Avellana Solar and Broadband Project
February 2023

U.S. Dept. of Agriculture

Rural Utilities Service

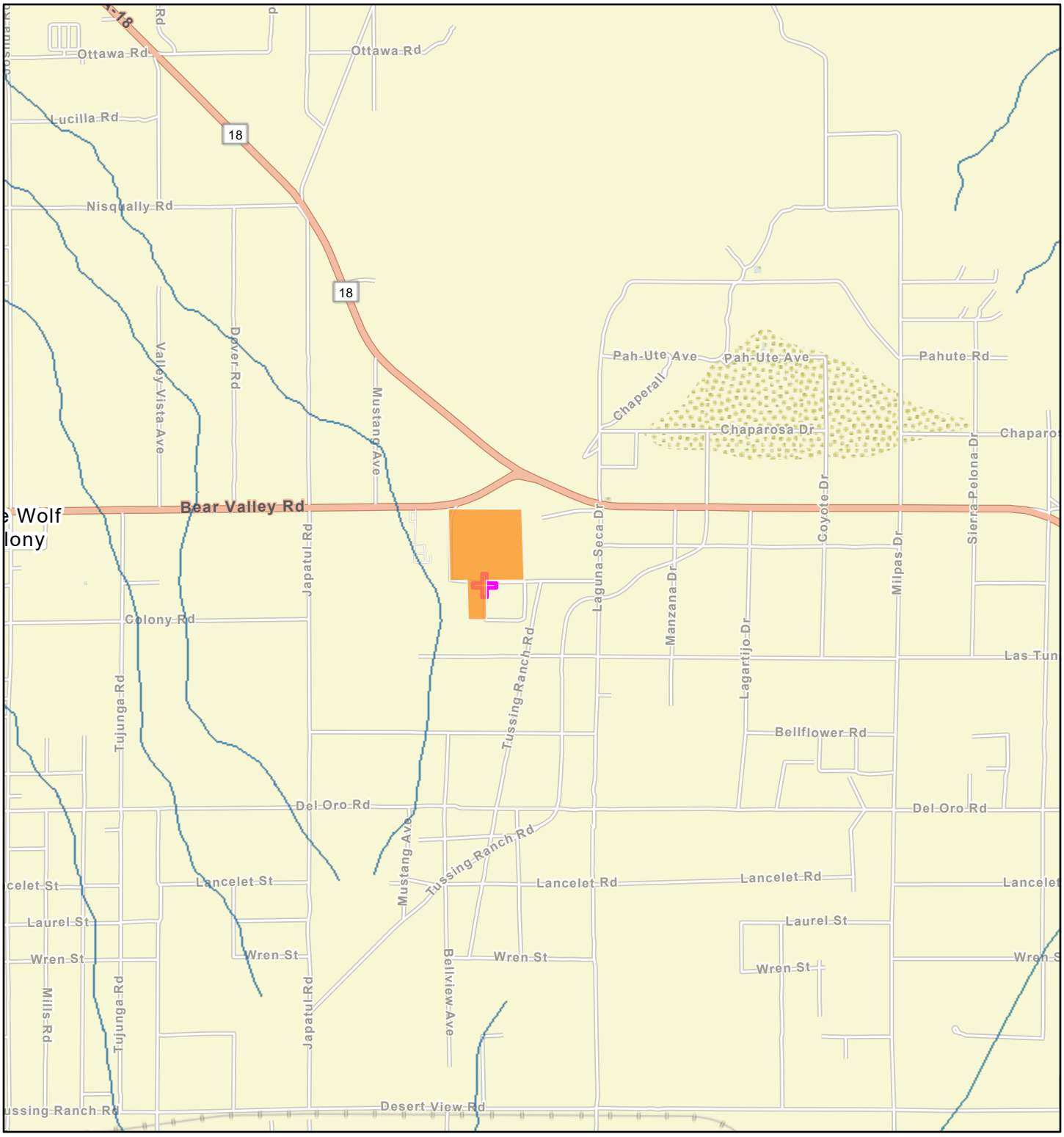
Environmental Assessment

APPENDIX C

WATER RESOURCES

U.S. Department of Agriculture
Rural Utilities Service (RUS)

Avellana Solar Installation: Water Resources



December 28, 2022

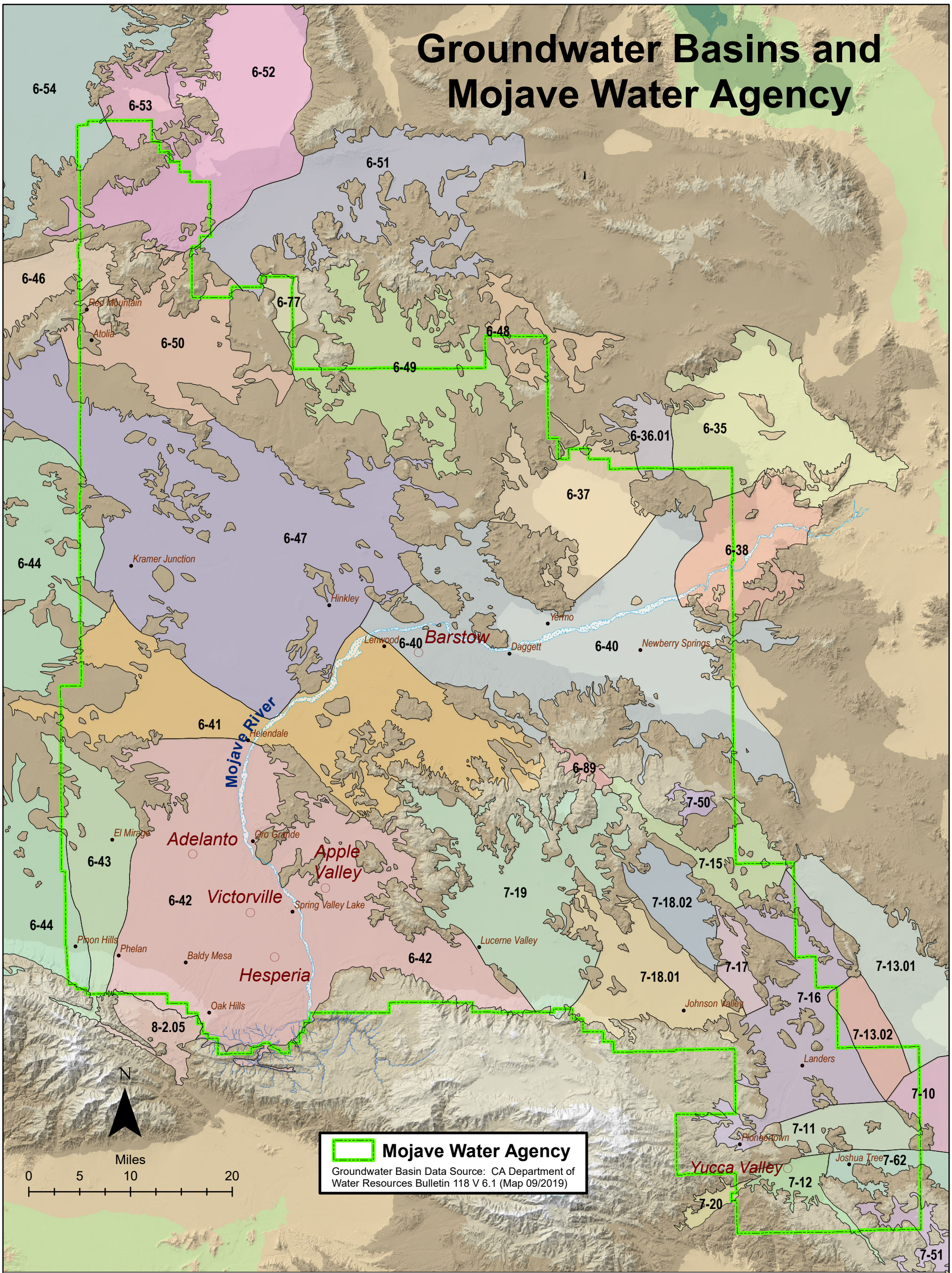
1:36,112

0 0.25 0.5 1 mi

0 0.4 0.8 1.6 km

- avellana solar
- Search Result (point)
- Impaired Streams
- Streams
- Water Bodies
- Sole Source Aquifers
- Watersheds (HUC12)

Groundwater Basins and Mojave Water Agency



Groundwater Basins and Subbasins

- 6-35 Cronise Valley
- 6-36.01 Langford Valley (Langford Well Lake)
- 6-37 Coyote Lake Valley
- 6-38 Caves Canyon Valley
- 6-40 Lower Mojave River Valley
- 6-41 Middle Mojave River Valley
- 6-42 Upper Mojave River Valley
- 6-43 El Mirage Valley
- 6-44 Antelope Valley
- 6-46 Fremont Valley
- 6-47 Harper Valley
- 6-48 Goldstone Valley
- 6-49 Superior Valley
- 6-50 Cuddeback Valley
- 6-51 Pilot Knob Valley
- 6-52 Searles Valley
- 6-53 Salt Wells Valley
- 6-54 Indian Wells Valley
- 6-77 Grass Valley
- 6-89 Kane Wash Area
- 7-10 Twentynine Palms Valley
- 7-11 Copper Mountain Valley
- 7-12 Warren Valley
- 7-13.01 Deadman Valley (Deadman Lake)
- 7-13.02 Deadman Valley (Surprise Spring)
- 7-15 Bessemer Valley
- 7-16 Ames Valley
- 7-17 Means Valley
- 7-18.01 Johnson Valley (Soggy Lake)
- 7-18.02 Johnson Valley (Upper Johnson Valley)
- 7-19 Lucerne Valley
- 7-20 Morongo Valley
- 7-50 Iron Ridge Area
- 7-51 Lost Horse Valley
- 7-62 Joshua Tree
- 8-2.05 Upper Santa Ana Valley (Cajon)

California Watersheds and Mojave Water Agency

China Lake
Salt Wells
Searles Valley
Pilot Knob
Koehn
Red Mountain
Atolia
Cuddeback
Bycycle
Goldstone
Lockhart
Grass Valley
Superior
Afton
Langford
Afton
Cronese
North
Muroc
Coyote
Lockhart
Harper Valley
Kramer Junction
Hinkley
Afton
Caves
Yermo
Lenwood
Barstow
Daggett
Newberry Springs
Lancaster
Lower Mojave
Newberry Springs
Troy Valley
Mojave River
Middle Mojave
Newberry Springs
Kane Wash
Buttes
El Mirage
Adelanto
Bessemer
Upper Mojave
Apple Valley
El Mirage
Rock
Creek
Lucerne Lake
Spring Valley Lake
Victorville
Hesperia
Pinon Hills
Phelan
Baldy Mesa
Lucerne Valley
Johnson
Means
Johnson Valley
Deadman
Oak Hills
Upper Santa Ana River
Cajon
Emerson
Landers
N
Pioneertown
Warren
Joshua Tree
Yucca Valley
Copper
Mountain
Morongo
Coachella
Miracle Hill
Coachella
Sky Valley
Miles
0 5 10 20

Cal-Water 2.2.1 Watershed Boundaries
Mojave Water Agency

Source: California Watersheds: The Data and Maps, http://cain.ice.ucdavis.edu/calwater/#Data

Preliminary Hydrology Study

MAY 17, 2022

DRNSTY-2021-00027

APN: 0435-015-13, 35

Bear Valley Road

Apple Valley

San Bernardino County, California

PROFESSIONAL ENGINEER'S AFFIRMATIVE STATEMENT

I have examined and am familiar with the information in this document and all appendices, and based on my inquiries of individuals immediately responsible for obtaining the information in this document, I believe that the information is true, accurate, and complete

Prepared by

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RED BRICK SOLUTION

County of San Bernardino
LAND DEVELOPMENT

PRELIMINARY APPROVAL

THE APPROVAL OF THIS REPORT SHALL NOT BE CONSTRUED TO BE A PERMIT FOR ANY DEVELOPMENT OR SITE IMPROVEMENT

By: Mariano Mosquera (I8267)
Date: 07/18/2022 5:27:37 PM

This report has Preliminary Approval. Prior to Final Approval of the report, all outstanding comments and requirements shall be met.

mariano.mosquera@lus.sbcounty.gov
C: (909) 601-4671 O: (909) 387-4104

Table of Contents

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- A. Location of Property 1
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- C. Methodology 1
- D. Compliance with Regulations 2
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Appendix

Appendix A

Exhbits

Land Use Map – A
FEMA Map – B
NOAA 14 Precipitation –C
Soil Report – D
Off-Site Hydrology - E
Pre-developed Hydrology – F
Developed Hydrology – G
Basin Volume Size – H
Channel Calculations – I, J,K

Appendix B - Off-Site Unit Hydrology Method Analysis
- Area A - 100-year Tributary Watershed
- Area B - 100-year Tributary Watershed

Appendix C - On-Site Rational Method Analysis
- DMA-A Pre-developed 25-year 1-hour
- DMA-A Developed 100-year 1-hour

Appendix D On-Site Unit Hydrology Method Analysis
- DMA-A Pre-developed 25-year 1-hour
- DMA-A Developed 100-year 1-hour

I. INTRODUCTION

A. LOCATION OF PROPERTY

The 40.2-acre project is a mixed-use retirement community that is located 1,425 feet west of the intersection of Bear Valley Road and Highway 18, east of the Town of Apple Valley, CA APN 0435-015-13. An additional 4.72-acres (APN 0435-015-35) just south of the site will be developed as a solar farm to support the site to the north.

B. PURPOSE AND SCOPE

The purpose of this study is to determine the off-site 100-year tributary storm flows and convey them through the site along with determining the developments effect on hydrology. The developed on-site increased 100-year storm flows will be mitigated down to 90% of the 25-year undeveloped storm flow levels in order to assure that downstream developments receive less than their historic storm flows. Since the 4.72-acre solar farm will not decrease the permeable area of its site nor increase storm water run-off, this study will focus only on the 40.2-acres site.

As a planning level document, this Preliminary Hydrology Study will address the requirements needed to resolve potential flood hazards for the proposed Residential Planned Development (RPD) as depicted on the Preliminary Development Plan, in accordance with Chapter 85.10 Planned Development Permits and therefore includes schematic level designs for off-site drainage conveyances, internal drainage conveyances, mitigation basin sizing, and recommendations for Pad Elevations that will provide flood protection. Once the Preliminary Development Plan is approved, Final Engineered Improvement Plans and a Final Hydrology Study will prepare for County Review and Approval.

When submitted, the Final Hydrology Study will address the sizing of catch basin inlets, underground storm drains, basin outlets, and spillways once final designs for streets, grading, and drainage facilities has been established.

C. METHODOLOGY

This study is based on using the San Bernardino County Hydrology Manuel and Addendum B, and CivilDesign Rational Method Software to model the storm channel flows.

The following criteria were used for the off-site tributary flows:

1.	Current land use:	Rural Living
2.	Proportion Impervious:	32%
3.	Intended Use:	Multiple Residential
4.	NOAA 14 Precipitation	100-year 1-hour=1.08 Developed 25-Year 1-hour= 0.787 Pre-developed
5.	Soil Type	Group A
6.	San Bernardino County Hydrology Manuel	Rational Method, Unit Hydrograph Method

D. COMPLIANCE WITH REGULATIONS

All calculations are based on generally accepted engineering practices in accordance with the San Bernardino County Hydrology Manual's Hydrologic Criteria and Drainage Design including the April 2010 Addendum that addresses the Antecedent Moisture Condition (AMC) for arid regions of the County.

E. FLOODPLAIN INFORMATION

The project site is located within the Department of Water Resources (DWR) Awareness 100-year floodplain (see Appendix A Exhibit B1) but outside of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map Panel 06071C6510H effective August 28, 2008, indicates that the site is in "Zone D". Zone D is defined by FEMA as "areas in which flood hazards are undetermined, but possible" (see Appendix A Exhibit B page 9) for the San Bernardino County.

II. OFF-SITE HYDROLOGY

A. PRE-DEVELOPED DRAINAGE:

The project straddles a ridge line that divides two off-site tributary watershed flows (see Appendix A Exhibit E page 18). Area A on the east consists of a 108.4-acre water shed that flows through the project site. Area B on the west consists of a smaller narrow 22.3-acre water shed that once entering the project site travels along the western edge eventually exiting west the site at the northwest corner - see Figure 1 below.

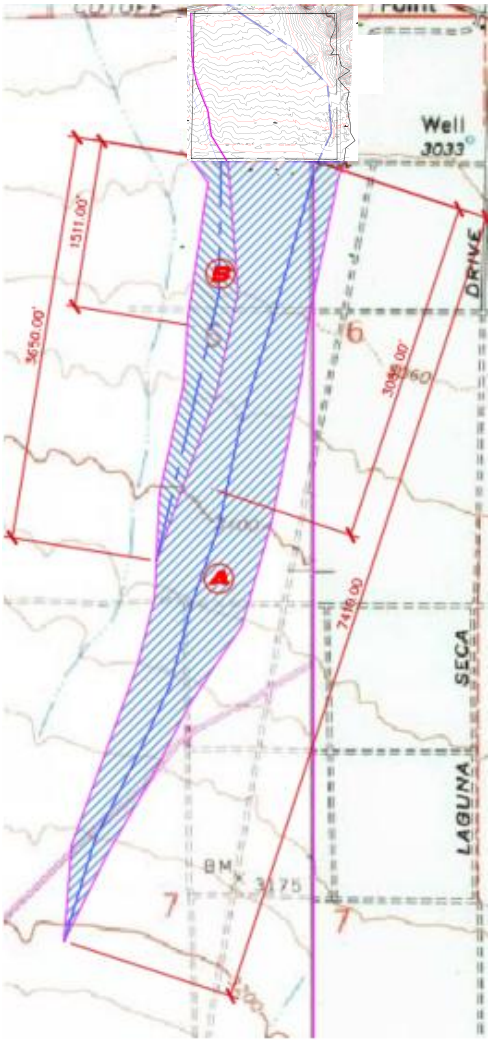


Figure 1

LAG TIME CALCULATION

$$Lag = C_t * \left((L * L_{ca})/s^{0.5}\right)^m$$

Where, AREA A

C_t = 24$\bar{n}$ ($\bar{n}$ = 0.033)`

L = 1.40 miles

Lca = 0.5843 miles (to the Centroid)

S = 163/1.4 = 116.4 (feet/mile)

m = 0.38

Lag = 0.298 hours

Where, AREA B

C_t = 24$\bar{n}$ ($\bar{n}$ = 0.033)

L = 0.6913 miles

Lca = 0.2862 miles (to the Centroid)

S = 73/0.6913 = 105.60 (feet/mile)

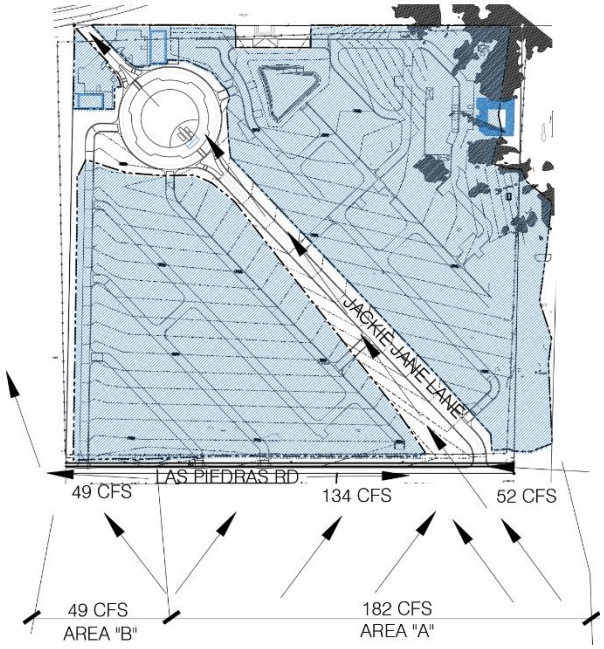
m = 0.38

Lag = 0.168 hours

Appendix A Exhibit E and Figure 1 show that the off-site tributary sheet flows from Area A combine with on-site flows and confluence within a dry wash that directs these concentrated flows northwesterly to the northwest corner of the site.

