0.0004
271	0.0042	0.0039	0.0004
272	0.0042	0.0038	0.0004
273	0.0042	0.0038	0.0004
274	0.0042	0.0038	0.0004
275	0.0041	0.0037	0.0004
276	0.0041	0.0037	0.0004
277	0.0041	0.0037	0.0004
278	0.0040	0.0037	0.0004
279	0.0040	0.0036	0.0004
280	0.0040	0.0036	0.0004
281	0.0040	0.0036	0.0004
282	0.0039	0.0036	0.0004
283	0.0039	0.0036	0.0004
284	0.0039	0.0035	0.0004
285	0.0039	0.0035	0.0004
286	0.0038	0.0035	0.0003
287	0.0038	0.0035	0.0003
288	0.0038	0.0035	0.0003

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Total soil rain loss = 2.09(In)  
Total effective rainfall = 0.39(In)  
Peak flow rate in flood hydrograph = 10.78(CFS)  
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24 - H O U R S T O R M  
R u n o f f H y d r o g r a p h

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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0000		0.00	Q				
0+10	0.0001		0.01	Q				
0+15	0.0003		0.03	Q				
0+20	0.0006		0.05	Q				
0+25	0.0010		0.06	Q				
0+30	0.0014		0.06	Q				
0+35	0.0019		0.06	Q				
0+40	0.0023		0.06	Q				
0+45	0.0027		0.06	Q				
0+50	0.0032		0.06	Q				
0+55	0.0036		0.06	Q				
1+ 0	0.0041		0.06	Q				
1+ 5	0.0045		0.06	Q				
1+10	0.0050		0.07	Q				
1+15	0.0054		0.07	Q				
1+20	0.0059		0.07	Q				
1+25	0.0063		0.07	Q				
1+30	0.0068		0.07	Q				
1+35	0.0072		0.07	Q				
1+40	0.0077		0.07	Q				
1+45	0.0081		0.07	Q				
1+50	0.0086		0.07	Q				
1+55	0.0091		0.07	Q				
2+ 0	0.0095		0.07	Q				
2+ 5	0.0100		0.07	Q				
2+10	0.0104		0.07	Q				
2+15	0.0109		0.07	Q				
2+20	0.0114		0.07	Q				
2+25	0.0119		0.07	Q				
2+30	0.0123		0.07	Q				
2+35	0.0128		0.07	QV				
2+40	0.0133		0.07	QV				
2+45	0.0137		0.07	QV				
2+50	0.0142		0.07	QV				
2+55	0.0147		0.07	QV				
3+ 0	0.0152		0.07	QV				
3+ 5	0.0157		0.07	QV				
3+10	0.0162		0.07	QV				
3+15	0.0166		0.07	QV				
3+20	0.0171		0.07	QV				
3+25	0.0176		0.07	QV				
3+30	0.0181		0.07	QV				
3+35	0.0186		0.07	QV				
3+40	0.0191		0.07	QV				
3+45	0.0196		0.07	QV				
3+50	0.0201		0.07	QV				
3+55	0.0206		0.07	QV				
4+ 0	0.0211		0.07	QV				
4+ 5	0.0216		0.07	QV				
4+10	0.0221		0.07	QV				
4+15	0.0226		0.07	QV				
4+20	0.0231		0.07	QV				
4+25	0.0237		0.07	QV				
4+30	0.0242		0.07	QV				
4+35	0.0247		0.08	QV				
4+40	0.0252		0.08	Q V				
4+45	0.0257		0.08	Q V				
4+50	0.0262		0.08	Q V				
4+55	0.0268		0.08	Q V				
5+ 0	0.0273		0.08	Q V				
5+ 5	0.0278		0.08	Q V				
5+10	0.0284		0.08	Q V				
5+15	0.0289		0.08	Q V				
5+20	0.0294		0.08	Q V				
5+25	0.0300		0.08	Q V				
5+30	0.0305		0.08	Q V				
5+35	0.0311		0.08	Q V				