B. POST-DEVELOPED DRAINAGE:

In order to separate the off-site flows from combining with the developed on-site storm flows, a high point has been designed to direct these two off-site flows easterly and westerly along Las Piedras Road respectively. The off-site Tributary Area "B" (see Appendix A Exhibit E page 17) produces a 100-year peak storm flow of 49 cfs that is conveyed west along Las Piedras Road off-site to confluence with other sheet flows traveling northwesterly (see Appendix B Area B Off-Site 100-year 3-Hour Unit Hydrograph calculation).



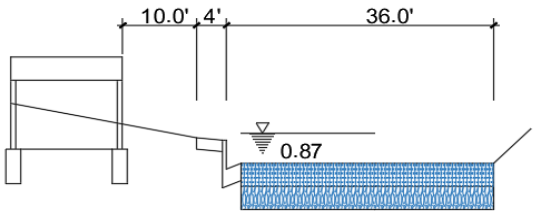
a) The off-site Tributary Area "A" produces a 100-year peak storm "sheet flow" approximately 1077 ft wide that confluences along Las Piedras Road to become a 186 cfs flow at the low point at Jackie Jane Lane. Adjusting the 186 cfs flows by contributing area along the easterly 1077 LF of Las Piedras Road shows that the 780 feet west of Jackie Jane Lane conveys a maximum of (186 cfs*780lf/1077lf=) 134 cfs that will confluence with the (186*297/1077=) 52 cfs that develops along the easterly 297 feet of Las Piedras Road prior to entering Jackie Jane Lane.

As an Interior Private Street Storm Conveyance System, Jackie Jane Lane bisects the project site transporting the 100-year off-site flows through the project without co- mingling with on-site flows (shown in blue). The on-site (blue) storm flows are captured within an independent storm drain system that does directs these flows to a retention/detention basin independently. Las Piedras Road and Jackie Jane Lane are designed as an channel with an 8-inch curb and the road beds constructed using a gravel containment geogrid which is 100% permeable. If constructed as a rectangular channel road section, these two streets can convey the storm flows northwesterly and release them into its historic drainage conveyance on the north side of the project site without confluencing with on-site storm flows.

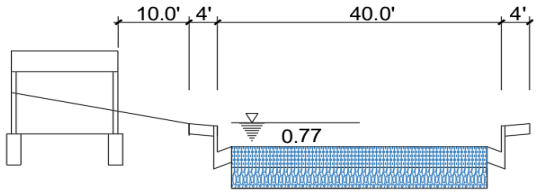
Table 1

Conveyance Channel	Req'd Q	Manning's	Slope	Width	Curb Height	Depth Q	Velocity
Street Name	cfs	n	%	ft	in	ft	fps
Las Piedras Road	134	0.02	0.4	36	8	0.886	4.2
Jackie Jane Lane	186	0.02	1	40	8	0.766	6.07

Table 1 above is a summary of the Manning's channel street calculations found in Appendix A Exhibits I & J. These calculations show that if the streets are constructed with 8-inch curbs with the water surface elevation confined within the street right-of-way (back of walk lines) no more than 2.5-inches above the top of curb.



LAS PIEDRAS ROAD



JACKIE JANE LANE

III. ON-SITE HYDROLOGY

A. ONSITE UNDEVELOPED DRAINAGE DESCRIPTION

The on-site tributary area consists of a 40.2-acre drainage area flowing generally from the southerly boundary northwesterly as sheet flows that confluence near the northern property line where they are directed westerly within the historic conveyance along the south side of Bear Valley Road. The overall site is divided into our (4) sub-areas for study purposes that confluence at the northwest corner of the site (see Appendix A Exhibit F page 19).

B. UNDEVELOPED HYDROLOGY

The 40.2-acre site's drainage area consists of native desert vegetation creosote bush, pencil cholla, blue sage, annual flowers, and grasses. The site was analyzed with the San Bernardino County Hydrology Manual and CivilDesign software to perform a Rational method analysis of the pre-developed site using the 25-year AMC II storm event as outlined the Detention Basin Design Criteria for San Bernardino County. From this analysis we have determined that the undeveloped storm flows are approximately 30.46 cfs. Converting this data to the unit hydrograph yields an undeveloped storm flow of 49.14 cfs over a 3-hour event. (see Appendix C and D)

C. ON-SITE DEVELOPED CONDITIONS

The developed drainage area is bisected by a drainage conveyance that will direct off-site flows through the site to the historic conveyance at the northwest corner of the site. This conveyance consists of Jackie Jane Lane and Cactus Flower Circle comprising of approximately 7.9 acres (see Appendix A Exhibit G page 20). The remaining 32.5 acres is broken down into seven subareas that confluence within a centralized retention/detention basin that discharges to the northern property where historic flows confluence and begin traveling to the northwest corner of the site. The on-site developed storm flows

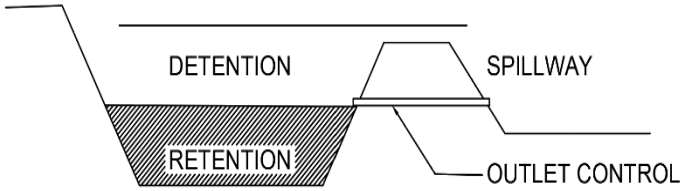
generally sheet flow northerly until captured by two interior streets, Joshua Bend Lane with a 39 cfs half street capacity and Palm Court with a half street capacity of 28 and 25.5 cfs that direct the 100-year storm flows northwesterly. These flows are then captured in a storm drain system located just south of their intersection with Cactus Flower Loop Road respectively. This storm drain system then redirects these on-site flows northeasterly to a centralized retention/detention basin sized to mitigate these flows down to below 90% of the 25-year pre-developed storm flow.

D. DEVELOPED HYDROLOGY

The 100-year storm condition outlined in the San Bernardino Hydrology Manual considers a 3-day storm event where the ground is saturated, and no ground water percolation occurs. This is accomplished by considering the Antecedent Moisture Condition case III (AMC-III) for our study. Using the point rainfall of 1.08 inches for the 100-year-one-hour storm event, the Rational method analysis determined that the 100-year 1-hour storm event will generate flows of 78.94 cfs. Converting this data to the unit hydrograph yields a developed storm flow of 75.09 cfs over a 3-hour event. (see Appendix C and D)

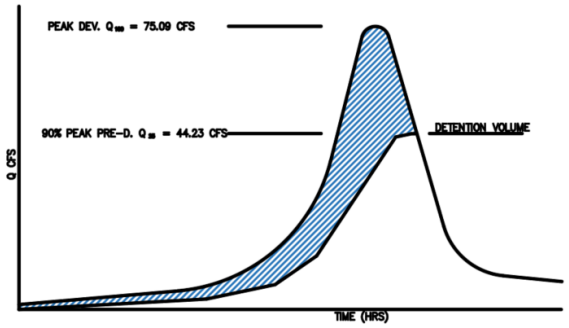
E. RETENTION/DETENTION BASIN SIZING

Since we are now required to provide on-site infiltration through the Water Quality Management Plan (WQMP), all basins must have a retention area for infiltration. Thus, if the project uses detention to mitigate the developed change in Q, then it will be a combined retention/detention basin with an outlet above the retention volume requirement as outlined in the WQMP.

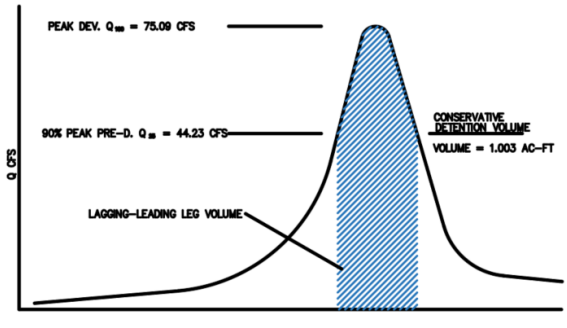


The pre-developed 25-year peak storm flow was determined to be 49.14 cfs (see page 57) which when reduced 90% yields a storm flow of 44.23 cfs. Per Addendum B to the San Bernardino County Hydrology Manual, The 100-year on-site developed peak storm flow of 75.09 cfs must be mitigated by a detention basin to a release rate of 44.23 cfs.

Basin	Pre-Developed	Post-Developed	Mitigated Post-Developed
Designation	25-Year Qcfs	100-Year Qcfs	90% 25-Year Qcfs
A1	49.14	75.09	44.23



ROUTED BASIN VOLUME



ESTIMATED BASIN VOLUME

Using the developed unit hydrograph one can estimate a conservative storm detention volume by determining the volume at the 44.23 cfs flow on the leading (rising) leg of the unit hydrograph curve (1.4648 ac-ft) and the lagging edge or opposite leg of the unit hydrograph curve (2.468 ac-ft (see Page 61). The detention volume is the difference in volume between the two or (2.468-1.4648=1.003) 1.003 ac-ft. being equal to 43,704 cubic feet which is a conservative estimate. Currently the on-site basin has been designed to store 53,301 cubic feet allowing for 0.60 feet of free board. (See Appendix A Exhibit H page 21)

IV. CONCLUSIONS

Currently the project is designed to pass the off-site 100-year storm through the project via Las Piedras Road and Jackie Jane Lane to the northwest corner of the site where they will be released in their historic drainage conveyance. Each of these streets have been designed as rectangular channels with an 8-inch curb face and a geogrid gravel bottom that is 100% permeable. Thus, on-site stormflows associated with these street areas will not add any developed storm flows as these off-site flows pass through the site.

The On-site developed 100-year peak storm flows will be mitigated to the 90% of 25-year predeveloped peak storm flows by means of a 53,302 cubic foot detention basin. Thus, the project has met the San Bernardino County's criteria for flood protection both on-site and off-site.

Based on the findings of this Hydrology Study, the design recommendations are as follows:

PAD elevations should be set 1.9-feet above the highest adjacent street flowline elevations based on the maximum storm flow depth of 0.87- ft in Las Piedras Road.

V. REFERENCES:

County San Bernardino of Public Works Low Impact Development Standards Manual. Updated February 2014.
County of San Bernardino Public Works Hydrology Manual. Created in August 1986.
http://cms.sbcounty.gov/Portals/50/floodcontrol/HydrologyManual.pdf
Federal Emergency Management Agency website: https://msc.fema.gov/portal accessed December 2016.
NOAA Atlas 14, Volume 6, Version 2 POINT PRECIPITATION FREQUENCY (PF) ESTIMATES WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION. Accessed December 2016.
NRCS Soils Data from Soil Map; San Bernardino County, California, Mojave River Area; Version 8, Sep 12, 2016 Accessed December 2016.

APPENDIX A

Exhibits:

Land Use Map – A

FEMA Map – B

NOAA 14 Precipitation – C

Soil Report – D

Off-Site Hydrology - E

Pre-developed Hydrology – F

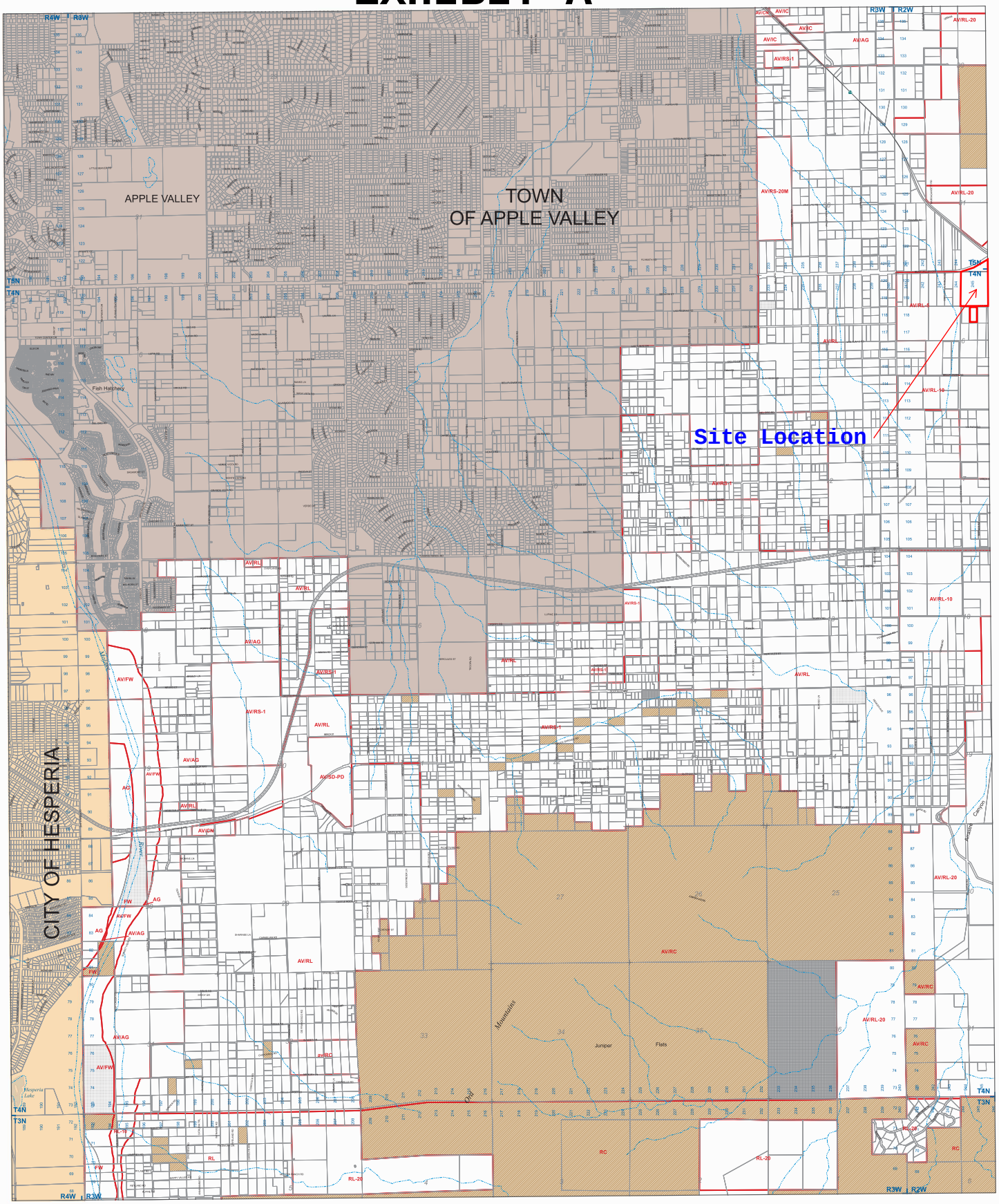
Developed Hydrology – G

Basin Volume Size – H

St. Channel Calculations – I, J, K

See EH31 A

EXHIBIT A



See FH06 A

See FH15 A

Land Use Zoning Districts

AG – Agriculture
CG – General Commercial
CH – Highway Commercial
CN – Neighborhood Commercial
CO – Office Commercial
CR – Rural Commercial
CS – Service Commercial
FW – Floodway
IC – Community Industrial
IN – Institutional
IR – Regional Industrial
OS – Open Space
RC – Resource Conservation
RL – Rural Living
RM – Multiple Residential
RS – Single Residential
SD – Special Development
SP – Specific Plan

County designated Land Use Zoning Districts do not apply to Federal or State owned property.

San Bernardino County Land Use Plan
GENERAL PLAN
Land Use Zoning Districts
Page 8

Legend

BLM
National Park
National Forest
Military
State
Indian Land
Other Federal Government
County
Private Unincorporated
RDA

12/2021

Jurisdictional Control data is for informational purposes only and is not part of the General Plan Land Use Zoning. The depiction of the various land ownership categories is the best available information but cannot be guaranteed accurate. For current land ownership information please contact the San Bernardino County Assessor's Office.

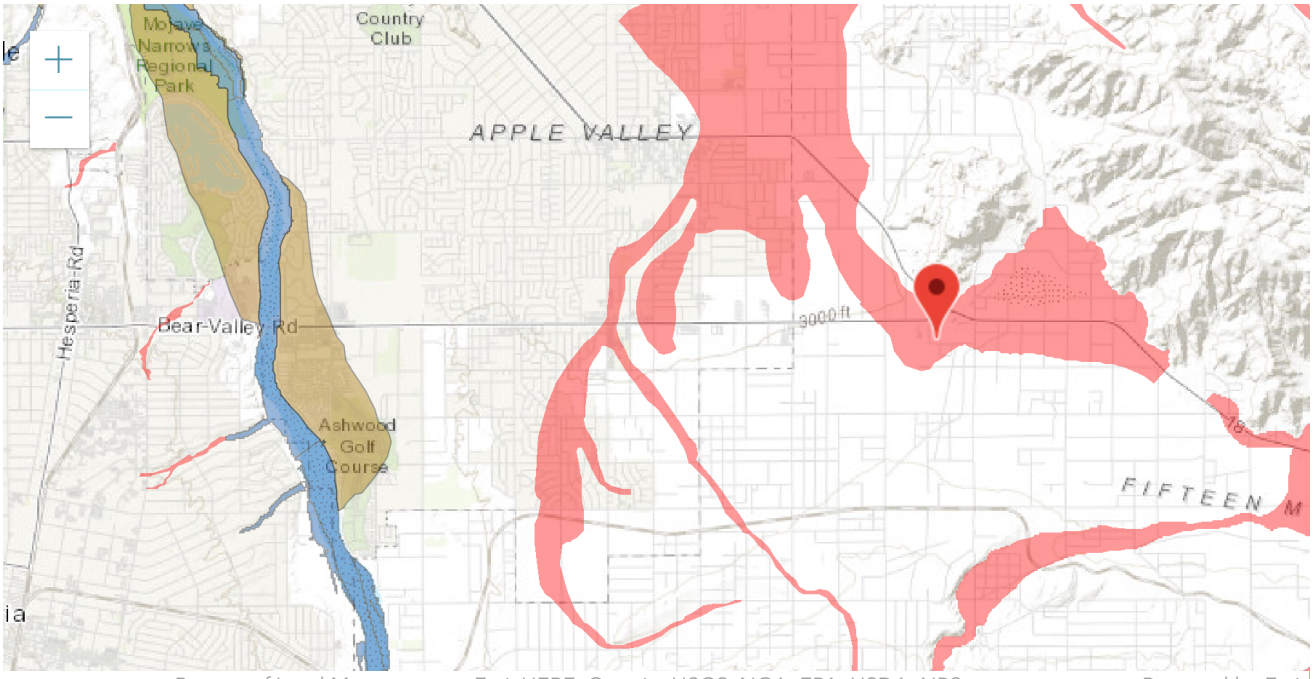
FH07 A
APPLE VALLEY SOUTH

EXHIBIT B1

CALIFORNIA DEPARTMENT OF
WATER RESOURCES

Floodplain Information

Latitude: 34.47132, Longitude: -117.12742



County: San Bernardino (34.47132, -117.12742)

Floodplain Layer	100-YR	200-YR	500-YR
FEMA Effective	N✓	N/A	N✓
DWR Awareness	Y✓	N/A	N/A
Regional/Special Studies	N✓	N/A	N
USACE Comp. Study	N✓	N✓	N

Y: The location is within the floodplain
N: The location is not within the floodplain
N/A: Data not available
✓ = Active Layer(s)

Floodplains are displayed using semi transparent colors. When viewing overlapping floodplains, the combination of multiple semi transparent colors will not match the legend colors. For accurate color representation, view floodplains individually.

FEMA Effective | Regional/Special Studies | DWR Awareness

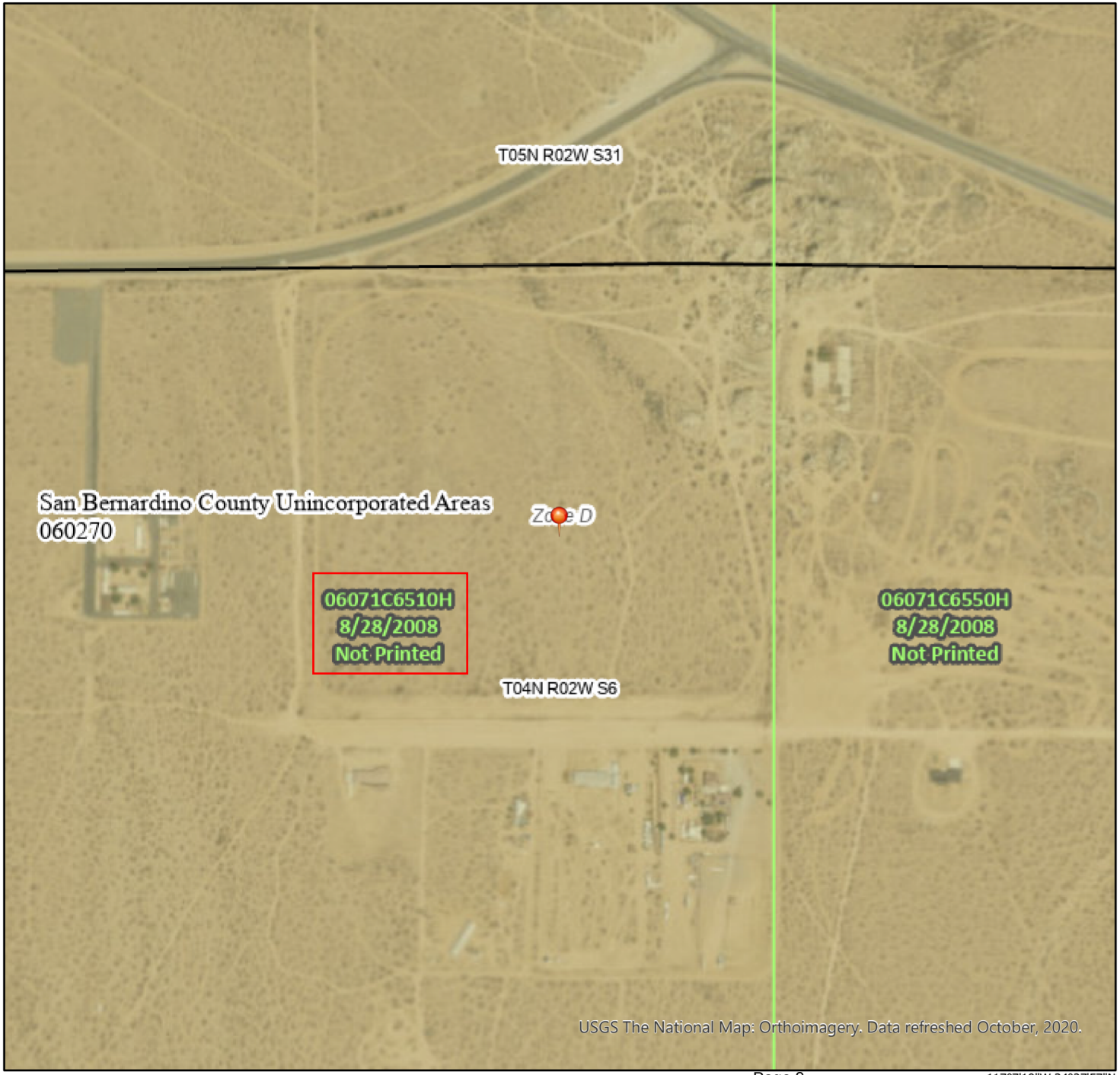
USACE Comprehensive Study | USACE Comprehensive Study | FEMA Effective

National Flood Hazard Layer FIRMette

FEMA

EXHIBIT B2

117°7'56"W 34°28'27"N



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

1:6,000

117°7'19"W 34°27'57"N

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
- 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 10/31/2020 at 3:02 AM 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.

12/2021

NOAA Atlas 14, Volume 6, Version 2
Location name: Apple Valley, California, USA*
Latitude: 34.4702°, Longitude: -117.127°
Elevation: 3032.49 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.081** (0.067-0.100)	**0.114** (0.094-0.139)	**0.159** (0.130-0.195)	**0.197** (0.161-0.244)	**0.253** (0.200-0.324)	**0.299** (0.231-0.390)	**0.348** (0.262-0.465)	**0.400** (0.294-0.551)	**0.475** (0.335-0.681)	**0.536** (0.365-0.796)
10-min	**0.117** (0.096-0.143)	**0.163** (0.134-0.199)	**0.227** (0.187-0.279)	**0.283** (0.231-0.350)	**0.363** (0.286-0.464)	**0.428** (0.331-0.560)	**0.498** (0.376-0.667)	**0.573** (0.421-0.789)	**0.681** (0.480-0.977)	**0.769** (0.523-1.14)
15-min	**0.141** (0.116-0.173)	**0.197** (0.162-0.241)	**0.275** (0.226-0.338)	**0.342** (0.279-0.423)	**0.439** (0.346-0.562)	**0.518** (0.400-0.677)	**0.602** (0.455-0.806)	**0.693** (0.509-0.954)	**0.824** (0.580-1.18)	**0.930** (0.633-1.38)
30-min	**0.196** (0.162-0.240)	**0.274** (0.226-0.336)	**0.383** (0.315-0.470)	**0.476** (0.388-0.589)	**0.611** (0.482-0.782)	**0.721** (0.557-0.942)	**0.839** (0.633-1.12)	**0.966** (0.709-1.33)	**1.15** (0.808-1.64)	**1.30** (0.881-1.92)
60-min	**0.253** (0.209-0.309)	**0.353** (0.291-0.432)	**0.493** (0.405-0.605)	**0.613** (0.500-0.759)	**0.787** (0.621-1.01)	**0.928** (0.718-1.21)	**1.08** (0.815-1.45)	**1.24** (0.913-1.71)	**1.48** (1.04-2.12)	**1.67** (1.14-2.47)
2-hr	**0.359** (0.296-0.439)	**0.482** (0.397-0.590)	**0.653** (0.537-0.802)	**0.799** (0.652-0.990)	**1.01** (0.797-1.29)	**1.18** (0.913-1.54)	**1.36** (1.03-1.82)	**1.55** (1.14-2.14)	**1.83** (1.29-2.62)	**2.05** (1.39-3.04)
3-hr	**0.438** (0.362-0.536)	**0.581** (0.479-0.711)	**0.778** (0.640-0.956)	**0.947** (0.772-1.17)	**1.19** (0.938-1.52)	**1.38** (1.07-1.81)	**1.59** (1.20-2.13)	**1.81** (1.33-2.49)	**2.12** (1.49-3.04)	**2.37** (1.61-3.51)
6-hr	**0.600** (0.495-0.734)	**0.787** (0.649-0.964)	**1.04** (0.859-1.28)	**1.26** (1.03-1.56)	**1.57** (1.24-2.01)	**1.82** (1.41-2.38)	**2.08** (1.57-2.79)	**2.36** (1.73-3.25)	**2.75** (1.94-3.94)	**3.06** (2.08-4.54)
12-hr	**0.771** (0.637-0.943)	**1.02** (0.845-1.26)	**1.37** (1.13-1.68)	**1.66** (1.35-2.06)	**2.07** (1.63-2.65)	**2.39** (1.85-3.13)	**2.73** (2.06-3.65)	**3.08** (2.26-4.24)	**3.57** (2.52-5.13)	**3.96** (2.70-5.88)
24-hr	**1.01** (0.896-1.16)	**1.37** (1.22-1.58)	**1.86** (1.64-2.15)	**2.27** (1.99-2.64)	**2.83** (2.40-3.41)	**3.28** (2.72-4.03)	**3.74** (3.03-4.71)	**4.22** (3.33-5.47)	**4.89** (3.70-6.60)	**5.43** (3.96-7.58)
2-day	**1.20** (1.07-1.38)	**1.66** (1.47-1.91)	**2.28** (2.01-2.63)	**2.78** (2.44-3.24)	**3.49** (2.96-4.20)	**4.04** (3.36-4.97)	**4.62** (3.74-5.81)	**5.22** (4.11-6.76)	**6.05** (4.58-8.17)	**6.71** (4.90-9.37)
3-day	**1.30** (1.16-1.50)	**1.82** (1.61-2.09)	**2.51** (2.22-2.90)	**3.08** (2.70-3.59)	**3.87** (3.28-4.66)	**4.49** (3.73-5.52)	**5.13** (4.16-6.46)	**5.80** (4.57-7.52)	**6.74** (5.10-9.10)	**7.49** (5.47-10.5)
4-day	**1.38** (1.23-1.59)	**1.93** (1.71-2.23)	**2.68** (2.37-3.10)	**3.30** (2.89-3.84)	**4.15** (3.52-4.99)	**4.82** (4.00-5.92)	**5.51** (4.46-6.94)	**6.24** (4.91-8.07)	**7.25** (5.48-9.79)	**8.06** (5.89-11.3)
7-day	**1.51** (1.33-1.73)	**2.10** (1.86-2.42)	**2.92** (2.58-3.37)	**3.60** (3.16-4.20)	**4.56** (3.86-5.49)	**5.31** (4.41-6.53)	**6.09** (4.93-7.67)	**6.91** (5.44-8.94)	**8.05** (6.09-10.9)	**8.95** (6.54-12.5)
10-day	**1.59** (1.41-1.83)	**2.22** (1.97-2.56)	**3.09** (2.73-3.57)	**3.82** (3.35-4.45)	**4.86** (4.12-5.85)	**5.67** (4.71-6.97)	**6.52** (5.28-8.21)	**7.41** (5.84-9.60)	**8.66** (6.55-11.7)	**9.65** (7.06-13.5)
20-day	**1.81** (1.61-2.09)	**2.56** (2.26-2.95)	**3.60** (3.18-4.15)	**4.48** (3.92-5.22)	**5.74** (4.86-6.91)	**6.75** (5.60-8.29)	**7.80** (6.32-9.82)	**8.91** (7.02-11.5)	**10.5** (7.90-14.1)	**11.7** (8.53-16.3)
30-day	**2.06** (1.82-2.37)	**2.90** (2.57-3.34)	**4.10** (3.62-4.74)	**5.13** (4.49-5.97)	**6.61** (5.60-7.95)	**7.79** (6.47-9.58)	**9.03** (7.31-11.4)	**10.3** (8.14-13.4)	**12.1** (9.18-16.4)	**13.6** (9.91-18.9)
45-day	**2.43** (2.15-2.80)	**3.43** (3.04-3.95)	**4.86** (4.29-5.61)	**6.09** (5.34-7.09)	**7.88** (6.68-9.49)	**9.34** (7.75-11.5)	**10.9** (8.79-13.7)	**12.4** (9.81-16.1)	**14.7** (11.1-19.8)	**16.4** (12.0-22.9)
60-day	**2.67** (2.37-3.08)	**3.76** (3.33-4.33)	**5.32** (4.70-6.15)	**6.68** (5.85-7.78)	**8.65** (7.33-10.4)	**10.3** (8.52-12.6)	**12.0** (9.69-15.1)	**13.7** (10.8-17.8)	**16.2** (12.3-21.9)	**18.1** (13.3-25.3)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

EXHIBIT D

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for San Bernardino County, California, Mojave River Area

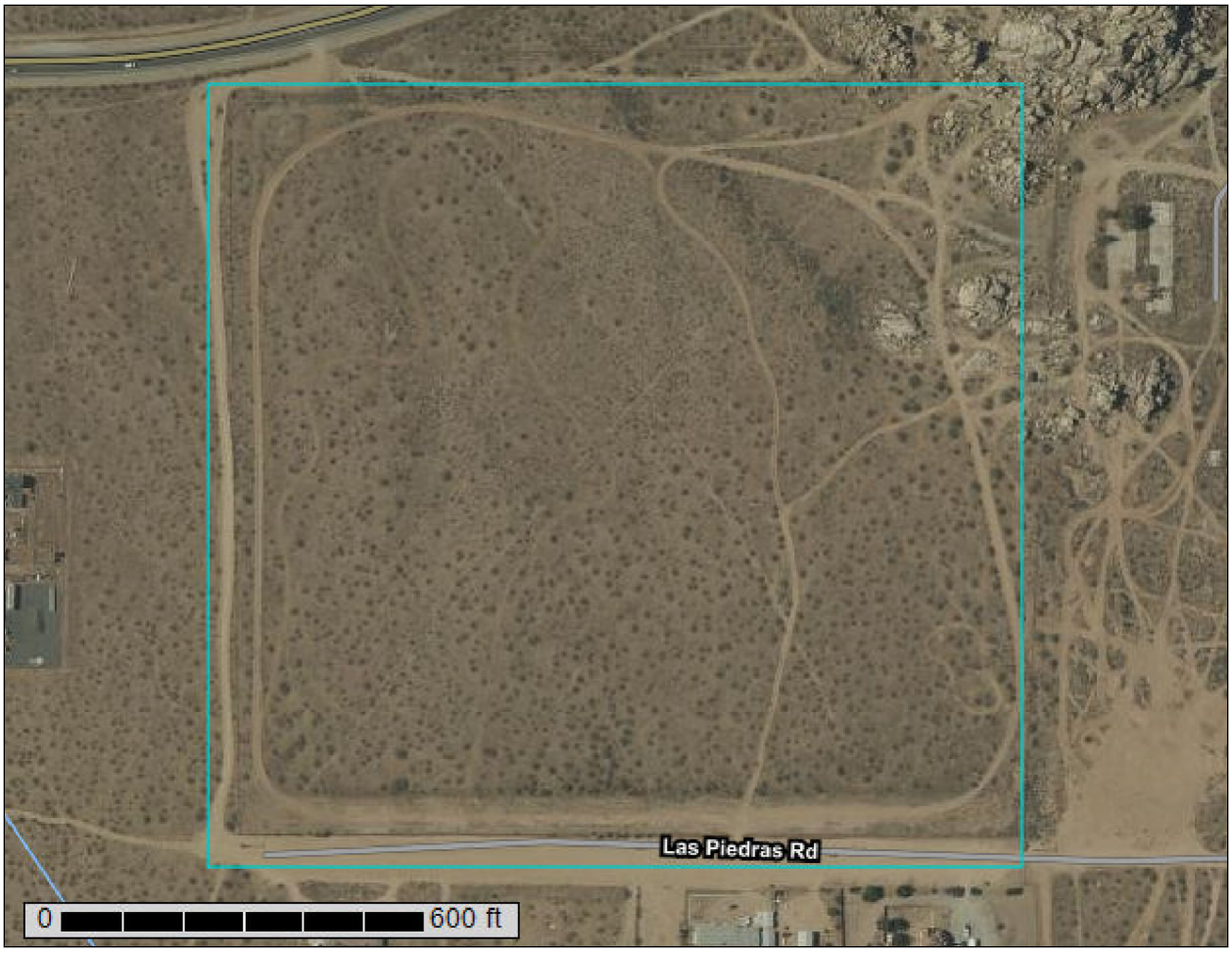


EXHIBIT D

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,330 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

San Bernardino County, California, Mojave River Area

131—HELENDALE LOAMY SAND, 0 TO 2 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hks4
Elevation: 2,500 to 3,800 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Helendale and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helendale

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 4 inches: loamy sand
H2 - 4 to 30 inches: sandy loam
H3 - 30 to 66 inches: sandy loam
H4 - 66 to 70 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Kimberlina
Percent of map unit: 5 percent
Hydric soil rating: No

Bryman
Percent of map unit: 5 percent
Hydric soil rating: No

Cajon
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils
Percent of map unit: 2 percent
Hydric soil rating: No

142—LUCERNE SANDY LOAM, 0 TO 2 PERCENT SLOPES

Map Unit Setting
National map unit symbol: hksh
Elevation: 2,900 to 3,400 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Lucerne and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lucerne

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile
H1 - 0 to 2 inches: sandy loam
H2 - 2 to 62 inches: sandy loam
H3 - 62 to 76 inches: sandy loam, sandy clay loam
H3 - 62 to 76 inches:

Properties and qualities
Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XE006CA - COARSE LOAMY
Hydric soil rating: No

Minor Components

Wasco

Percent of map unit: 5 percent
Hydric soil rating: No

Hesperia

Percent of map unit: 5 percent
Hydric soil rating: No

Bryman

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils

Percent of map unit: 2 percent
Hydric soil rating: No

158—ROCK OUTCROP-LITHIC TORRIORTHENTS COMPLEX, 15 TO 50 PERCENT SLOPES*

Map Unit Setting

National map unit symbol: hkt0
Elevation: 650 to 9,000 feet
Mean annual precipitation: 3 to 5 inches
Mean annual air temperature: 63 to 66 degrees F
Frost-free period: 200 to 290 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 60 percent
Lithic torriorthents and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Description of Lithic Torriorthents

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from granite

Typical profile

H2 - 15 to 29 inches: bedrock

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Excessively drained
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydric soil rating: No