5+40	0.0316	0.08	Q	V
5+45	0.0322	0.08	Q	V
5+50	0.0327	0.08	Q	V
5+55	0.0333	0.08	Q	V
6+ 0	0.0338	0.08	Q	V
6+ 5	0.0344	0.08	Q	V
6+10	0.0349	0.08	Q	V
6+15	0.0355	0.08	Q	V
6+20	0.0361	0.08	Q	V
6+25	0.0366	0.08	Q	V
6+30	0.0372	0.08	Q	V
6+35	0.0378	0.08	Q	V
6+40	0.0384	0.08	Q	V
6+45	0.0389	0.08	Q	V
6+50	0.0395	0.08	Q	V
6+55	0.0401	0.09	Q	V
7+ 0	0.0407	0.09	Q	V
7+ 5	0.0413	0.09	Q	V
7+10	0.0419	0.09	Q	V
7+15	0.0425	0.09	Q	V
7+20	0.0431	0.09	Q	V
7+25	0.0437	0.09	Q	V
7+30	0.0443	0.09	Q	V
7+35	0.0449	0.09	Q	V
7+40	0.0455	0.09	Q	V
7+45	0.0461	0.09	Q	V
7+50	0.0467	0.09	Q	V
7+55	0.0474	0.09	Q	V
8+ 0	0.0480	0.09	Q	V
8+ 5	0.0486	0.09	Q	V
8+10	0.0493	0.09	Q	V
8+15	0.0499	0.09	Q	V
8+20	0.0505	0.09	Q	V
8+25	0.0512	0.09	Q	V
8+30	0.0518	0.09	Q	V
8+35	0.0525	0.09	Q	V
8+40	0.0532	0.10	Q	V
8+45	0.0538	0.10	Q	V
8+50	0.0545	0.10	Q	V
8+55	0.0552	0.10	Q	V
9+ 0	0.0558	0.10	Q	V
9+ 5	0.0565	0.10	Q	V
9+10	0.0572	0.10	Q	V
9+15	0.0579	0.10	Q	V
9+20	0.0586	0.10	Q	V
9+25	0.0593	0.10	Q	V
9+30	0.0600	0.10	Q	V
9+35	0.0607	0.10	Q	V
9+40	0.0614	0.10	Q	V
9+45	0.0621	0.10	Q	V
9+50	0.0628	0.10	Q	V
9+55	0.0636	0.11	Q	V
10+ 0	0.0643	0.11	Q	V
10+ 5	0.0650	0.11	Q	V
10+10	0.0658	0.11	Q	V
10+15	0.0665	0.11	Q	V
10+20	0.0673	0.11	Q	V
10+25	0.0680	0.11	Q	V
10+30	0.0688	0.11	Q	V
10+35	0.0696	0.11	Q	V
10+40	0.0704	0.11	Q	V
10+45	0.0711	0.11	Q	V
10+50	0.0719	0.12	Q	V
10+55	0.0727	0.12	Q	V
11+ 0	0.0735	0.12	Q	V
11+ 5	0.0744	0.12	Q	V
11+10	0.0752	0.12	Q	V
11+15	0.0760	0.12	Q	V
11+20	0.0768	0.12	Q	V
11+25	0.0777	0.12	Q	V
11+30	0.0785	0.12	Q	V

11+35	0.0794	0.13	Q	V				
11+40	0.0803	0.13	Q	V				
11+45	0.0812	0.13	Q	V				
11+50	0.0820	0.13	Q	V				
11+55	0.0829	0.13	Q	V				
12+ 0	0.0839	0.13	Q	V				
12+ 5	0.0848	0.13	Q	V				
12+10	0.0857	0.14	Q	V				
12+15	0.0867	0.14	Q	V				
12+20	0.0877	0.15	Q	V				
12+25	0.0888	0.15	Q	V				
12+30	0.0899	0.16	Q	V				
12+35	0.0910	0.16	Q	V				
12+40	0.0921	0.16	Q	V				
12+45	0.0932	0.16	Q	V				
12+50	0.0943	0.16	Q	V				
12+55	0.0954	0.17	Q	V				
13+ 0	0.0966	0.17	Q	V				
13+ 5	0.0978	0.17	Q	V				
13+10	0.0990	0.17	Q	V				
13+15	0.1002	0.18	Q	V				
13+20	0.1014	0.18	Q	V				
13+25	0.1026	0.18	Q	V				
13+30	0.1039	0.18	Q	V				
13+35	0.1052	0.19	Q	V				
13+40	0.1065	0.19	Q	V				
13+45	0.1078	0.19	Q	V				
13+50	0.1092	0.20	Q	V				
13+55	0.1105	0.20	Q	V				
14+ 0	0.1119	0.20	Q	V				
14+ 5	0.1133	0.21	Q	V				
14+10	0.1148	0.21	Q	V				
14+15	0.1163	0.22	Q	V				
14+20	0.1178	0.22	Q	V				
14+25	0.1193	0.22	Q	V				
14+30	0.1209	0.23	Q	V				
14+35	0.1226	0.24	Q	V				
14+40	0.1242	0.24	Q	V				
14+45	0.1259	0.25	Q	V				
14+50	0.1277	0.26	Q	V				
14+55	0.1295	0.26	Q	V				
15+ 0	0.1314	0.27	Q	V				
15+ 5	0.1333	0.28	Q	V				
15+10	0.1353	0.29	Q	V				
15+15	0.1374	0.30	Q	V				
15+20	0.1396	0.32	Q	V				
15+25	0.1419	0.33	Q	V				
15+30	0.1441	0.32	Q	V				
15+35	0.1462	0.30	Q	V				
15+40	0.1482	0.28	Q	V				
15+45	0.1502	0.29	Q	V				
15+50	0.1524	0.32	Q	V				
15+55	0.1550	0.37	Q	V				
16+ 0	0.1582	0.46	Q	V				
16+ 5	0.1692	1.60	Q	V				
16+10	0.2109	6.06	Q	V				
16+15	0.2835	10.54	Q	V	QV			
16+20	0.3577	10.78	Q	V	Q	V		
16+25	0.3963	5.60	Q	V			V	
16+30	0.4141	2.59	Q	V			V	
16+35	0.4222	1.18	Q	V			V	
16+40	0.4264	0.60	Q	V			V	
16+45	0.4303	0.57	Q	V			V	
16+50	0.4332	0.42	Q	V			V	
16+55	0.4351	0.28	Q	V			V	
17+ 0	0.4369	0.26	Q	V			V	
17+ 5	0.4387	0.25	Q	V			V	
17+10	0.4403	0.24	Q	V			V	
17+15	0.4418	0.22	Q	V			V	
17+20	0.4433	0.22	Q	V			V	
17+25	0.4447	0.21	Q	V			V	