Minor Components

Sparkhule

Percent of map unit: 4 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Hydric soil rating: No

Trigger

Percent of map unit: 3 percent
Hydric soil rating: No

174—WASCO SANDY LOAM, COOL, 2 TO 5 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hktj
Elevation: 250 to 3,700 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Wasco and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wasco

Setting

Landform: Fan aprons
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

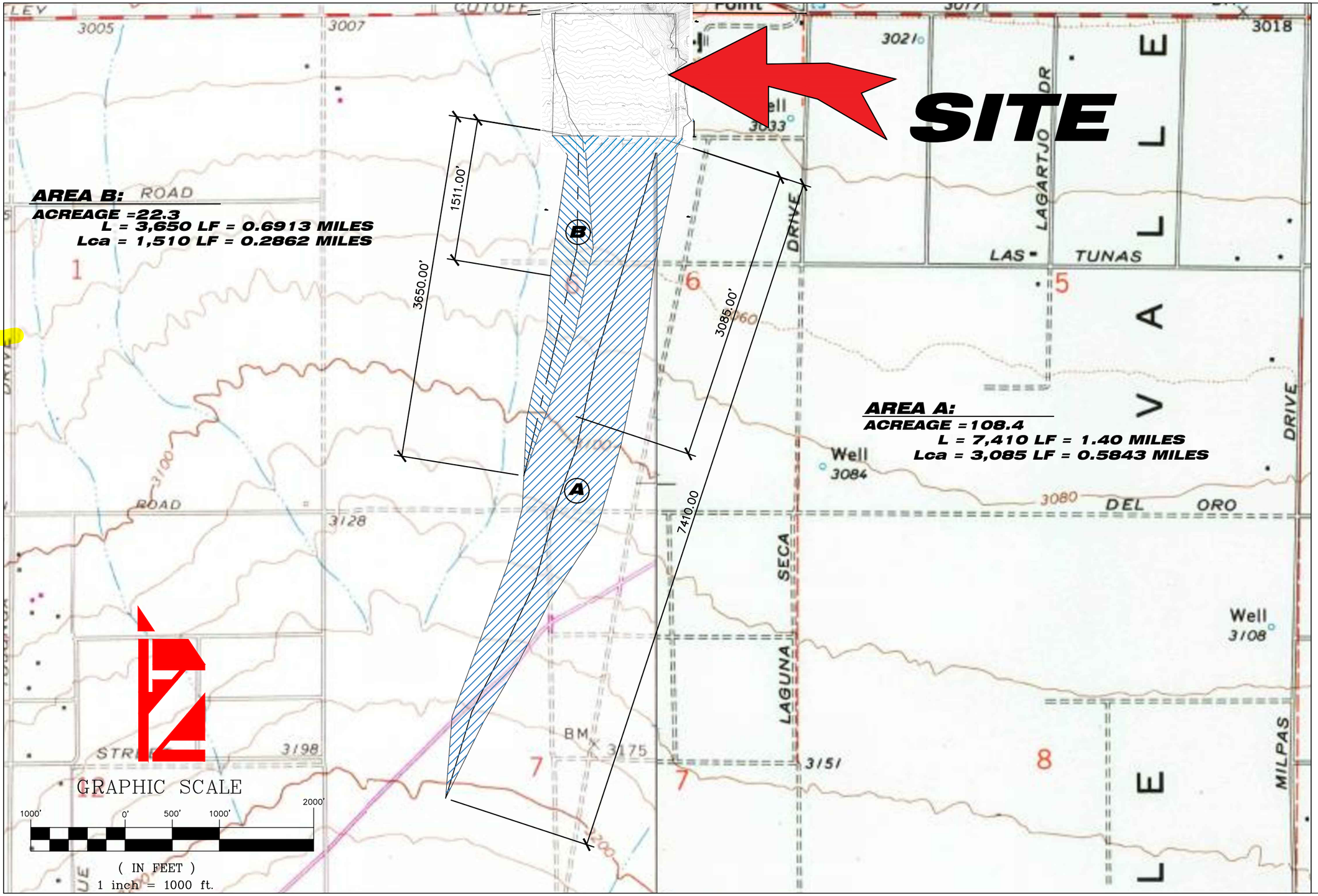
H1 - 0 to 7 inches: sandy loam
H2 - 7 to 60 inches: sandy loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF003CA - COARSE LOAMY
Hydric soil rating: No



AVELLANA PROPERTIES

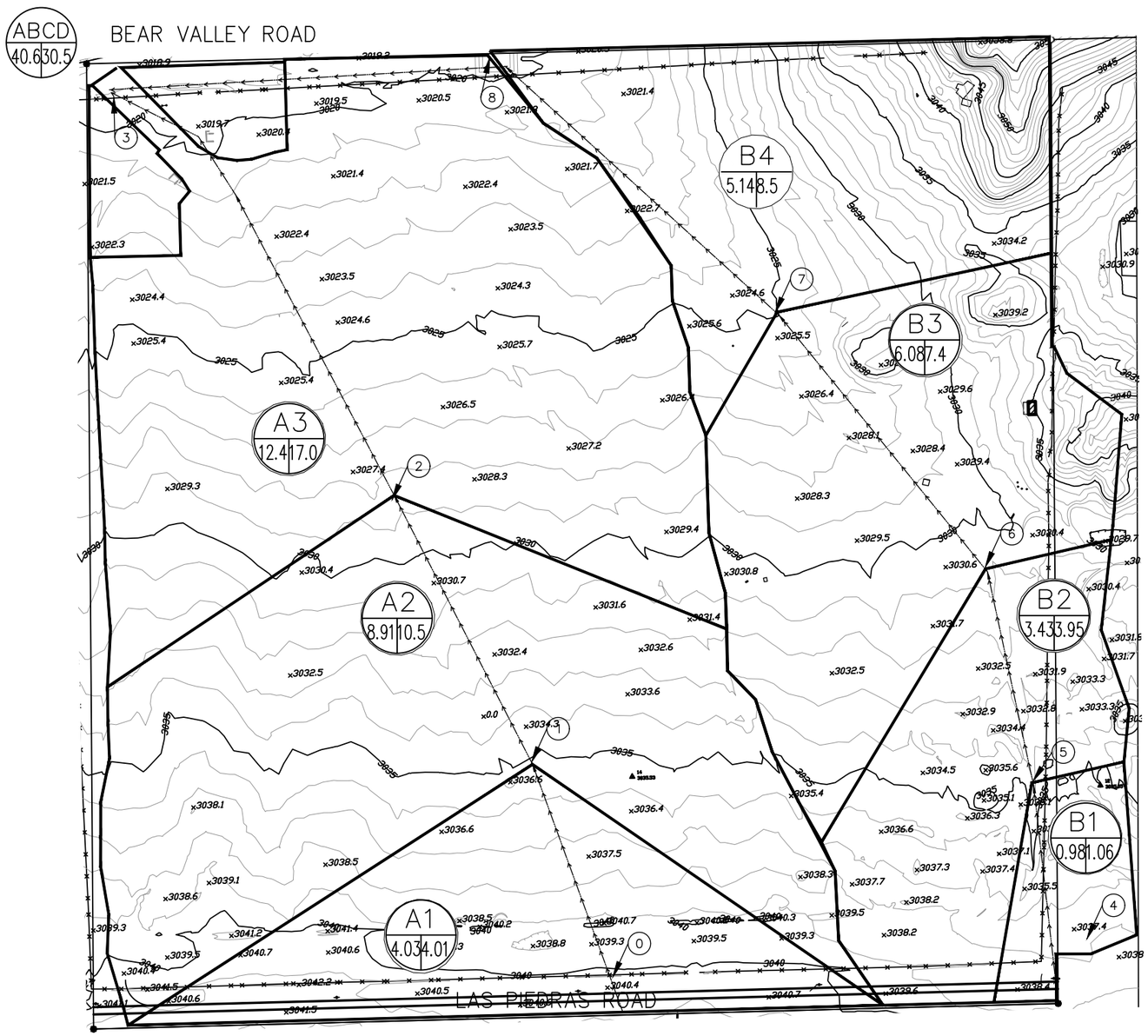
OFF-SITE TRIBUTARY DRAINAGE AREA MAP

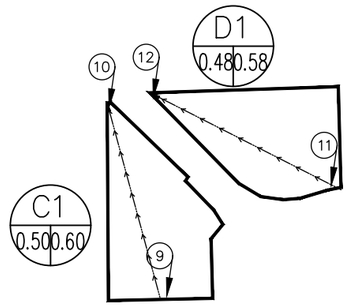
UNIT HYDROGRAPH METHOD

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT E





COMMERCIAL PROPERTIES

LEGEND:

NODE (#)

AREA (AC)

XX — DRAINAGE SUB-AREA OR LOCATION

XX — X — Q_{25} (cfs)

SUBAREA BOUNDARY

SUBAREA FLOWLINE

GRAPHIC SCALE

180' 0' 90' 180' 360'

(IN FEET)

1 inch = 180 ft.

AVELLANA PROPERTIES

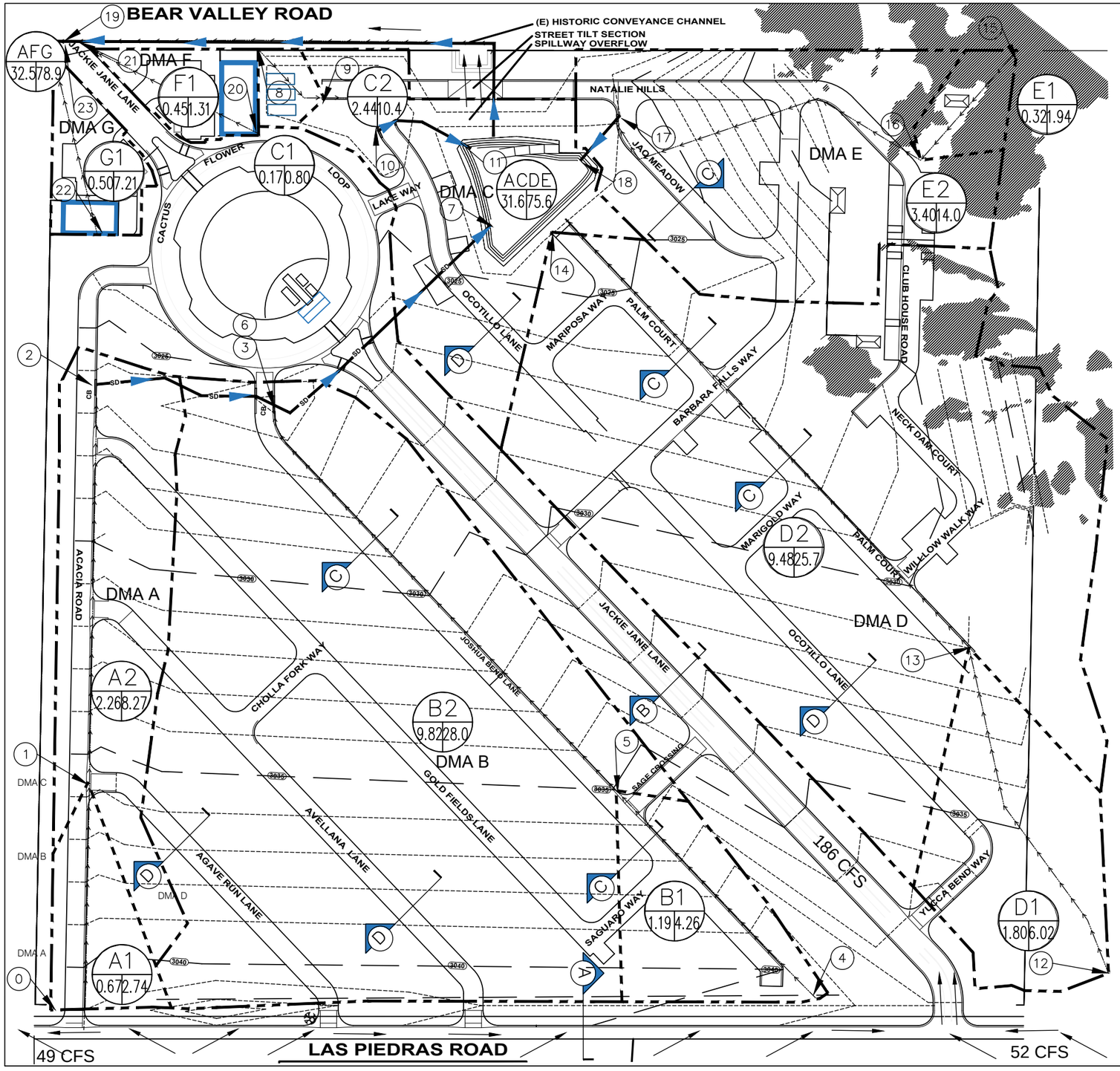
ON-SITE HYDROLOGY MAP

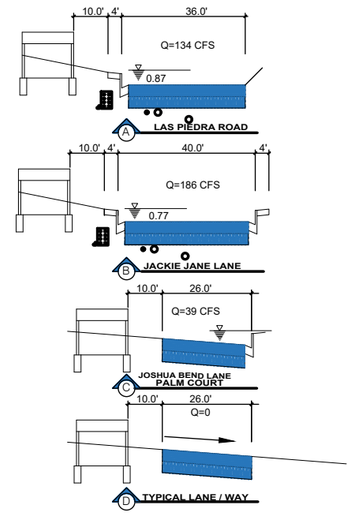
PRE-DEVELOPED DRAINAGE AREAS

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT F





LEGEND:

NODE (#)

AREA (AC) — XX — DRAINAGE SUB-AREA OR LOCATION

XX — X — Q_{100}(cfs)

AREA BOUNDARY

SUBAREA BOUNDARY

SD — STORM DRAIN

CATCH BASIN

COMMERCIAL STRUCTURE

SS PACKAGE TREATMENT

ROCKS

GRAPHIC SCALE

150' 0' 75' 150' 300'

(IN FEET)

1 inch = 150 ft.

AVELLANA PROPERTIES

ON-SITE HYDROLOGY MAP

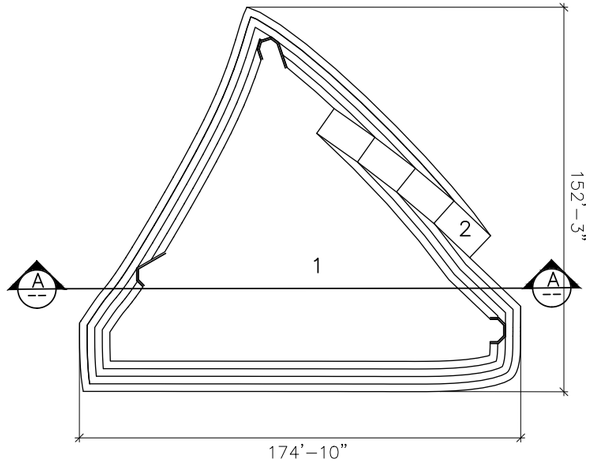
DEVELOPED DRAINAGE AREAS

RED BRICK SOLUTION

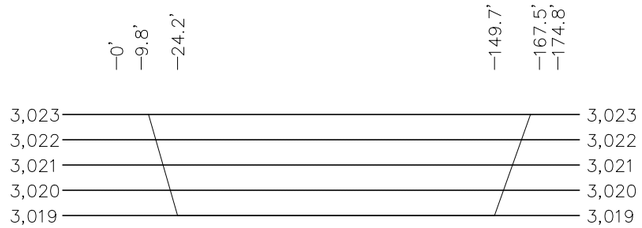
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT G

12/2021

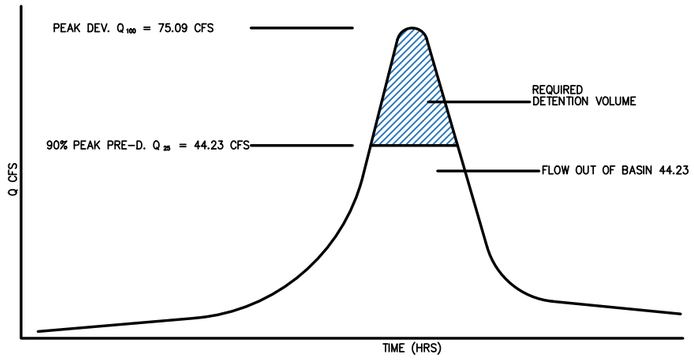


1 53,302 CF
Drainage Area Basin

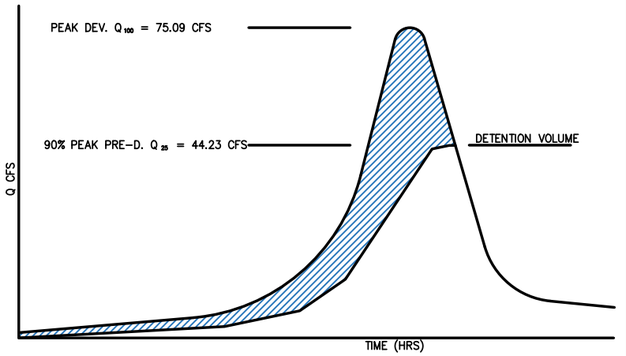


Area 1 : 10,011 SF @ Elev 3,019
Area 2 : 16,640 SF @ Elev 3,023
Volume of this Basin : (10,011+ (1/2*(16,640-10,011))*4
= 53,302 CF