17+30	0.4461	0.20	Q	V
17+35	0.4474	0.19	Q	V
17+40	0.4487	0.19	Q	V
17+45	0.4500	0.18	Q	V
17+50	0.4512	0.18	Q	V
17+55	0.4523	0.17	Q	V
18+ 0	0.4535	0.17	Q	V
18+ 5	0.4546	0.16	Q	V
18+10	0.4557	0.16	Q	V
18+15	0.4567	0.15	Q	V
18+20	0.4576	0.14	Q	V
18+25	0.4586	0.13	Q	V
18+30	0.4595	0.13	Q	V
18+35	0.4603	0.13	Q	V
18+40	0.4612	0.13	Q	V
18+45	0.4620	0.12	Q	V
18+50	0.4629	0.12	Q	V
18+55	0.4637	0.12	Q	V
19+ 0	0.4645	0.12	Q	V
19+ 5	0.4653	0.11	Q	V
19+10	0.4660	0.11	Q	V
19+15	0.4668	0.11	Q	V
19+20	0.4676	0.11	Q	V
19+25	0.4683	0.11	Q	V
19+30	0.4690	0.11	Q	V
19+35	0.4697	0.10	Q	V
19+40	0.4704	0.10	Q	V
19+45	0.4711	0.10	Q	V
19+50	0.4718	0.10	Q	V
19+55	0.4725	0.10	Q	V
20+ 0	0.4732	0.10	Q	V
20+ 5	0.4738	0.10	Q	V
20+10	0.4745	0.09	Q	V
20+15	0.4751	0.09	Q	V
20+20	0.4758	0.09	Q	V
20+25	0.4764	0.09	Q	V
20+30	0.4770	0.09	Q	V
20+35	0.4776	0.09	Q	V
20+40	0.4783	0.09	Q	V
20+45	0.4789	0.09	Q	V
20+50	0.4795	0.09	Q	V
20+55	0.4800	0.09	Q	V
21+ 0	0.4806	0.08	Q	V
21+ 5	0.4812	0.08	Q	V
21+10	0.4818	0.08	Q	V
21+15	0.4823	0.08	Q	V
21+20	0.4829	0.08	Q	V
21+25	0.4835	0.08	Q	V
21+30	0.4840	0.08	Q	V
21+35	0.4846	0.08	Q	V
21+40	0.4851	0.08	Q	V
21+45	0.4857	0.08	Q	V
21+50	0.4862	0.08	Q	V
21+55	0.4867	0.08	Q	V
22+ 0	0.4872	0.08	Q	V
22+ 5	0.4878	0.08	Q	V
22+10	0.4883	0.08	Q	V
22+15	0.4888	0.07	Q	V
22+20	0.4893	0.07	Q	V
22+25	0.4898	0.07	Q	V
22+30	0.4903	0.07	Q	V
22+35	0.4908	0.07	Q	V
22+40	0.4913	0.07	Q	V
22+45	0.4918	0.07	Q	V
22+50	0.4923	0.07	Q	V
22+55	0.4928	0.07	Q	V
23+ 0	0.4932	0.07	Q	V
23+ 5	0.4937	0.07	Q	V
23+10	0.4942	0.07	Q	V
23+15	0.4947	0.07	Q	V
23+20	0.4951	0.07	Q	V

23+25	0.4956	0.07	Q				V
23+30	0.4960	0.07	Q				V
23+35	0.4965	0.07	Q				V
23+40	0.4970	0.07	Q				V
23+45	0.4974	0.07	Q				V
23+50	0.4979	0.07	Q				V
23+55	0.4983	0.06	Q				V
24+ 0	0.4987	0.06	Q				V
24+ 5	0.4992	0.06	Q				V
24+10	0.4995	0.05	Q				V
24+15	0.4998	0.03	Q				V
24+20	0.4999	0.02	Q				V
24+25	0.4999	0.01	Q				V
24+30	0.4999	0.00	Q				V
24+35	0.5000	0.00	Q				V
24+40	0.5000	0.00	Q				V
24+45	0.5000	0.00	Q				V

~ 21,780 CF



CONTECH CHAMBER SYSTEM: 1 THROUGH 5  
RETENTION CAPACITY CALCULATION  
TOTAL CAPACITY: 31,500 CF

# PROJECT SUMMARY

## CALCULATION DETAILS

- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 1,094 lf.

## STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 5,370 cf.
- BACKFILL STORAGE VOLUME = 3,742 cf.
- TOTAL STORAGE PROVIDED = 9,113 cf.

## PIPE DETAILS

- DIAMETER = 30 IN.
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 15 IN.