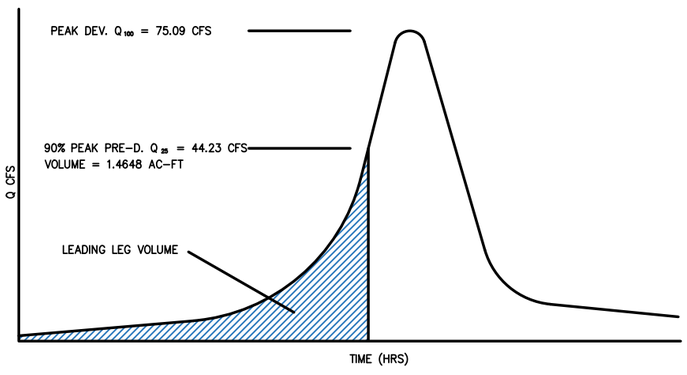
SECTION A–A

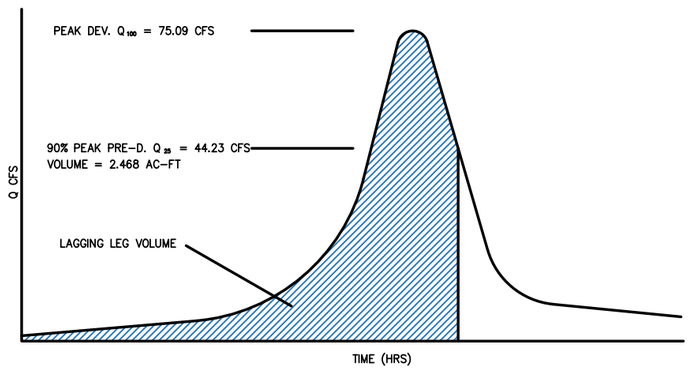


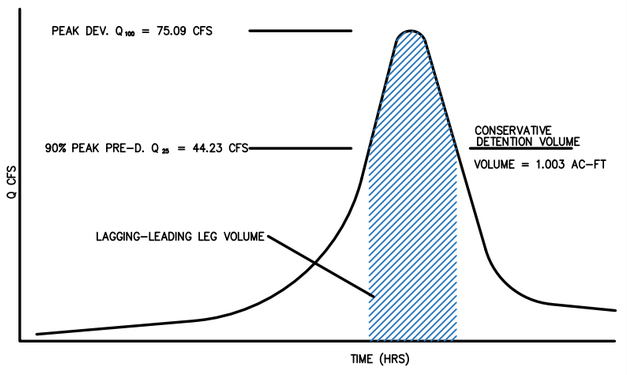
PERFECT DETENTION BASIN



ROUTED BASIN VOLUME







ESTIMATING ROUTED BASIN VOLUME

AVALLANA PROPERTIES

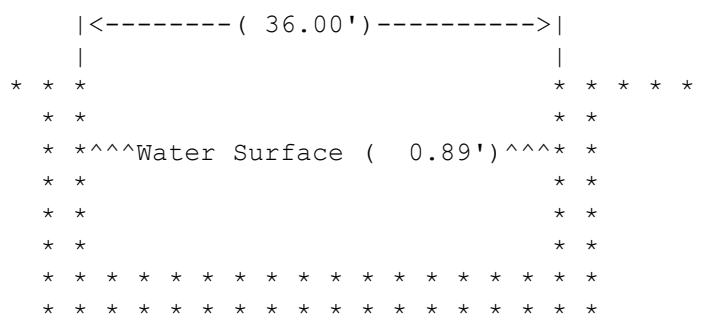
ON-SITE HYDROLOGY

POST-DEVELOPED DETENTION BASIN

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT H

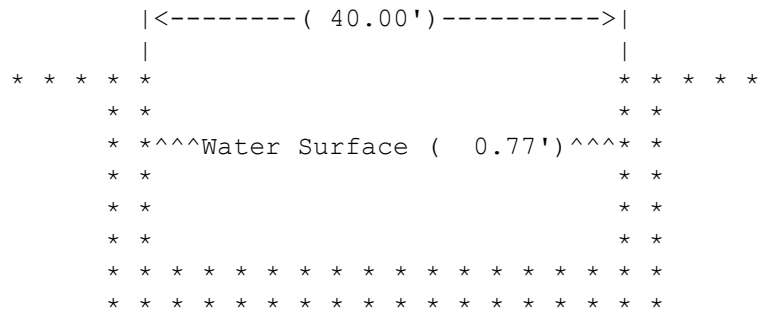
Exhibit I
Las Piedras Road Capacity



Rectangular Open Channel

Flowrate	134.000	CFS
Velocity	4.199	fps
Depth of Flow	0.886	feet
Critical Depth	0.755	feet
Total Depth	0.886	feet
Base Width	36.000	feet
Slope of Channel	0.400	%
X-Sectional Area	31.910	sq. ft.
Wetted Perimeter	37.773	feet
AR^(2/3)	28.516	
Mannings 'n'	0.020	

Exhibit J
Jackie Jane Lane Capacity



Rectangular Open Channel

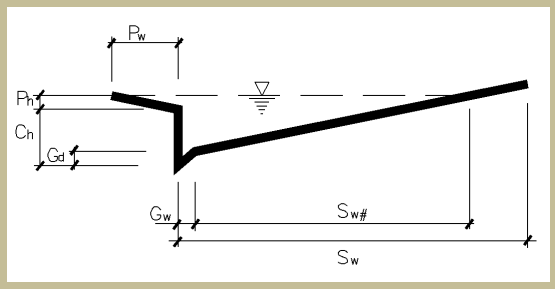
Flowrate	186.000	CFS
Velocity	6.068	fps
Depth of Flow	0.766	feet
Critical Depth	0.876	feet
Total Depth	0.766	feet
Base Width	40.000	feet
Slope of Channel	1.000	%
X-Sectional Area	30.653	sq. ft.
Wetted Perimeter	41.533	feet
AR^(2/3)	25.034	
Mannings 'n'	0.020	

EXHIBIT K
1/2 STREET CAPACITY

26 FT HALF STREET FLOW CALCULATIONS

Given:

Half Street CL to Curb	Sw	26	Ft
Street X-Slope	Cs =	0.021	Ft/Ft
Gutter Width	Gw =	2	Ft
Gutter Depth	Gd =	0.17	Ft
Parkway width	Pw =	10	Ft
Curb Heigth	Ch =	0.5	Ft
Slope of Street	s =	0.0137	Ft/Ft
Manning's Coeficient	n=	0.015	



Then:	Ph =	0.2
	Ch-Gd =	0.33
	Ch-Gd+Ph=	0.53
	Sw1	15.7143
	Sw2	25.2381

ROW Street Capacity

AREA	A =	8.9181	SF
WETTED PERIMETER	Wp =	37.75	FT
R= A/P	R =	0.23622	
	Q =	39.43	CFS

CF Street Capacity

AREA	A =	3.422857	SF
WETTED PERIMETER	Wp =	18.22	FT
R= A/P	R =	0.187811	
	Q =	12.98	CFS

APPENDIX B

Off-Site Unit Hydrograph Method Analysis:

Area A - 100-year Tributary Watershed
Area B - 100-year Tributary Watershed

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

Study date 04/03/21

++

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

Program License Serial Number 6434

Area A

Off-Site Tributary Watershed

Storm Event Year = 100

Antecedent Moisture Condition = 3

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 10		
108.40	1	0.61
Rainfall data for year 2		
108.40	6	0.79
Rainfall data for year 2		
108.40	24	1.37
Rainfall data for year 100		
108.40	1	1.08
Rainfall data for year 100		
108.40	6	2.08
Rainfall data for year 100		
108.40	24	3.74

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
67.0	84.6	108.40	1.000	0.290	0.900	0.261

Area-averaged adjusted loss rate Fm (In/Hr) = 0.261

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
97.56	0.900	67.0	84.6	1.82	0.586
10.84	0.100	98.0	98.0	0.20	0.937

Area-averaged catchment yield fraction, Y = 0.622
Area-averaged low loss fraction, Yb = 0.378
++
Watercourse length = 7410.00(Ft.)
Length from concentration point to centroid = 3085.00(Ft.)
Elevation difference along watercourse = 163.00(Ft.)
Mannings friction factor along watercourse = 0.033
Watershed area = 108.40(Ac.)
Catchment Lag time = 0.298 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 28.0026
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.261(In/Hr)
Average low loss rate fraction (Yb) = 0.378 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.512(In)
Computed peak 30-minute rainfall = 0.877(In)
Specified peak 1-hour rainfall = 1.080(In)
Computed peak 3-hour rainfall = 1.614(In)
Specified peak 6-hour rainfall = 2.080(In)
Specified peak 24-hour rainfall = 3.740(In)

Rainfall depth area reduction factors:
Using a total area of 108.40(Ac.) (Ref: fig. E-4)

5-minute factor = 0.995 Adjusted rainfall = 0.510(In)
30-minute factor = 0.995 Adjusted rainfall = 0.873(In)
1-hour factor = 0.995 Adjusted rainfall = 1.075(In)
3-hour factor = 0.999 Adjusted rainfall = 1.613(In)
6-hour factor = 1.000 Adjusted rainfall = 2.079(In)
24-hour factor = 1.000 Adjusted rainfall = 3.739(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 = 1310.96 (CFS))	
1	1.588	20.822
2	8.151	86.032
3	26.232	237.044
4	48.370	290.211
5	61.393	170.727
6	69.399	104.959
7	75.204	76.098
8	79.612	57.796
9	83.005	44.477
10	85.831	37.049
11	88.199	31.044
12	90.013	23.780
13	91.574	20.459
14	92.925	17.715
15	94.094	15.325
16	95.057	12.630
17	95.913	11.211
18	96.639	9.521
19	97.225	7.683
20	97.714	6.419
21	98.041	4.274
22	98.330	3.792
23	98.661	4.338

24	98.997	4.405
25	99.333	4.405
26	99.588	3.345
27	99.763	2.294
28	100.000	1.147

Total soil rain loss = 0.41(In)
Total effective rainfall = 1.21(In)
Peak flow rate in flood hydrograph = 185.92(CFS)

++

3 - 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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+ 5	0.0015	0.22	Q				
0+10	0.0092	1.11	Q				
0+15	0.0340	3.60	Q				
0+20	0.0801	6.70	VQ				
0+25	0.1397	8.66	VQ				
0+30	0.2086	9.99	VQ				
0+35	0.2849	11.08	VQ				
0+40	0.3678	12.03	VQ				
0+45	0.4565	12.89	VQ				
0+50	0.5510	13.71	Q				
0+55	0.6511	14.53	Q				
1+ 0	0.7567	15.34	VQ				
1+ 5	0.8680	16.17	Q				
1+10	0.9855	17.05	Q				
1+15	1.1095	18.00	QV				
1+20	1.2405	19.03	QV				
1+25	1.3790	20.10	QV				
1+30	1.5241	21.07	QV				
1+35	1.6730	21.63	Q V				
1+40	1.8260	22.22	Q V				
1+45	1.9887	23.62	Q V				
1+50	2.1666	25.83	Q V				
1+55	2.3692	29.42	Q V				
2+ 0	2.6169	35.96	Q V				
2+ 5	3.0049	56.34	Q				
2+10	3.6859	98.87	V Q				
2+15	4.8529	169.45	V			Q	
2+20	6.1333	185.92	V			Q	
2+25	6.9983	125.59	Q				
2+30	7.6130	89.27	Q		V		
2+35	8.1044	71.35	Q		V		
2+40	8.5152	59.64	Q		V		
2+45	8.8641	50.67	Q		V		
2+50	9.1713	44.61	Q		V		
2+55	9.4434	39.50	Q		V		
3+ 0	9.6795	34.29	Q		V		
3+ 5	9.8921	30.86	Q		V		
3+10	10.0798	27.25	Q		V		
3+15	10.2344	22.45	Q		V		
3+20	10.3532	17.25	Q		V		
3+25	10.4500	14.05	Q		V		
3+30	10.5296	11.55	Q		V		
3+35	10.5943	9.40	Q		V		
3+40	10.6477	7.75	Q		V		
3+45	10.6892	6.04	Q		V		
3+50	10.7253	5.24	Q		V		
3+55	10.7597	4.99	Q		V		
4+ 0	10.7913	4.59	Q		V		
4+ 5	10.8198	4.14	Q		V		
4+10	10.8421	3.24	Q		V		

```
    4+15      10.8584      2.36  Q          |          |          |        V|
    4+20      10.8689      1.52  Q          |          |          |        V|
    4+25      10.8743      0.79  Q          |          |          |        V|
    4+30      10.8785      0.61  Q          |          |          |        V|
    4+35      10.8818      0.48  Q          |          |          |        V|
    4+40      10.8844      0.38  Q          |          |          |        V|
    4+45      10.8865      0.31  Q          |          |          |        V|
    4+50      10.8882      0.25  Q          |          |          |        V|
    4+55      10.8895      0.19  Q          |          |          |        V|
    5+ 0      10.8904      0.13  Q          |          |          |        V|
    5+ 5      10.8909      0.08  Q          |          |          |        V|
    5+10      10.8912      0.04  Q          |          |          |        V|
    5+15      10.8912      0.01  Q          |          |          |         V
-------------------------------------------------------------------------
```

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

Study date 12/17/21

++

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

Program License Serial Number 6434

AREA B OFF-SITE
100-YEAR 3-HOUR
AMC III

Storm Event Year = 100

Antecedent Moisture Condition = 3

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 10		
22.30	1	0.61
Rainfall data for year 2		
22.30	6	0.79
Rainfall data for year 2		
22.30	24	1.37
Rainfall data for year 100		
22.30	1	1.08
Rainfall data for year 100		
22.30	6	2.08
Rainfall data for year 100		
22.30	24	3.74

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
67.0	84.6	22.30	1.000	0.290	0.900	0.261

Area-averaged adjusted loss rate Fm (In/Hr) = 0.261

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
20.07	0.900	67.0	84.6	1.82	0.586
2.23	0.100	98.0	98.0	0.20	0.937

Area-averaged catchment yield fraction, Y = 0.622
Area-averaged low loss fraction, Yb = 0.378
Direct entry of lag time by user
++
Watershed area = 22.30(Ac.)
Catchment Lag time = 0.168 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 49.6032
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.261(In/Hr)
Average low loss rate fraction (Yb) = 0.378 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.512(In)
Computed peak 30-minute rainfall = 0.877(In)
Specified peak 1-hour rainfall = 1.080(In)
Computed peak 3-hour rainfall = 1.614(In)
Specified peak 6-hour rainfall = 2.080(In)
Specified peak 24-hour rainfall = 3.740(In)

Rainfall depth area reduction factors:
Using a total area of 22.30(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.512(In)
30-minute factor = 0.999 Adjusted rainfall = 0.876(In)
1-hour factor = 0.999 Adjusted rainfall = 1.079(In)
3-hour factor = 1.000 Adjusted rainfall = 1.614(In)
6-hour factor = 1.000 Adjusted rainfall = 2.080(In)
24-hour factor = 1.000 Adjusted rainfall = 3.740(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 = 269.69 (CFS))	
1	3.911	10.547
2	30.044	70.479
3	60.203	81.335
4	73.504	35.873
5	81.235	20.850
6	86.407	13.949
7	90.024	9.754
8	92.637	7.047
9	94.634	5.386
10	96.151	4.090
11	97.274	3.028
12	98.003	1.966
13	98.541	1.451
14	99.136	1.604
15	99.618	1.302
16	100.000	1.029

```
      ---------------------------------------------------------------------
      ---------------------------------------------------------------------
      ---------------------------------------------------------------------
      Total soil rain loss =      0.58(In)
      Total effective rainfall =      1.50(In)
      Peak flow rate in flood hydrograph =     49.12(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        6 - 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
      ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       12.5      25.0      37.5      50.0
-------------------------------------------------------------------------
  0+ 5       0.0005      0.07  Q         |         |         |         |
  0+10       0.0042      0.54  Q         |         |         |         |
  0+15       0.0116      1.08  Q         |         |         |         |
  0+20       0.0207      1.33  VQ        |         |         |         |
  0+25       0.0310      1.48  VQ        |         |         |         |
  0+30       0.0419      1.60  VQ        |         |         |         |
  0+35       0.0535      1.68  VQ        |         |         |         |
  0+40       0.0656      1.75  VQ        |         |         |         |
  0+45       0.0781      1.82  |Q        |         |         |         |
  0+50       0.0910      1.87  |Q        |         |         |         |
  0+55       0.1043      1.92  |Q        |         |         |         |
  1+ 0       0.1178      1.96  |Q        |         |         |         |
  1+ 5       0.1316      2.01  |Q        |         |         |         |
  1+10       0.1457      2.05  |QV       |         |         |         |
  1+15       0.1601      2.09  |QV       |         |         |         |
  1+20       0.1749      2.14  |QV       |         |         |         |
  1+25       0.1899      2.18  |QV       |         |         |         |
  1+30       0.2051      2.22  |QV       |         |         |         |
  1+35       0.2207      2.26  |Q V      |         |         |         |
  1+40       0.2366      2.31  |Q V      |         |         |         |
  1+45       0.2528      2.35  |Q V      |         |         |         |
  1+50       0.2694      2.40  |Q V      |         |         |         |
  1+55       0.2863      2.46  |Q  V     |         |         |         |
  2+ 0       0.3036      2.51  | Q V     |         |         |         |
  2+ 5       0.3213      2.57  | Q V     |         |         |         |
  2+10       0.3395      2.64  | Q V     |         |         |         |
  2+15       0.3582      2.71  | Q  V    |         |         |         |
  2+20       0.3773      2.78  | Q  V    |         |         |         |
  2+25       0.3970      2.86  | Q  V    |         |         |         |
  2+30       0.4173      2.94  | Q  V    |         |         |         |
  2+35       0.4382      3.04  | Q   V   |         |         |         |
  2+40       0.4598      3.13  | Q   V   |         |         |         |
  2+45       0.4821      3.24  | Q   V   |         |         |         |
  2+50       0.5053      3.36  | Q    V  |         |         |         |
  2+55       0.5293      3.49  | Q    V  |         |         |         |
  3+ 0       0.5543      3.63  | Q    V  |         |         |         |
  3+ 5       0.5804      3.79  |  Q    V |         |         |         |
  3+10       0.6077      3.97  |  Q    V |         |         |         |
  3+15       0.6364      4.17  |  Q     V|         |         |         |
  3+20       0.6667      4.40  |  Q     V|         |         |         |
  3+25       0.6987      4.63  |  Q      V         |         |         |
  3+30       0.7309      4.69  |  Q      V         |         |         |
  3+35       0.7637      4.75  |  Q      V         |         |         |
  3+40       0.7986      5.07  |   Q     |V        |         |         |
  3+45       0.8368      5.56  |   Q     | V       |         |         |
  3+50       0.8802      6.30  |    Q    | V       |         |         |
  3+55       0.9319      7.50  |     Q   |  V      |         |         |
  4+ 0       1.0036     10.41  |       Q |   V     |         |         |
  4+ 5       1.1388     19.64  |         |    QV   |         |         |
  4+10       1.4613     46.82  |         |         V         |      Q  |
  4+15       1.7996     49.12  |         |         |    V    |        Q|
  4+20       1.9844     26.83  |         |         |Q      V |         |
  4+25       2.1088     18.06  |         |   Q     |         V         |
  4+30       2.2032     13.72  |         Q         |         |V        |
  4+35       2.2791     11.01  |       Q |         |         | V       |
```

4+40	2.3414	9.05	Q			V
4+45	2.3943	7.68	Q			V
4+50	2.4395	6.56	Q			V
4+55	2.4783	5.63	Q			V
5+ 0	2.5114	4.80	Q			V
5+ 5	2.5409	4.29	Q			V
5+10	2.5691	4.09	Q			V
5+15	2.5947	3.71	Q			V
5+20	2.6176	3.34	Q			V
5+25	2.6363	2.70	Q			V
5+30	2.6538	2.55	Q			V
5+35	2.6706	2.43	Q			V
5+40	2.6866	2.33	Q			V
5+45	2.7020	2.23	Q			V
5+50	2.7168	2.15	Q			V
5+55	2.7310	2.07	Q			V
6+ 0	2.7448	2.00	Q			V
6+ 5	2.7577	1.87	Q			V
6+10	2.7670	1.35	Q			V
6+15	2.7724	0.78	Q			V
6+20	2.7760	0.52	Q			V
6+25	2.7785	0.37	Q			V
6+30	2.7804	0.27	Q			V
6+35	2.7817	0.20	Q			V
6+40	2.7827	0.14	Q			V
6+45	2.7834	0.10	Q			V
6+50	2.7839	0.07	Q			V
6+55	2.7843	0.05	Q			V
7+ 0	2.7846	0.04	Q			V
7+ 5	2.7847	0.03	Q			V
7+10	2.7848	0.02	Q			V
7+15	2.7849	0.01	Q			V

APPENDIX C

On-Site Rational Method Analysis:

DMA-A Pre-developed 25-year 1-hour

DMA-A Developed 100-year 1-hour

Pre-Developed 25 Year 1 Hour

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2018 Version 9.0
Rational Hydrology Study Date: 03/21/21

DW Pre Developed

Program License Serial Number 6434

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 25.0
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 0.787 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 0.000 to Point/Station 1.000
**** INITIAL AREA EVALUATION **** A1

UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 50.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.810(In/Hr)
Initial subarea data:
Initial area flow distance = 359.030(Ft.)
Top (of initial area) elevation = 3041.000(Ft.)
Bottom (of initial area) elevation = 3035.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.01671 s(%)= 1.67
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.837 min.
Rainfall intensity = 1.916(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
Subarea runoff = 4.012(CFS)
Total initial stream area = 4.030(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.810(In/Hr)

++

Process from Point/Station 1.000 to Point/Station 2.000
**** IMPROVED CHANNEL TRAVEL TIME **** A2

Upstream point elevation = 3035.000(Ft.)
Downstream point elevation = 3028.000(Ft.)
Channel length thru subarea = 413.450(Ft.)
Channel base width = 12.000(Ft.)
Slope or 'Z' of left channel bank = 1.390
Slope or 'Z' of right channel bank = 1.750
Estimated mean flow rate at midpoint of channel = 7.282(CFS)
Manning's 'N' = 0.033
Maximum depth of channel = 4.000(Ft.)
Flow(q) thru subarea = 7.282(CFS)
Depth of flow = 0.256(Ft.), Average velocity = 2.294(Ft/s)
Channel flow top width = 12.804(Ft.)

```
Flow Velocity =    2.29(Ft/s)
Travel time  =    3.00 min.
Time of concentration =   19.84 min.
Critical depth =      0.223(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810(In/Hr)
Rainfall intensity =      1.708(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.473
Subarea runoff =      6.448(CFS) for    8.910(Ac.)
Total runoff =     10.460(CFS)
Effective area this stream =       12.94(Ac.)
Total Study Area (Main Stream No. 1) =       12.94(Ac.)
Area averaged Fm value =    0.810(In/Hr)
Depth of flow =   0.318(Ft.), Average velocity =   2.633(Ft/s)
Critical depth =      0.283(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

A3

```
____________________________________________________________________________
Upstream point elevation =  3028.000(Ft.)
Downstream point elevation =  3021.000(Ft.)
Channel length thru subarea  =   458.930(Ft.)
Channel base width      =    4.000(Ft.)
Slope or 'Z' of left channel bank =   1.360
Slope or 'Z' of right channel bank =   1.230
Estimated mean flow rate at midpoint of channel =     13.770(CFS)
Manning's 'N'    = 0.033
Maximum depth of channel  =    1.500(Ft.)
Flow(q) thru subarea =     13.770(CFS)
Depth of flow =   0.731(Ft.), Average velocity =   3.805(Ft/s)
Channel flow top width =    5.895(Ft.)
Flow Velocity =    3.81(Ft/s)
Travel time  =    2.01 min.
Time of concentration =   21.85 min.
Critical depth =      0.664(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810(In/Hr)
Rainfall intensity =      1.596(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.444
Subarea runoff =      6.538(CFS) for   11.070(Ac.)
Total runoff =     16.997(CFS)
Effective area this stream =       24.01(Ac.)
Total Study Area (Main Stream No. 1) =       24.01(Ac.)
Area averaged Fm value =    0.810(In/Hr)
Depth of flow =   0.825(Ft.), Average velocity =   4.062(Ft/s)
Critical depth =      0.758(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.010(Ac.)
Runoff from this stream =     16.997(CFS)
```

```
Time of concentration =   21.85 min.
Rainfall intensity =     1.596(In/Hr)
Area averaged loss rate (Fm) =    0.8095(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
```

B1

```
------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810(In/Hr)
Initial subarea data:
Initial area flow distance =   299.750(Ft.)
Top (of initial area) elevation =  3039.000(Ft.)
Bottom (of initial area) elevation =  3034.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.01668  s(%)=       1.67
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.670 min.
Rainfall intensity =      2.014(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.538
Subarea runoff =      1.063(CFS)
Total initial stream area =        0.980(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.810(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** IMPROVED CHANNEL TRAVEL TIME ****
```

B2

```
------------------------------------------------------------------------
Upstream point elevation =  3034.000(Ft.)
Downstream point elevation =  3030.800(Ft.)
Channel length thru subarea  =   299.120(Ft.)
Channel base width      =    4.500(Ft.)
Slope or 'Z' of left channel bank =   0.290
Slope or 'Z' of right channel bank =   1.450
Estimated mean flow rate at midpoint of channel =      2.537(CFS)
Manning's 'N'    = 0.033
Maximum depth of channel  =    2.500(Ft.)
Flow(q) thru subarea =      2.537(CFS)
Depth of flow =   0.285(Ft.), Average velocity =   1.875(Ft/s)
Channel flow top width =    4.996(Ft.)
Flow Velocity =    1.87(Ft/s)
Travel time  =    2.66 min.
Time of concentration =   18.33 min.
Critical depth =      0.211(Ft.)
 Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810(In/Hr)
Rainfall intensity =      1.805(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.496
Subarea runoff =      2.888(CFS) for    3.430(Ac.)
Total runoff =      3.951(CFS)
Effective area this stream =        4.41(Ac.)
Total Study Area (Main Stream No. 1) =       28.42(Ac.)
Area averaged Fm value =    0.810(In/Hr)
Depth of flow =   0.373(Ft.), Average velocity =   2.198(Ft/s)
Critical depth =      0.281(Ft.)
```

++
Process from Point/Station 6.000 to Point/Station 7.000
**** IMPROVED CHANNEL TRAVEL TIME ****

B3

Upstream point elevation = 3030.800(Ft.)
Downstream point elevation = 3025.000(Ft.)
Channel length thru subarea = 449.920(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 1.440
Slope or 'Z' of right channel bank = 0.590
Estimated mean flow rate at midpoint of channel = 5.701(CFS)
Manning's 'N' = 0.033
Maximum depth of channel = 5.000(Ft.)
Flow(q) thru subarea = 5.701(CFS)
Depth of flow = 0.269(Ft.), Average velocity = 2.063(Ft/s)
Channel flow top width = 10.546(Ft.)
Flow Velocity = 2.06(Ft/s)
Travel time = 3.64 min.
Time of concentration = 21.96 min.
Critical depth = 0.215(Ft.)
Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 50.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.810(In/Hr)
Rainfall intensity = 1.590(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.442
Subarea runoff = 3.420(CFS) for 6.080(Ac.)
Total runoff = 7.371(CFS)
Effective area this stream = 10.49(Ac.)
Total Study Area (Main Stream No. 1) = 34.50(Ac.)
Area averaged Fm value = 0.810(In/Hr)
Depth of flow = 0.314(Ft.), Average velocity = 2.275(Ft/s)
Critical depth = 0.254(Ft.)

++
Process from Point/Station 7.000 to Point/Station 8.000
**** IMPROVED CHANNEL TRAVEL TIME ****

B4

Upstream point elevation = 3025.000(Ft.)
Downstream point elevation = 3019.500(Ft.)
Channel length thru subarea = 530.730(Ft.)
Channel base width = 10.000(Ft.)
Slope or 'Z' of left channel bank = 1.440
Slope or 'Z' of right channel bank = 0.590
Estimated mean flow rate at midpoint of channel = 7.978(CFS)
Manning's 'N' = 0.033
Maximum depth of channel = 5.000(Ft.)
Flow(q) thru subarea = 7.978(CFS)
Depth of flow = 0.352(Ft.), Average velocity = 2.191(Ft/s)
Channel flow top width = 10.714(Ft.)
Flow Velocity = 2.19(Ft/s)
Travel time = 4.04 min.
Time of concentration = 26.00 min.
Critical depth = 0.270(Ft.)
Adding area flow to channel
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 50.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.810(In/Hr)
Rainfall intensity = 1.413(In/Hr) for a 25.0 year storm

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.384
Subarea runoff =      1.119(CFS) for    5.140(Ac.)
Total runoff =      8.490(CFS)
Effective area this stream =       15.63(Ac.)
Total Study Area (Main Stream No. 1) =       39.64(Ac.)
Area averaged Fm value =    0.810(In/Hr)
Depth of flow =   0.365(Ft.), Average velocity =   2.243(Ft/s)
Critical depth =      0.277(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.630(Ac.)
Runoff from this stream =      8.490(CFS)
Time of concentration =   26.00 min.
Rainfall intensity =     1.413(In/Hr)
Area averaged loss rate (Fm) =    0.8095(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****      C1
------------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810(In/Hr)
Initial subarea data:
Initial area flow distance =   244.110(Ft.)
Top (of initial area) elevation =  3023.240(Ft.)
Bottom (of initial area) elevation =  3019.000(Ft.)
Difference in elevation =     4.240(Ft.)
Slope =    0.01737  s(%)=       1.74
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.318 min.
Rainfall intensity =      2.146(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.560
Subarea runoff =      0.601(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.810(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.500(Ac.)
Runoff from this stream =      0.601(CFS)
Time of concentration =   14.32 min.
Rainfall intensity =     2.146(In/Hr)
Area averaged loss rate (Fm) =    0.8095(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****      D1
------------------------------------------------------------------------------
UNDEVELOPED (average cover) subarea
```

```
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 50.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810(In/Hr)
Initial subarea data:
Initial area flow distance =   207.280(Ft.)
Top (of initial area) elevation =  3020.630(Ft.)
Bottom (of initial area) elevation =  3018.000(Ft.)
Difference in elevation =     2.630(Ft.)
Slope =    0.01269  s(%)=       1.27
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.281 min.
Rainfall intensity =      2.150(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.561
Subarea runoff =      0.579(CFS)
Total initial stream area =        0.480(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.810(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      0.480(Ac.)
Runoff from this stream =      0.579(CFS)
Time of concentration =   14.28 min.
Rainfall intensity =     2.150(In/Hr)
Area averaged loss rate (Fm) =    0.8095(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream Flow rate    Area     TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     17.00    24.010     21.85    0.810      1.596
2      8.49    15.630     26.00    0.810      1.413
3      0.60     0.500     14.32    0.810      2.146
4      0.58     0.480     14.28    0.810      2.150
Qmax(1) =
           1.000 *    1.000 *    16.997) +
           1.303 *    0.840 *     8.490) +
           0.589 *    1.000 *     0.601) +
           0.587 *    1.000 *     0.579) + =      26.989
Qmax(2) =
           0.767 *    1.000 *    16.997) +
           1.000 *    1.000 *     8.490) +
           0.452 *    1.000 *     0.601) +
           0.450 *    1.000 *     0.579) + =      22.065
Qmax(3) =
           1.699 *    0.655 *    16.997) +
           2.214 *    0.551 *     8.490) +
           1.000 *    1.000 *     0.601) +
           0.997 *    1.000 *     0.579) + =      30.448
Qmax(4) =
           1.704 *    0.654 *    16.997) +
           2.220 *    0.549 *     8.490) +
           1.003 *    0.997 *     0.601) +
           1.000 *    1.000 *     0.579) + =      30.459

Total of 4 streams to confluence:
Flow rates before confluence point:
      16.997       8.490       0.601       0.579
Maximum flow rates at confluence using above data:
       26.989       22.065       30.448       30.459
Area of streams before confluence:
       24.010       15.630        0.500        0.480
Effective area values after confluence:
```

```
       38.124       40.620       25.320       25.255
Results of confluence:
Total flow rate =     30.459(CFS)
Time of concentration =    14.281 min.
Effective stream area after confluence =     25.255(Ac.)
Study area average Pervious fraction(Ap) =  1.000
Study area average soil loss rate(Fm) =    0.810(In/Hr)
Study area total (this main stream) =      40.62(Ac.)
End of computations, Total Study Area =           40.62 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  50.0
```

Post-Developed 100 Year 1 Hour

```
                San Bernardino County Rational Hydrology Program

                    (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2018 Version 9.0
        Rational Hydrology Study        Date: 03/21/21
------------------------------------------------------------------------
DW Post Developed



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


Program License Serial Number 6434

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.080 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3
```

A1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        0.000 to Point/Station        1.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   303.000(Ft.)
Top (of initial area) elevation =  3041.000(Ft.)
Bottom (of initial area) elevation =  3035.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01980  s(%)=       1.98
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.237 min.
Rainfall intensity =      4.747(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff =      2.744(CFS)
Total initial stream area =        0.670(Ac.)
Pervious area fraction = 0.250
Initial area Fm value =    0.196(In/Hr)
```

A2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
 *** IMPROVED CHANNEL TRAVEL TIME ****
 ______________________________________________________________________
 pstream point elevation =  3035.000(Ft.)
Downstream point elevation =  3026.000(Ft.)
Channel length thru subarea  =   519.500(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      5.547(CFS)
Manning's 'N'    = 0.033
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.547(CFS)
Depth of flow =   0.309(Ft.), Average velocity =   1.822(Ft/s)
```

```
Channel flow top width =   17.736(Ft.)
Flow Velocity =    1.82(Ft/s)
Travel time  =    4.75 min.
Time of concentration =   11.99 min.
Critical depth =      0.275(Ft.)
 Adding area flow to channel
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      3.334(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.847
Subarea runoff =      5.530(CFS) for    2.260(Ac.)
Total runoff =      8.274(CFS)
Effective area this stream =        2.93(Ac.)
Total Study Area (Main Stream No. 1) =        2.93(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Depth of flow =   0.364(Ft.), Average velocity =   2.015(Ft/s)
Critical depth =      0.328(Ft.)
```

P1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  3026.000(Ft.)
Downstream point/station elevation =  3023.000(Ft.)
Pipe length  =   220.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     8.274(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.274(CFS)
Normal flow depth in pipe =   11.94(In.)
Flow top width inside pipe =   17.01(In.)
Critical Depth =   13.37(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =    12.54 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.930(Ac.)
Runoff from this stream =      8.274(CFS)
Time of concentration =   12.54 min.
Rainfall intensity =     3.231(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
```

B1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =   387.700(Ft.)
Top (of initial area) elevation =  3040.000(Ft.)
Bottom (of initial area) elevation =  3035.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.01290  s(%)=       1.29
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.702 min.
Rainfall intensity =      4.172(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.858
Subarea runoff =      4.258(CFS)
Total initial stream area =        1.190(Ac.)
Pervious area fraction = 0.250
Initial area Fm value =    0.196(In/Hr)
```

B2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  3035.000(Ft.)
Downstream point elevation =  3025.000(Ft.)
Channel length thru subarea  =   681.240(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =     16.183(CFS)
Manning's 'N'    = 0.033
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     16.183(CFS)
Depth of flow =   0.494(Ft.), Average velocity =   2.241(Ft/s)
Channel flow top width =   27.212(Ft.)
Flow Velocity =    2.24(Ft/s)
Travel time  =    5.07 min.
Time of concentration =   13.77 min.
Critical depth =      0.441(Ft.)
 Adding area flow to channel
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      3.026(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.842
Subarea runoff =     23.784(CFS) for    9.820(Ac.)
Total runoff =     28.043(CFS)
Effective area this stream =       11.01(Ac.)
Total Study Area (Main Stream No. 1) =       13.94(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Depth of flow =   0.616(Ft.), Average velocity =   2.573(Ft/s)
Critical depth =      0.559(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.010(Ac.)
Runoff from this stream =     28.043(CFS)
Time of concentration =   13.77 min.
Rainfall intensity =     3.026(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)
```

```
1      8.27     2.930     12.54    0.196      3.231
2     28.04    11.010     13.77    0.196      3.026
Qmax(1) =
          1.000 *    1.000 *     8.274) +
          1.072 *    0.911 *    28.043) + =      35.662
Qmax(2) =
          0.933 *    1.000 *     8.274) +
          1.000 *    1.000 *    28.043) + =      35.760

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.274      28.043
Maximum flow rates at confluence using above data:
       35.662       35.760
Area of streams before confluence:
        2.930       11.010
Effective area values after confluence:
       12.959       13.940
Results of confluence:
Total flow rate =     35.760(CFS)
Time of concentration =    13.768 min.
Effective stream area after confluence =     13.940(Ac.)
Study area average Pervious fraction(Ap) =  0.250
Study area average soil loss rate(Fm) =    0.196(In/Hr)
Study area total (this main stream) =      13.94(Ac.)
```

P2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
'rocess from Point/Station        6.000 to Point/Station        7.000
 *** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  3023.000(Ft.)
Downstream point/station elevation =  3019.000(Ft.)
Pipe length  =   420.47(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    35.760(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    35.760(CFS)
Normal flow depth in pipe =   22.31(In.)
Flow top width inside pipe =   30.88(In.)
Critical Depth =   23.90(In.)
Pipe flow velocity =      8.36(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =    14.61 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     13.940(Ac.)
Runoff from this stream =     35.760(CFS)
Time of concentration =   14.61 min.
Rainfall intensity =     2.904(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
```

C1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
```

```
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   116.000(Ft.)
Top (of initial area) elevation =  3024.500(Ft.)
Bottom (of initial area) elevation =  3023.600(Ft.)
Difference in elevation =     0.900(Ft.)
Slope =    0.00776  s(%)=       0.78
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.945 min.
Rainfall intensity =      5.448(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =      0.803(CFS)
Total initial stream area =        0.170(Ac.)
Pervious area fraction = 0.250
Initial area Fm value =    0.196(In/Hr)
```

C2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  3023.600(Ft.)
Downstream point elevation =  3023.200(Ft.)
Channel length thru subarea  =    99.440(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      5.639(CFS)
Manning's 'N'    = 0.033
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      5.639(CFS)
Depth of flow =   0.419(Ft.), Average velocity =   1.059(Ft/s)
Channel flow top width =   23.387(Ft.)
Flow Velocity =    1.06(Ft/s)
Travel time  =    1.56 min.
Time of concentration =    7.51 min.
Critical depth =      0.277(Ft.)
 Adding area flow to channel
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      4.626(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.862
Subarea runoff =      9.602(CFS) for    2.440(Ac.)
Total runoff =     10.405(CFS)
Effective area this stream =        2.61(Ac.)
Total Study Area (Main Stream No. 1) =       16.55(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Depth of flow =   0.537(Ft.), Average velocity =   1.235(Ft/s)
Critical depth =      0.363(Ft.)
```

P3

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  3021.500(Ft.)
Downstream point/station elevation =  3019.000(Ft.)
Pipe length  =   133.63(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    10.405(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    10.405(CFS)
Normal flow depth in pipe =   12.59(In.)
Flow top width inside pipe =   16.51(In.)
```