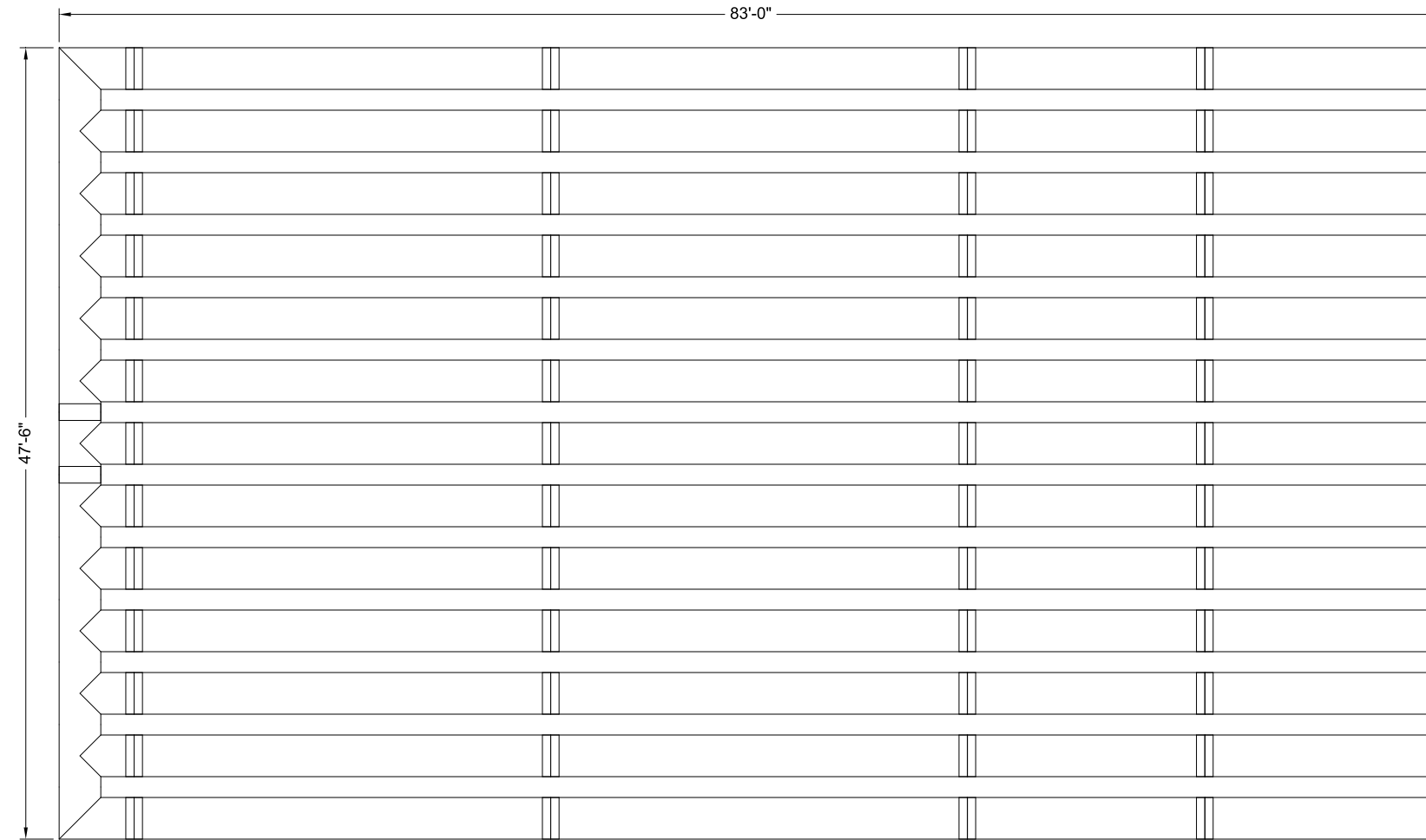
## BACKFILL DETAILS

- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 6 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 6 IN.

## NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2 2/3" x 1/2" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

# FOR CONTECH SYSTEM-1,2




**ASSEMBLY**  
SCALE: 1" = 10'

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DATE	REVISION DESCRIPTION	BY


  
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[www.ContechES.com](http://www.ContechES.com)  
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 800-338-1122 513-645-7000 513-645-7993 FAX

  
**CONTECH**  
 CMP DETENTION SYSTEMS  
 CONTECH  
**DYODS**  
 DRAWING

DYO10865 Warmington, Palm Ave  
 Retention/Infiltration System  
 Fontana, CA  
**DETENTION SYSTEM**

PROJECT No.: 6763	SEQ. No.: 10865	DATE: 10/7/2021
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		<b>D1</b>

# PROJECT SUMMARY

## CALCULATION DETAILS

- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 537 lf.

## STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 2,634 cf.
- BACKFILL STORAGE VOLUME = 1,971 cf.
- TOTAL STORAGE PROVIDED = 4,604 cf.

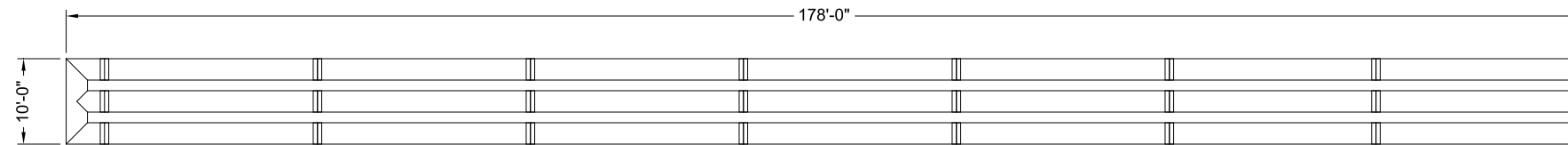
## PIPE DETAILS

- DIAMETER = 30 IN.
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 15 IN.