```
Critical Depth =   14.89(In.)
Pipe flow velocity =      7.89(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     7.79 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.610(Ac.)
Runoff from this stream =     10.405(CFS)
Time of concentration =    7.79 min.
Rainfall intensity =     4.508(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
```

D1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
rocess from Point/Station       12.000 to Point/Station       13.000
*** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   481.000(Ft.)
Top (of initial area) elevation =  3038.000(Ft.)
Bottom (of initial area) elevation =  3032.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01247  s(%)=       1.25
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.550 min.
Rainfall intensity =      3.910(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =       6.016(CFS)
Total initial stream area =        1.800(Ac.)
Pervious area fraction = 0.250
Initial area Fm value =    0.196(In/Hr)
```

D2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
rocess from Point/Station       13.000 to Point/Station       14.000
*** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________________
pstream point elevation =  3032.000(Ft.)
Downstream point elevation =  3023.000(Ft.)
Channel length thru subarea  =   784.290(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =     15.890(CFS)
Manning's 'N'    = 0.033
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     15.890(CFS)
Depth of flow =   0.516(Ft.), Average velocity =   2.034(Ft/s)
Channel flow top width =   28.296(Ft.)
Flow Velocity =    2.03(Ft/s)
Travel time  =    6.42 min.
Time of concentration =   15.97 min.
Critical depth =      0.438(Ft.)
 Adding area flow to channel
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      2.727(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =     19.679(CFS) for    9.480(Ac.)
Total runoff =     25.694(CFS)
Effective area this stream =       11.28(Ac.)
Total Study Area (Main Stream No. 1) =       27.83(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Depth of flow =   0.625(Ft.), Average velocity =   2.295(Ft/s)
Critical depth =      0.539(Ft.)
```

♀

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     11.280(Ac.)
Runoff from this stream =     25.694(CFS)
Time of concentration =   15.97 min.
Rainfall intensity =     2.727(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
```

♀

E1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Initial subarea data:
Initial area flow distance =   195.000(Ft.)
Top (of initial area) elevation =  3057.000(Ft.)
Bottom (of initial area) elevation =  3033.000(Ft.)
Difference in elevation =    24.000(Ft.)
Slope =    0.12308  s(%)=      12.31
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    4.210 min.
Rainfall intensity =      6.936(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =      1.941(CFS)
Total initial stream area =        0.320(Ac.)
Pervious area fraction = 0.250
Initial area Fm value =    0.196(In/Hr)
```

♀

E2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       17.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  3033.000(Ft.)
Downstream point elevation =  3025.000(Ft.)
Channel length thru subarea  =   465.300(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      8.012(CFS)
```

```
Manning's 'N'    = 0.033
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      8.012(CFS)
Depth of flow =   0.360(Ft.), Average velocity =   1.993(Ft/s)
Channel flow top width =   20.349(Ft.)
Flow Velocity =    1.99(Ft/s)
Travel time  =    3.89 min.
Time of concentration =    8.10 min.
Critical depth =      0.324(Ft.)
 Adding area flow to channel
MOBILE HOME PARK subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2500     Max loss rate(Fm)=     0.196(In/Hr)
Rainfall intensity =      4.387(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     12.088(CFS) for    3.400(Ac.)
Total runoff =     14.029(CFS)
Effective area this stream =        3.72(Ac.)
Total Study Area (Main Stream No. 1) =       31.55(Ac.)
Area averaged Fm value =    0.196(In/Hr)
Depth of flow =   0.452(Ft.), Average velocity =   2.294(Ft/s)
Critical depth =      0.414(Ft.)
```

♀

P4

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.000 to Point/Station       18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  3021.000(Ft.)
Downstream point/station elevation =  3019.000(Ft.)
Pipe length  =    73.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    14.029(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.029(CFS)
Normal flow depth in pipe =   13.76(In.)
Flow top width inside pipe =   15.28(In.)
Critical Depth =   16.58(In.)
Pipe flow velocity =      9.69(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     8.23 min.
```

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AC DE

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.000 to Point/Station       18.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      3.720(Ac.)
Runoff from this stream =     14.029(CFS)
Time of concentration =    8.23 min.
Rainfall intensity =     4.340(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
Summary of stream data:

Stream Flow rate    Area     TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     35.76    13.940     14.61    0.196      2.904
2     10.41     2.610      7.79    0.196      4.508
3     25.69    11.280     15.97    0.196      2.727
4     14.03     3.720      8.23    0.196      4.340
Qmax(1) =
          1.000 *    1.000 *    35.760) +
```

```
           0.628 *    1.000 *    10.405) +
           1.070 *    0.914 *    25.694) +
           0.653 *    1.000 *    14.029) + =      76.591
Qmax(2) =
           1.593 *    0.533 *    35.760) +
           1.000 *    1.000 *    10.405) +
           1.704 *    0.488 *    25.694) +
           1.041 *    0.947 *    14.029) + =      75.962
Qmax(3) =
           0.935 *    1.000 *    35.760) +
           0.587 *    1.000 *    10.405) +
           1.000 *    1.000 *    25.694) +
           0.611 *    1.000 *    14.029) + =      73.801
Qmax(4) =
           1.530 *    0.563 *    35.760) +
           0.961 *    1.000 *    10.405) +
           1.637 *    0.515 *    25.694) +
           1.000 *    1.000 *    14.029) + =      76.516

Total of 4 streams to confluence:
Flow rates before confluence point:
      35.760      10.405      25.694      14.029
Maximum flow rates at confluence using above data:
       76.591       75.962       73.801       76.516
Area of streams before confluence:
       13.940        2.610       11.280        3.720
Effective area values after confluence:
       30.584       19.072       31.550       19.991
Results of confluence:
Total flow rate =     76.591(CFS)
Time of concentration =    14.606 min.
Effective stream area after confluence =     30.584(Ac.)
Study area average Pervious fraction(Ap) =  0.250
Study area average soil loss rate(Fm) =    0.196(In/Hr)
Study area total (this main stream) =      31.55(Ac.)
```

P5

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  3023.000(Ft.)
Downstream point/station elevation =  3019.000(Ft.)
Pipe length  =   383.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    76.591(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    76.591(CFS)
Normal flow depth in pipe =   30.00(In.)
Flow top width inside pipe =   37.95(In.)
Critical Depth =   32.85(In.)
Pipe flow velocity =     10.41(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =    15.22 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     30.584(Ac.)
Runoff from this stream =     76.591(CFS)
Time of concentration =   15.22 min.
Rainfall intensity =     2.821(In/Hr)
Area averaged loss rate (Fm) =    0.1963(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2500
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
```

F1

```
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   270.000(Ft.)
Top (of initial area) elevation =  3019.000(Ft.)
Bottom (of initial area) elevation =  3018.800(Ft.)
Difference in elevation =     0.200(Ft.)
Slope =    0.00074  s(%)=       0.07
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.064 min.
Rainfall intensity =      3.320(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =       1.313(CFS)
Total initial stream area =        0.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)
```

♀

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.450(Ac.)
Runoff from this stream =      1.313(CFS)
Time of concentration =   12.06 min.
Rainfall intensity =     3.320(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

♀

G1

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =     5.000(Ft.)
Top (of initial area) elevation =  3018.800(Ft.)
Bottom (of initial area) elevation =  3018.700(Ft.)
Difference in elevation =     0.100(Ft.)
Slope =    0.02000  s(%)=       2.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    1.265 min.
Rainfall intensity =     16.090(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.896
Subarea runoff =       7.205(CFS)
Total initial stream area =        0.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)
```

♀

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MINOR STREAMS ****
```

AFG

```
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.500(Ac.)
Runoff from this stream =      7.205(CFS)
Time of concentration =    1.27 min.
Rainfall intensity =    16.090(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     76.59    30.584     15.22    0.196      2.821
2      1.31     0.450     12.06    0.079      3.320
3      7.21     0.500      1.27    0.079     16.090
Qmax(1) =
           1.000 *    1.000 *    76.591) +
           0.846 *    1.000 *     1.313) +
           0.171 *    1.000 *     7.205) + =      78.937
Qmax(2) =
           1.190 *    0.793 *    76.591) +
           1.000 *    1.000 *     1.313) +
           0.202 *    1.000 *     7.205) + =      75.007
Qmax(3) =
           6.055 *    0.083 *    76.591) +
           4.940 *    0.105 *     1.313) +
           1.000 *    1.000 *     7.205) + =      46.444

Total of 3 streams to confluence:
Flow rates before confluence point:
      76.591       1.313       7.205
Maximum flow rates at confluence using above data:
       78.937       75.007       46.444
Area of streams before confluence:
       30.584        0.450        0.500
Effective area values after confluence:
       31.534       25.193        3.090
Results of confluence:
Total flow rate =     78.937(CFS)
Time of concentration =    15.219 min.
Effective stream area after confluence =     31.534(Ac.)
Study area average Pervious fraction(Ap) =  0.245
Study area average soil loss rate(Fm) =    0.193(In/Hr)
Study area total (this main stream) =      31.53(Ac.)
End of computations, Total Study Area =           32.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.246
Area averaged SCS curve number =  32.0
```

APPENDIX D

On-Site Unit Hydrograph Method Analysis:

DMA-A Pre-developed 25-year 1-hour

DMA-A Developed 100-year 1-hour

Pre-Developed Unit Hydrograph

```
        U n i t   H y d r o g r a p h   A n a l y s i s

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

                Study date  03/22/21

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

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


Program License Serial Number 6434

------------------------------------------------------------------------
DW Pre Unit



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

        Storm Event Year = 25

        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 10
            40.64            1           0.61
------------------------------------------------------------------------
Rainfall data for year 2
            40.64            6           0.79
------------------------------------------------------------------------
Rainfall data for year 2
            40.64           24           1.37
------------------------------------------------------------------------
Rainfall data for year 100
            40.64            1           1.08
------------------------------------------------------------------------
Rainfall data for year 100
            40.64            6           2.08
------------------------------------------------------------------------
Rainfall data for year 100
            40.64           24           3.74
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

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


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 2)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 50.0      50.0         40.64      1.000     0.810    1.000    0.810

Area-averaged adjusted loss rate Fm (In/Hr) =  0.810

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC2)           Yield Fr
```

```
    40.64   1.000         50.0      50.0      10.00     0.026

Area-averaged catchment yield fraction, Y =  0.026
Area-averaged low loss fraction, Yb =  0.974
User entry of time of concentration  =   0.240 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      40.64(Ac.)
Catchment Lag time =   0.192 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 43.4028
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.810(In/Hr)
Average low loss rate fraction (Yb) = 0.974 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.379(In)
Computed peak 30-minute rainfall =  0.649(In)
Specified peak 1-hour rainfall =  0.799(In)
Computed peak 3-hour rainfall =  1.233(In)
Specified peak 6-hour rainfall =  1.622(In)
Specified peak 24-hour rainfall =  2.900(In)


Rainfall depth area reduction factors:
Using a total area of      40.64(Ac.) (Ref: fig. E-4)

5-minute factor = 0.998     Adjusted rainfall =  0.378(In)
30-minute factor = 0.998    Adjusted rainfall =  0.648(In)
1-hour factor = 0.998       Adjusted rainfall =  0.797(In)
3-hour factor = 1.000       Adjusted rainfall =  1.233(In)
6-hour factor = 1.000       Adjusted rainfall =  1.622(In)
24-hour factor = 1.000      Adjusted rainfall =  2.900(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 =       491.49 (CFS))

  1                3.137                 15.419
  2               22.663                 95.965
  3               53.668                152.388
  4               68.764                 74.194
  5               77.374                 42.319
  6               83.049                 27.889
  7               87.227                 20.536
  8               90.208                 14.654
  9               92.496                 11.245
 10               94.309                  8.909
 11               95.725                  6.962
 12               96.837                  5.465
 13               97.647                  3.979
 14               98.161                  2.525
 15               98.652                  2.415
 16               99.173                  2.560
 17               99.599                  2.094
 18              100.000                  1.972
------------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number             (In)                (In)
  1              0.3783               0.3783
  2              0.4658               0.0874
  3              0.5260               0.0602
  4              0.5734               0.0474
  5              0.6132               0.0397
  6              0.6476               0.0345
  7              0.6783               0.0307
  8              0.7060               0.0277
  9              0.7314               0.0254
 10              0.7549               0.0235
 11              0.7768               0.0219
 12              0.7973               0.0205
```

13	0.8230	0.0257
14	0.8476	0.0246
15	0.8711	0.0235
16	0.8937	0.0226
17	0.9155	0.0218
18	0.9365	0.0210
19	0.9568	0.0203
20	0.9764	0.0197
21	0.9955	0.0191
22	1.0141	0.0185
23	1.0321	0.0180
24	1.0497	0.0176
25	1.0668	0.0171
26	1.0836	0.0167
27	1.0999	0.0163
28	1.1159	0.0160
29	1.1315	0.0156
30	1.1469	0.0153
31	1.1619	0.0150
32	1.1766	0.0147
33	1.1910	0.0145
34	1.2052	0.0142
35	1.2192	0.0139
36	1.2329	0.0137

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0137	0.0134	0.0004
2	0.0139	0.0136	0.0004
3	0.0145	0.0141	0.0004
4	0.0147	0.0143	0.0004
5	0.0153	0.0149	0.0004
6	0.0156	0.0152	0.0004
7	0.0163	0.0159	0.0004
8	0.0167	0.0163	0.0004
9	0.0176	0.0171	0.0005
10	0.0180	0.0176	0.0005
11	0.0191	0.0186	0.0005
12	0.0197	0.0192	0.0005
13	0.0210	0.0205	0.0005
14	0.0218	0.0212	0.0006
15	0.0235	0.0229	0.0006
16	0.0246	0.0239	0.0006
17	0.0205	0.0200	0.0005
18	0.0219	0.0213	0.0006
19	0.0254	0.0247	0.0007
20	0.0277	0.0270	0.0007
21	0.0345	0.0336	0.0009
22	0.0397	0.0387	0.0010
23	0.0602	0.0587	0.0015
24	0.0874	0.0675	0.0200
25	0.3783	0.0675	0.3109
26	0.0474	0.0462	0.0012
27	0.0307	0.0299	0.0008
28	0.0235	0.0229	0.0006
29	0.0257	0.0251	0.0007
30	0.0226	0.0220	0.0006
31	0.0203	0.0198	0.0005
32	0.0185	0.0181	0.0005
33	0.0171	0.0167	0.0004
34	0.0160	0.0156	0.0004
35	0.0150	0.0146	0.0004
36	0.0142	0.0138	0.0004

Total soil rain loss = 0.88(In)
Total effective rainfall = 0.35(In)
Peak flow rate in flood hydrograph = 49.14(CFS)

++
3 - 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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0
0+ 5	0.0000	0.01	Q				
0+10	0.0003	0.04	Q				
0+15	0.0010	0.09	Q				
0+20	0.0018	0.12	Q				
0+25	0.0028	0.14	Q				
0+30	0.0038	0.15	Q				
0+35	0.0050	0.17	Q				
0+40	0.0062	0.18	Q				
0+45	0.0074	0.19	Q				
0+50	0.0088	0.20	Q				
0+55	0.0102	0.20	Q				
1+ 0	0.0117	0.21	Q				
1+ 5	0.0132	0.22	Q				
1+10	0.0148	0.24	Q				
1+15	0.0165	0.25	Q				
1+20	0.0183	0.26	Q				
1+25	0.0202	0.27	Q				
1+30	0.0221	0.28	Q				
1+35	0.0240	0.27	Q				
1+40	0.0260	0.28	Q				
1+45	0.0281	0.31	Q				
1+50	0.0304	0.34	QV				
1+55	0.0332	0.40	QV				
2+ 0	0.0385	0.77	QV				
2+ 5	0.0876	7.13	V Q				
2+10	0.3157	33.13	V		Q		
2+15	0.6541	49.14			V		Q
2+20	0.8214	24.29		Q	V		
2+25	0.9183	14.07	Q		V		
2+30	0.9831	9.41	Q			V	
2+35	1.0313	7.00	Q			V	
2+40	1.0663	5.08	Q			V	
2+45	1.0936	3.95	Q			V	
2+50	1.1154	3.17	Q			V	
2+55	1.1327	2.52	Q			V	
3+ 0	1.1465	2.01	Q			V	
3+ 5	1.1568	1.50	Q			V	
3+10	1.1637	1.00	Q			V	
3+15	1.1699	0.90	Q			V	
3+20	1.1762	0.91	Q			V	
3+25	1.1813	0.74	Q			V	
3+30	1.1858	0.65	Q			V	
3+35	1.1860	0.03	Q			V	
3+40	1.1861	0.02	Q			V	
3+45	1.1862	0.02	Q			V	
3+50	1.1863	0.01	Q			V	
3+55	1.1864	0.01	Q			V	
4+ 0	1.1864	0.01	Q			V	
4+ 5	1.1864	0.00	Q			V	
4+10	1.1865	0.00	Q			V	
4+15	1.1865	0.00	Q			V	
4+20	1.1865	0.00	Q			V	
4+25	1.1865	0.00	Q				V

Post-Developed Unit Hydrograph

```
        U n i t   H y d r o g r a p h   A n a l y s i s

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

                Study date  03/22/21

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

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


Program License Serial Number 6434

------------------------------------------------------------------------
DW Post Unit



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

        Storm Event Year = 100

        Antecedent Moisture Condition = 3

 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 10
            32.50            1           0.61
------------------------------------------------------------------------
Rainfall data for year 2
            32.50            6           0.79
------------------------------------------------------------------------
Rainfall data for year 2
            32.50           24           1.37
------------------------------------------------------------------------
Rainfall data for year 100
            32.50            1           1.08
------------------------------------------------------------------------
Rainfall data for year 100
            32.50            6           2.08
------------------------------------------------------------------------
Rainfall data for year 100
            32.50           24           3.74
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

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


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 32.0      52.0         32.50      1.000     0.785    0.246    0.193

Area-averaged adjusted loss rate Fm (In/Hr) =  0.193

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
```

```
     8.00   0.246         32.0      52.0       9.23     0.086
    24.50   0.754         98.0      98.0       0.20     0.937

Area-averaged catchment yield fraction, Y =  0.728
Area-averaged low loss fraction, Yb =  0.272
User entry of time of concentration  =   0.250 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      32.50(Ac.)
Catchment Lag time =   0.200 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 41.6667
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.193(In/Hr)
Average low loss rate fraction (Yb) = 0.272 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.512(In)
Computed peak 30-minute rainfall =  0.877(In)
Specified peak 1-hour rainfall =  1.080(In)
Computed peak 3-hour rainfall =  1.614(In)
Specified peak 6-hour rainfall =  2.080(In)
Specified peak 24-hour rainfall =  3.740(In)