## BACKFILL DETAILS

- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 6 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 6 IN.

## FOR CONTECH SYSTEM-3,4



## NOTES



- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
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**ASSEMBLY**  
SCALE: 1" = 20'

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**CMP DETENTION SYSTEMS**  
  
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**DYODS**  
 DRAWING

DYO10865 Warmington, Palm Ave  
 Retention/Infiltration System  
 Fontana, CA  
**DETENTION SYSTEM**

PROJECT No.: 6763	SEQ. No.: 10865	DATE: 10/7/2021
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		<b>D1</b>

# PROJECT SUMMARY

## CALCULATION DETAILS

- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 495 lf.

## STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 2,430 cf.
- BACKFILL STORAGE VOLUME = 1,758 cf.
- TOTAL STORAGE PROVIDED = 4,188 cf.

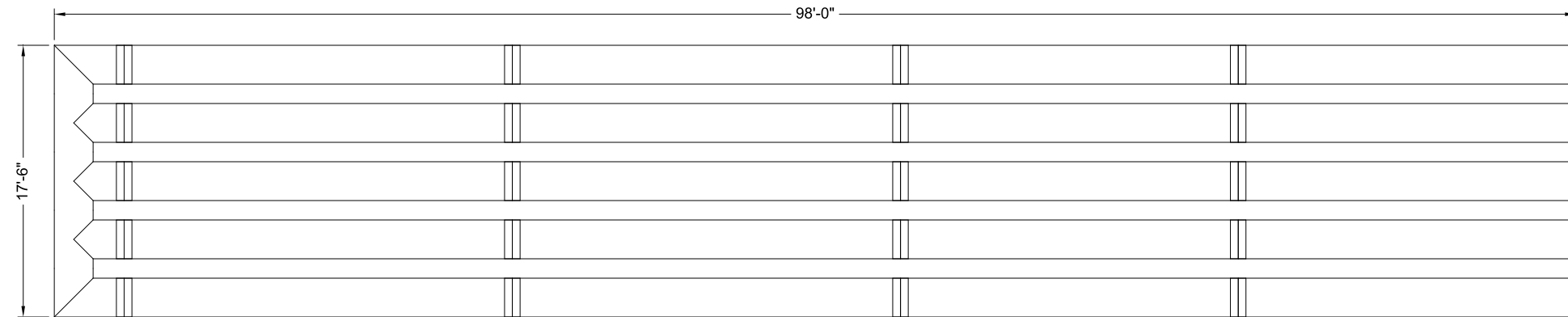
## PIPE DETAILS

- DIAMETER = 30 IN.
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 15 IN.

## BACKFILL DETAILS

- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 6 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 6 IN.

## FOR CONTECH SYSTEM-5



## NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
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**ASSEMBLY**  
SCALE: 1" = 10'

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CMP DETENTION SYSTEMS  
CONTECH  
**DYODS**  
DRAWING

DYO10865 Warmington, Palm Ave  
Retention/Infiltration System  
Fontana, CA  
DETENTION SYSTEM

PROJECT No.: 6763	SEQ. No.: 10865	DATE: 10/7/2021
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.:		<b>D1</b>

RETENTION/INFILTRATION BASIN-1  
DETENTION CAPACITY CALCULATION  
BASIN CAPACITY: 39,204 CF

Infiltration/Retention Basin Volume Table (Bottom Elev of Basin 1353.00)

Detention Volume Table

Total Depth	Elevation	Elevation Area (sf)	Average Area (sf)	Depth (ft)	Volume (cf)	Volume (ac-ft)	Total Volume (ac-ft)
Retention							
0.0	1353.0	6,240					0.00
			6,491	0.5	3,245	0.07	
0.5	1353.5	6,741					0.07
			7,265	1.0	7,265	0.17	
1.5	1354.5	7,788					0.24
			8,340	1.0	8,340	0.19	
2.5	1355.5	8,892					0.43
Detention			9,473	1.0	9,473	0.22	
3.5	1356.5	10,054					0.65
			10,664	1.0	10,664	0.24	
4.5	1357.5	11,274			Det Vol (Total)		0.90
4.5							

Water depth for Ret/Inf Capacitycapacity

Ret/Inf Volume for WQ Mitigation

5-Contech Chamber System combined capacity

39,204 CF (0.9 AC-FT)  
 31,500 CF WITH CHAMBER SYSTEM  
**70,704 CF TOTAL > REQD. 57,619 CF**

## **RUNOFF FLOW CALCULATION 100-YR STORM EVENT**

Q<sub>peak</sub> (100yr storm) in Developed Condition: 46.7 cfs

Q<sub>peak</sub> (100yr storm) in Existing Condition: 42.1 cfs

Increase in runoff flow rate: 4.6 cfs

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
(c) Copyright 1983-2016 Advanced Engineering Software (aes)  
Ver. 23.0 Release Date: 07/01/2016 License ID 1400

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* HIGHLAND/PALM AVE RESIDENTIAL \*  
\* 100-YR STORM EVENT \*  
\* DEVELOPED CONDITION \*  
\*\*\*\*\*

FILE NAME: PALM.DAT  
TIME/DATE OF STUDY: 14:17 10/08/2021

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000  
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5000

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

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	WIDTH (FT)	CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

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

\*\*\*\*\*  
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21  
\*\*\*\*\*

=====  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<  
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 2005.00  
ELEVATION DATA: UPSTREAM(FEET) = 1415.00 DOWNSTREAM(FEET) = 1366.00

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.448  
\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.711  
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "8-10 DWELLINGS/ACRE"	A	15.20	0.74	0.400	52	16.45

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.400



SUBAREA RUNOFF(CFS) = 46.71  
TOTAL AREA(ACRES) = 15.20 PEAK FLOW RATE(CFS) = 46.71

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 15.2 TC(MIN.) = 16.45  
EFFECTIVE AREA(ACRES) = 15.20 AREA-AVERAGED Fm(INCH/HR)= 0.30  
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.400  
PEAK FLOW RATE(CFS) = 46.71

=====

END OF RATIONAL METHOD ANALYSIS

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
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Ver. 23.0 Release Date: 07/01/2016 License ID 1400

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* HIGHLAND/PALM AVE RESIDENTIAL \*  
\* 100-YR STORM EVENT \*  
\* EXISTING CONDITION \*  
\*\*\*\*\*

FILE NAME: PALM.DAT  
TIME/DATE OF STUDY: 14:29 10/08/2021

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--\*TIME-OF-CONCENTRATION MODEL\*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000  
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.5000

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

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	WIDTH (FT)	CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES: LIP (FT)	MANNING HIKE FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167 0.0150

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

\*\*\*\*\*  
FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21  
\*\*\*\*\*

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<  
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1331.00  
ELEVATION DATA: UPSTREAM(FEET) = 1417.00 DOWNSTREAM(FEET) = 1360.00

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 16.250  
\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.743  
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL ".4 DWELLING/ACRE"	A	15.20	0.74	0.900	52	16.25

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74  
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.900

SUBAREA RUNOFF(CFS) = 42.07  
TOTAL AREA(ACRES) = 15.20 PEAK FLOW RATE(CFS) = 42.07


=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 15.2 TC(MIN.) = 16.25  
EFFECTIVE AREA(ACRES) = 15.20 AREA-AVERAGED Fm(INCH/HR)= 0.67  
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.900  
PEAK FLOW RATE(CFS) = 42.07

=====

END OF RATIONAL METHOD ANALYSIS



# HYDRAULIC CALCULATION

\*\*\*\*\*  
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Ver. 23.0 Release Date: 07/01/2016 License ID 1400

Analysis prepared by:

-----  
TIME/DATE OF STUDY: 11:16 08/18/2021  
=====

Problem Descriptions:  
36IN RCP SIZING

\*\*\*\*\*  
>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

-----  
PIPE DIAMETER(FEET) = 3.000  
FLOWDEPTH(FEET) = 2.850  
PIPE SLOPE(FEET/FEET) = 0.0100  
MANNINGS FRICTION FACTOR = 0.015000  
>>>> NORMAL DEPTH FLOW(CFS) = 62.11 > 46.7 cfs (Qpeak 100 -yr storm)

=====

NORMAL-DEPTH FLOW INFORMATION:  
-----  
NORMAL DEPTH(FEET) = 2.85  
FLOW AREA(SQUARE FEET) = 6.94  
FLOW TOP-WIDTH(FEET) = 1.308  
FLOW PRESSURE + MOMENTUM(POUNDS) = 1674.84  
FLOW VELOCITY(FEET/SEC.) = 8.955  
FLOW VELOCITY HEAD(FEET) = 1.245  
HYDRAULIC DEPTH(FEET) = 5.30  
FROUDE NUMBER = 0.685  
SPECIFIC ENERGY(FEET) = 4.10  
=====

\*\*\*\*\*

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE  
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Ver. 23.0 Release Date: 07/01/2016 License ID 1400

Analysis prepared by:

-----  
TIME/DATE OF STUDY: 11:28 10/20/2021  
=====

Problem Descriptions:  
CB FLOWBY SIZING

\*\*\*\*\*

>>>FLOWBY CATCH BASIN INLET CAPACITY INPUT INFORMATION<<<<

-----

Curb Inlet Capacities are approximated based on the Bureau of  
Public Roads nomograph plots for flowby basins and sump basins.

STREETFLOW(CFS) = 5.25  
GUTTER FLOWDEPTH(FEET) = 0.40  
BASIN LOCAL DEPRESSION(FEET) = 0.20

-----

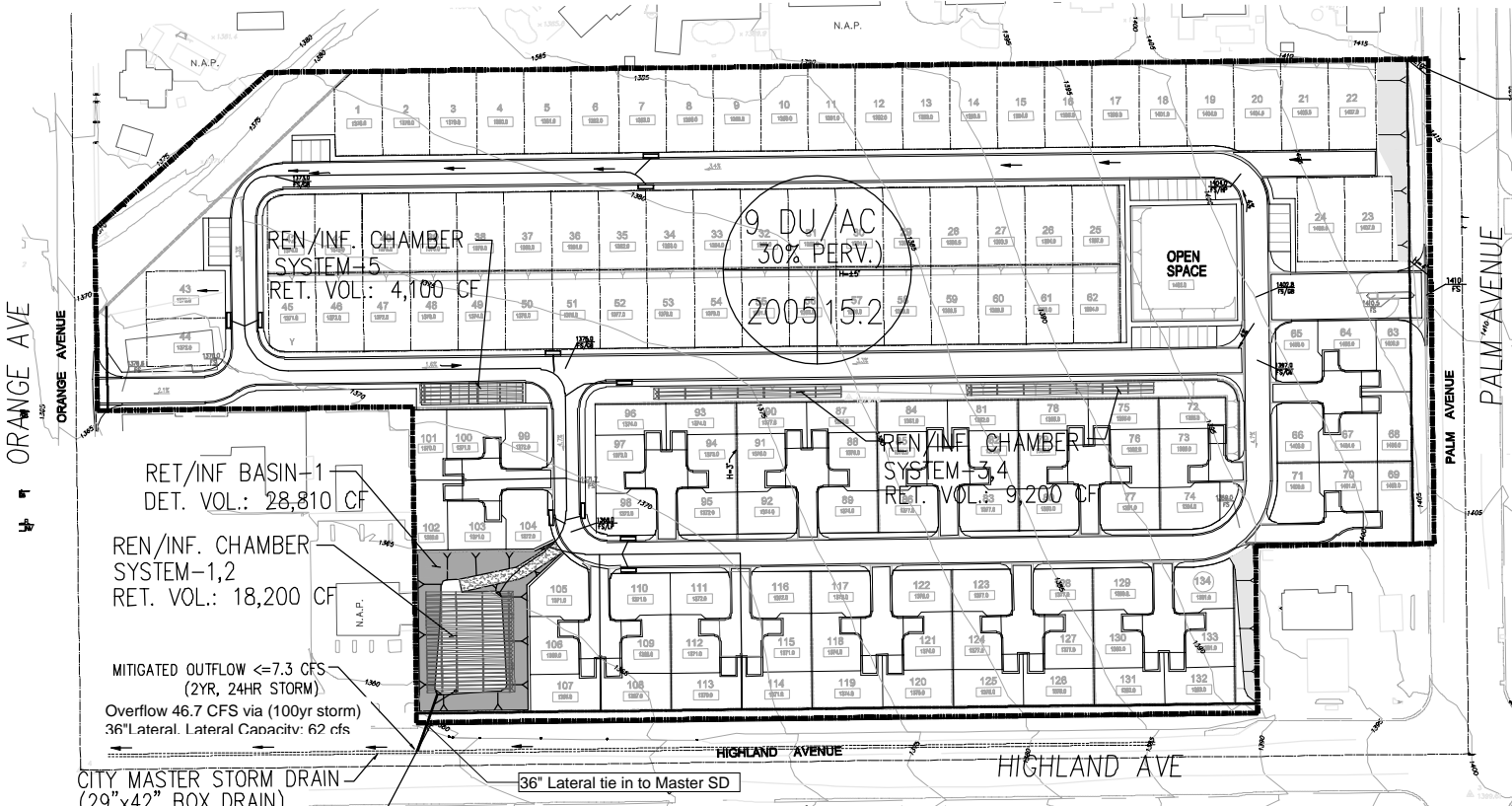
FLOWBY BASIN ANALYSIS RESULTS:

BASIN WIDTH	FLOW INTERCEPTION
1.66	0.89
2.00	1.06
2.50	1.30
3.00	1.54
3.50	1.78
4.00	2.01
4.50	2.24
5.00	2.45
5.50	2.64
6.00	2.83
6.50	3.01
7.00	3.19
7.50	3.36
8.00	3.53
8.50	3.70
9.00	3.85
9.50	3.99
10.00	4.12
10.50	4.25
11.00	4.37
11.50	4.47
12.00	4.58
12.50	4.67
13.00	4.76
13.50	4.85
14.00	4.92
14.50	5.00
15.00	5.06
15.50	5.13
16.00	5.19
16.50	5.24
16.58	5.25

=====

## HYDROLOGY EXHIBIT

PLOT DATE: October 22, 2021 ashafiq



1415.0 HP  
 $Q_{100} = 0$  CFS  
 $Q_2 = 0$  CFS

1366.0 FS  
 $Q_{100} = 46.7$  CFS  
 $Q_2 = 13.8$  CFS

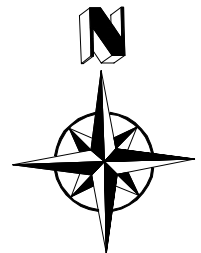
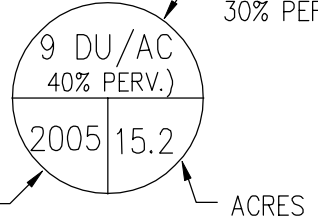
**LEGEND**

SITE DRAINAGE AREA

ELEVATION

NODE

RUNOFF



SCALE: 1" = 180'

**APN: 0285-211-21 & 0285-211-23**

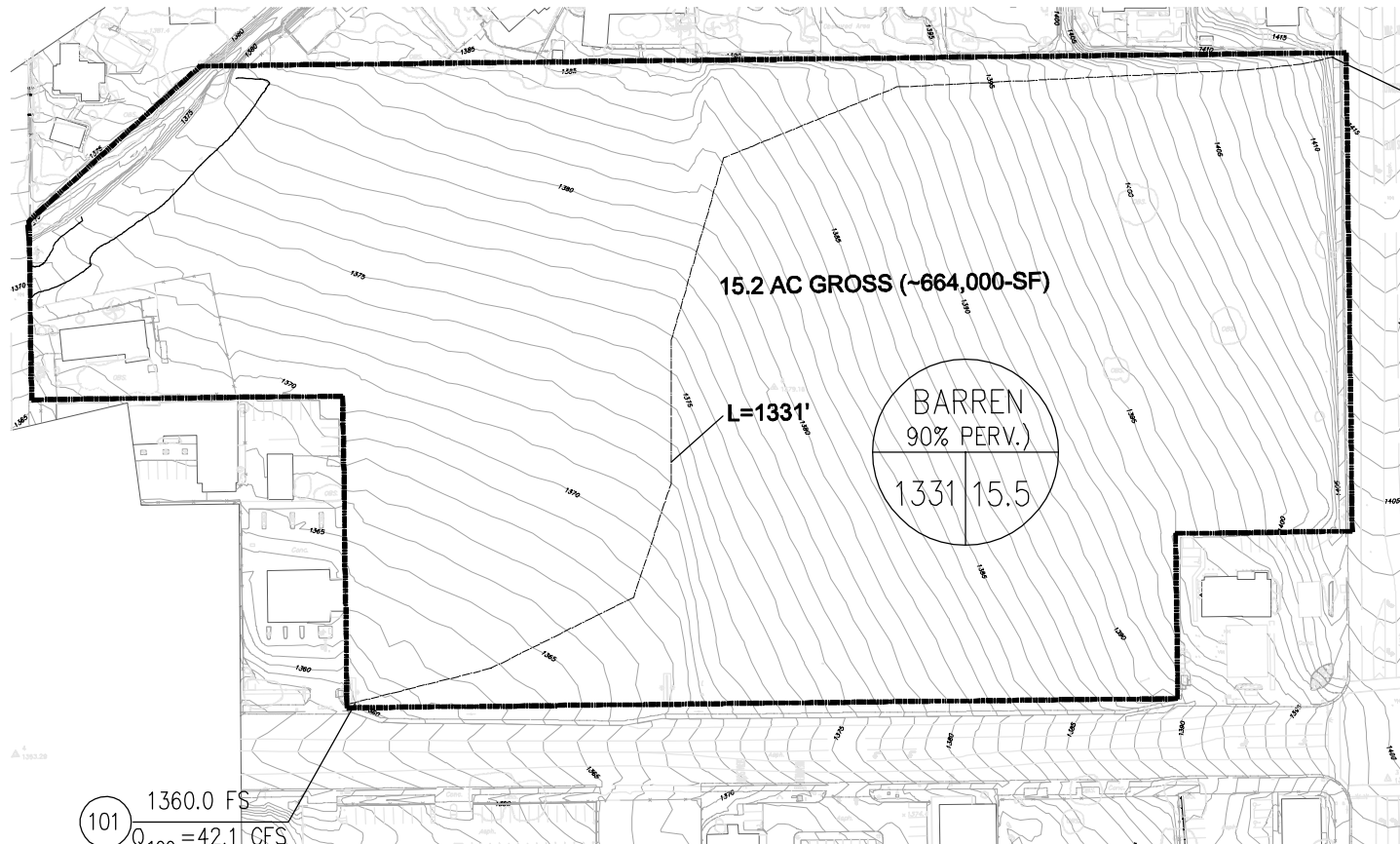
**COUNTY OF SAN BERNARDINO  
 DRAINAGE EXHIBIT-DEVELOPED**



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PLOT DATE: October 22, 2021 ashafiq



1417.0 HP  
 $Q_{100} = 0$  CFS  
 $Q_2 = 0$  CFS

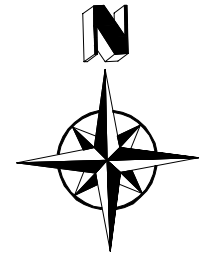
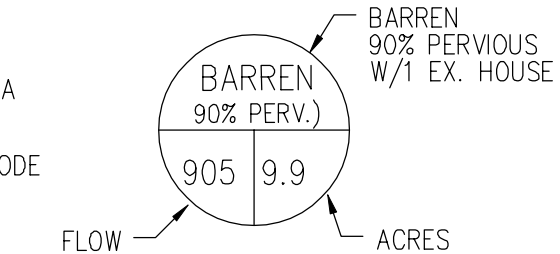
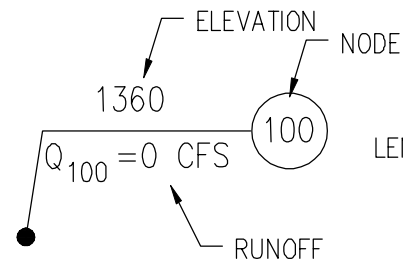
15.2 AC GROSS (~664,000-SF)

L=1331'



101 1360.0 FS  
 $Q_{100} = 42.1$  CFS  
 $Q_2 = 7.3$  CFS

### LEGEND



SCALE: 1" = 180'

**APN: 0285-211-21 & 0285-211-23**  
**COUNTY OF SAN BERNARDINO**  
**DRAINAGE EXHIBIT-EXISTING**



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