Rainfall depth area reduction factors:
Using a total area of      32.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.998     Adjusted rainfall =  0.512(In)
30-minute factor = 0.998    Adjusted rainfall =  0.876(In)
1-hour factor = 0.998       Adjusted rainfall =  1.078(In)
3-hour factor = 1.000       Adjusted rainfall =  1.614(In)
6-hour factor = 1.000       Adjusted rainfall =  2.080(In)
24-hour factor = 1.000      Adjusted rainfall =  3.740(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 =       393.05 (CFS))

  1               2.935                 11.536
  2              20.613                 69.484
  3              51.467                121.268
  4              67.222                 61.925
  5              76.108                 34.929
  6              81.970                 23.039
  7              86.247                 16.809
  8              89.430                 12.512
  9              91.773                  9.210
 10              93.683                  7.507
 11              95.168                  5.837
 12              96.358                  4.677
 13              97.275                  3.603
 14              97.918                  2.529
 15              98.357                  1.723
 16              98.850                  1.939
 17              99.345                  1.946
 18              99.682                  1.325
 19             100.000                  1.249
------------------------------------------------------------------------
Peak Unit   Adjusted mass rainfall  Unit rainfall
Number              (In)                (In)
  1              0.5117              0.5117
  2              0.6300              0.1183
  3              0.7114              0.0815
  4              0.7756              0.0641
  5              0.8293              0.0537
  6              0.8759              0.0466
  7              0.9174              0.0415
  8              0.9548              0.0375
  9              0.9892              0.0343
 10              1.0210              0.0318
```

11	1.0506	0.0296
12	1.0784	0.0278
13	1.1105	0.0321
14	1.1411	0.0306
15	1.1704	0.0293
16	1.1984	0.0281
17	1.2254	0.0270
18	1.2514	0.0260
19	1.2765	0.0251
20	1.3007	0.0243
21	1.3242	0.0235
22	1.3470	0.0228
23	1.3692	0.0222
24	1.3907	0.0216
25	1.4117	0.0210
26	1.4322	0.0205
27	1.4522	0.0200
28	1.4717	0.0195
29	1.4907	0.0191
30	1.5094	0.0187
31	1.5277	0.0183
32	1.5456	0.0179
33	1.5631	0.0176
34	1.5804	0.0172
35	1.5973	0.0169
36	1.6139	0.0166

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0166	0.0045	0.0121
2	0.0169	0.0046	0.0123
3	0.0176	0.0048	0.0128
4	0.0179	0.0049	0.0130
5	0.0187	0.0051	0.0136
6	0.0191	0.0052	0.0139
7	0.0200	0.0054	0.0145
8	0.0205	0.0056	0.0149
9	0.0216	0.0059	0.0157
10	0.0222	0.0060	0.0161
11	0.0235	0.0064	0.0171
12	0.0243	0.0066	0.0177
13	0.0260	0.0071	0.0189
14	0.0270	0.0073	0.0196
15	0.0293	0.0080	0.0213
16	0.0306	0.0083	0.0223
17	0.0278	0.0076	0.0202
18	0.0296	0.0081	0.0216
19	0.0343	0.0093	0.0250
20	0.0375	0.0102	0.0273
21	0.0466	0.0127	0.0339
22	0.0537	0.0146	0.0391
23	0.0815	0.0161	0.0654
24	0.1183	0.0161	0.1022
25	0.5117	0.0161	0.4956
26	0.0641	0.0161	0.0480
27	0.0415	0.0113	0.0302
28	0.0318	0.0086	0.0231
29	0.0321	0.0087	0.0234
30	0.0281	0.0076	0.0204
31	0.0251	0.0068	0.0183
32	0.0228	0.0062	0.0166
33	0.0210	0.0057	0.0153
34	0.0195	0.0053	0.0142
35	0.0183	0.0050	0.0133
36	0.0172	0.0047	0.0125

Total soil rain loss = 0.29(In)
Total effective rainfall = 1.32(In)
Peak flow rate in flood hydrograph = 75.09(CFS)

3 - 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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 20.0 40.0 60.0 80.0	
0+ 5	0.0010	0.14	Q	
0+10	0.0077	0.98	Q	
0+15	0.0247	2.47	VQ	
0+20	0.0473	3.28	VQ	
0+25	0.0734	3.80	VQ	
0+30	0.1023	4.18	VQ	
0+35	0.1334	4.52	VQ	
0+40	0.1666	4.82	VQ	
0+45	0.2016	5.09	Q	
0+50	0.2386	5.36	Q	
0+55	0.2775	5.64	QV	
1+ 0	0.3182	5.92	QV	
1+ 5	0.3611	6.23	QV	
1+10	0.4062	6.54	QV	
1+15	0.4536	6.89	Q V	
1+20	0.5038	7.28	Q V	
1+25	0.5568	7.70	Q V	
1+30	0.6112	7.90	Q V	
1+35	0.6662	7.99	Q V	
1+40	0.7241	8.41	Q V	
1+45	0.7873	9.17	Q V	
1+50	0.8578	10.25	Q V	
1+55	0.9406	12.02	Q V	
2+ 0	1.0475	15.51	Q V	
2+ 5	1.2298	26.48	Q	**@44.23 = 1.4648**
2+10	1.6099	55.18	V Q	
2+15	2.1270	75.09	V Q	
2+20	2.4437	45.98	Q V	**@44.23 = 2,468**
2+25	2.6559	30.81	Q V	
2+30	2.8167	23.35	Q V	
2+35	2.9490	19.20	Q V	
2+40	3.0595	16.05	Q V	
2+45	3.1527	13.53	Q V	
2+50	3.2345	11.87	Q V	
2+55	3.3059	10.37	Q V	
3+ 0	3.3692	9.19	Q V	
3+ 5	3.4243	8.00	Q V	
3+10	3.4672	6.22	Q V	
3+15	3.4954	4.10	Q V	
3+20	3.5177	3.23	Q V	
3+25	3.5358	2.63	Q V	
3+30	3.5490	1.91	Q V	
3+35	3.5593	1.50	Q V	
3+40	3.5641	0.70	Q V	
3+45	3.5677	0.52	Q V	
3+50	3.5704	0.39	Q V	
3+55	3.5724	0.29	Q V	
4+ 0	3.5739	0.21	Q V	
4+ 5	3.5749	0.16	Q V	
4+10	3.5757	0.12	Q V	
4+15	3.5763	0.09	Q V	
4+20	3.5767	0.06	Q V	
4+25	3.5770	0.03	Q V	
4+30	3.5771	0.02	Q V	

Water Analysis

Aug 1, 2022

APN: 0435-015-13, 35

Bear Valley Road

Apple Valley

San Bernardino

County, California

PROFESSIONAL ENGINEER'S AFFIRMATIVE STATEMENT

I have examined and am familiar with the information in this document and all appendices, and based on my inquiries of individuals immediately responsible for obtaining the information in this document, I believe that the information is true, accurate, and complete

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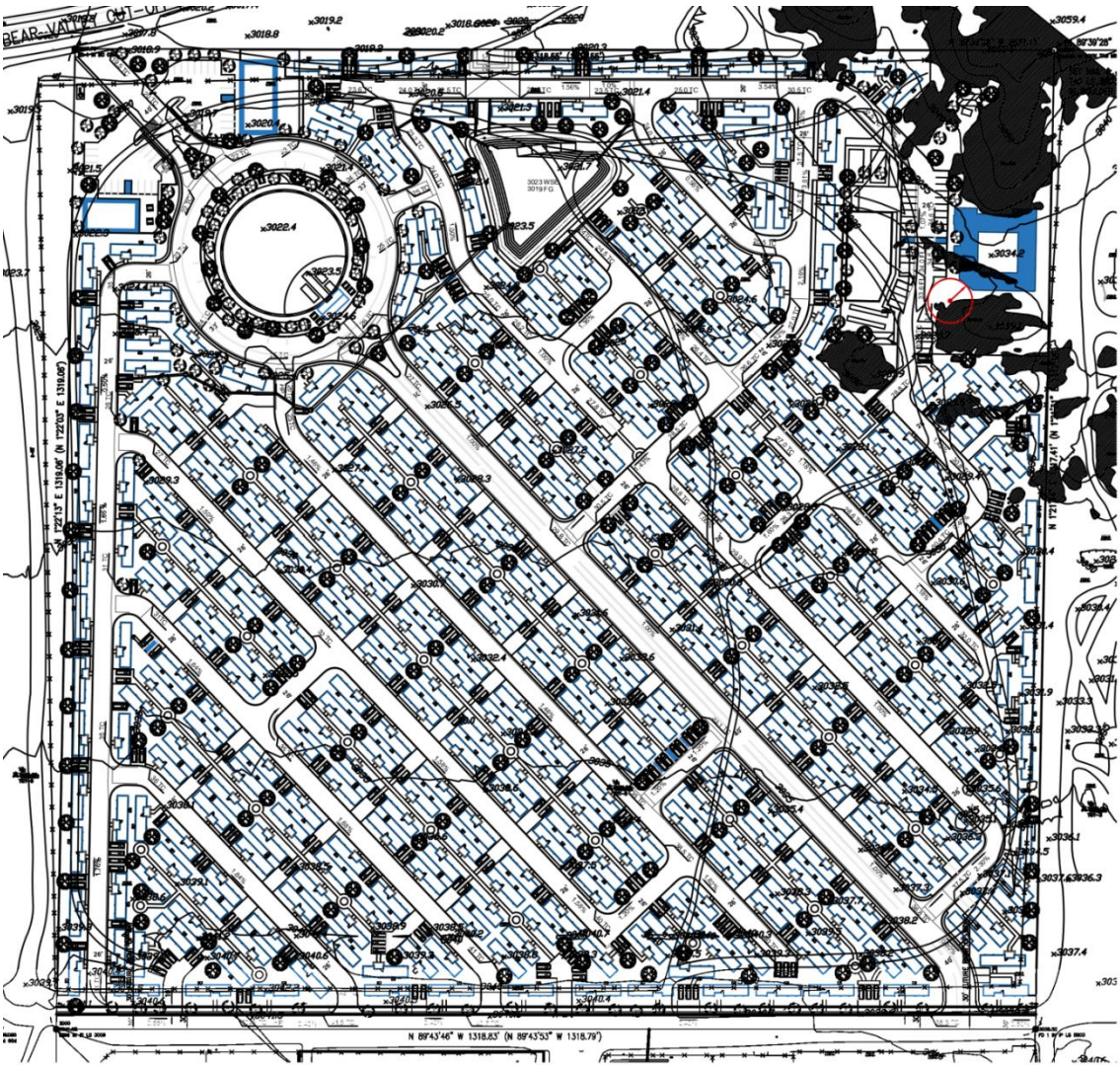
I. INTRODUCTION

A. LOCATION OF PROPERTY

The 40.2-acre project is a Planned Residential Development for a Senior Community that is located 1,425 feet west of the intersection of Bear Valley Road and Highway 18, east of the Town of Apple Valley, CA APN 0435-015-13. An additional 4.72-acres (APN 0435-015-35) just south of the site will be developed as a solar farm and domestic water supply and storage facility to support the site to the



north.

B. PURPOSE AND SCOPE

The purpose of this study is to analyzes the project's anticipated water and sewer demands use during construction and operations to determine if the Project would:

1. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities the construction or relocation of which could cause significant environmental effects?

2. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?
3. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?
4. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?
5. Comply with federal, state and local management and reduction statutes and regulations related to solid waste?

C. PROJECT DESCRIPTION

The Project Development Plan is designed as a "Self-Sustainable living Community". Avellana has been designed to create a micro-living-environment that caters to almost all the needs of its future population without placing additional burdens on the neighboring resources as it embraces a minimal-carbon footprint lifestyle that can be described in the following terms:

1. Construction Operations
2. 399 custom designed "senior-optimized" mobile homes
3. A First Aid Center focused on geriatric care
4. A Community Center with pool and serving kitchen.
5. A Wellness Convenience Shop
6. A Pond, used for fire suppression storage, requiring pumps for aeration.
7. A Detention Basin/Park

As there are no sewer, water, or natural gas services currently serving the subject property Avellana will generate and provide its own utilities from entirely within the community property boundaries, with the exception of SB County Police and Fire services. As such Avellana will meet 2040 water and sewer allowances by providing its own reclaimed system that recharges its own aquifer.

D. WATER AND SEWER SERVING THE PROJECT

The Project Site is currently vacant and is consistent with the County General Plan and Zoning District with a Conditional Use Permit for the Senior Mobile Home Park and Community Center, and includes a request for a Planned Development Permit to allow for a Planned Residential Development of a senior residential community with incidental service uses of the Community Center, pool, First Aid Center and Wellness Convenience Shop.

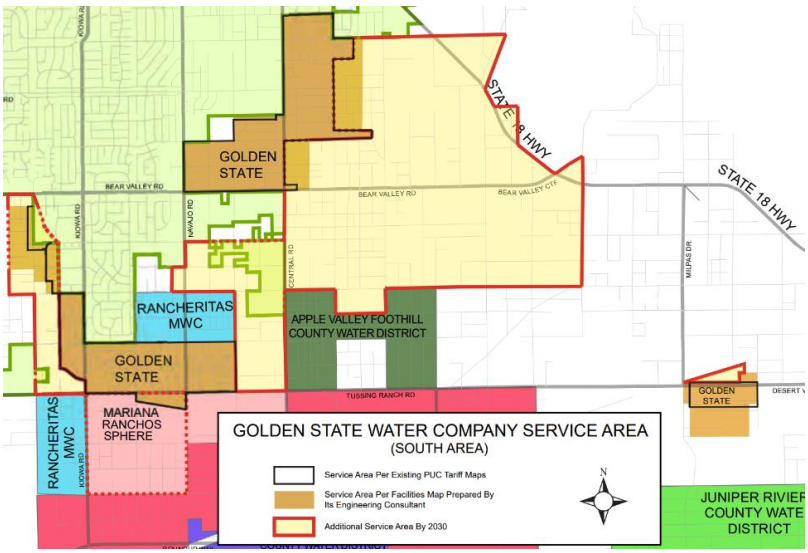
Currently the neighbors are receiving electricity from Edison, and phone service from Verizon. The Project is not located near water services from the County of San Bernardino (CSA 64), Golden State Water Company, nor natural gas service from SoCal Gas.

Power, water, and sewer utility services for Avellana will be provided by forming a special purpose California Mutual Corporation, Avellana Power Limited to deploy water, water treatment, and electricity services within the property boundaries. This entity has already been formed and

designated by the IRS as a 501(c)(12) public benefit non-profit corporation and will provide comprehensive utility services to all Avellana residents.

As the valley continues to grow future demands would be serviced by Golden State Water Company Apple Valley South by year 2030. Water delivered to customers in the Apple Valley South System is groundwater pumped from the Mojave River Basin-Alto Sub-Basin, which is the upper portion of the Mojave River, and water purchased from Liberty Utilities Company. Golden State Water Company conducted a source water assessment in September 2000 for each groundwater well serving the customers of its Apple Valley South System. Three of the groundwater wells are considered most vulnerable to the following activities associated with contaminants detected in the water supply:

- High- and low-density septic systems
- High density housing
- Other water supply wells



Based on current demands, future water requirements in 2040 would be higher than 50 percent utilization that well pump capacity could deliver, if well pumps operated at 100 percent, water requirement would be achieved. Depending on yearly precipitation rates, future water demands could exceed supply. To fulfill future water supplies, other water options may include desalinated water, water transfers, reduction analysis and recycled water to replenish future groundwater aquifer levels if pumping surpasses the Free Production Allowance.

With regards to source water production, the State Water Resources Control Board (Division of Drinking Water) performed a Sanitary Survey for the area with results provided in a letter dated May 14, 2020. The letter identified the historic Maximum Day Water Demand (MDD) (year 2010) exceeds the current source capacity (with the highest source off-line). A MDD of 5.92 MGD is compared with a source capacity of 5.06 MGD resulting in an apparent existing deficiency of 0.86 MGD. However, given the significant MDD reduction trend (since 2010) when compared to years 2011-2018, a more appropriate computation could be made by averaging the current trend values. In doing so (and excluding year 2017 as an anomaly), the MDD would adjust to 4.48 MGD and thus an apparent surplus of 0.58 MGD would result. As such, the true availability of source waters should be confirmed and, should an actual deficiency caused (or exacerbated) by the Project be identified, the Project should be required to pay its proportional share for necessary source water facility improvements.

If an overall usage of water within Golden State was to be used, Golden State Water would be assessed a replenishment charge to buy resources for aquifer replenishment. Therefore, no significant adverse impacts are identified or anticipated, and no mitigation measures are required.

II. ESTIMATED WATER CONSUMPTION GENERATED BY THE PROJECT

A. DOMESTIC DEMAND:

Per California Assembly Bill 1668 dated May 31, 2018, the per capita limit for water is 55 gpd. Figuring that the senior residences would average 1.8 persons per dwelling unit (DU), that translates to 99 gallons per unit per day. With 399 DUs, that equals 39,501 gallons per day for the residential use water demand. In addition, there will be a Community Center & Pool, a Wellness Convenience Shop, and First Aid Center that will require approximately 5000 gpd based on the number and kind of fixtures in These incidental service uses.

For the purposes of this Study, the project will have a demand of 45,000 gpd which is 50.4 afy (acre feet per year).

B. FIRE FLOW PROTECTION SYSTEM DEMAND:

In order to ensure the Fire Protection System and infrastructure will meet the requirement set forth by the Apple Valley Fire Protection District. The infrastructure will need to include the following:

- All permanent structures will have internal sprinkler systems per California sprinkler system codes
- Hydrants will be located per the requirements of the Apple Valley Fire Protection district.
- Supply piping will be sized to adequately handle the water flow requirements (volume and pressure) to every hydrant.

The flow rate requirement established by Apple Valley Fire Protection district is to provide a flow rate of 2,250 gpm. for a two (2) hour duration. This combination of flow rate and duration consumes a water volume of 270,000 gallons.

C. EVAPOTRANSPIRATION DEMAND:

Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

The project is in the area known as the California High Desert Valleys and is classified by the California Irrigation Management Information System (CIMIS) as ETo Zone 17 which has the second highest evapotranspiration rates in the State. Monthly average rates range from 1.86 to 9.92 inches/month for a yearly rate of 66.5 inches.

Landscape water demands:

Given the following:

Average waterwise landscape area of each DU =	54 square-feet
Maximum Applied Water Allowance Plant Factor =	0.20
Eto =	66.5 in/yr
Irrigation Efficiency =	0.81

Then the Estimated Water Used (Gallons per Year) is:

(Eto/12) x (PLANT FACTOR) x (HYDROZONE SQ. FT.) x (.62)/ IRRIGATION EFFICIENCY =

(66.5/12) x 0.20 x 54 x 0.62/0.81 = 45.81 CF x 7.481 gal/cf = 342.71 gpy

Considering that there are 399 units the total demand would be (45.81 cf/43560*399=) 0.42 afy.

Pond Evaporation Rate Demand: The Nearest Pond to the project is Spring Valley Lake in Victorville. The University of California at Riverside has determined that the loss from evaporation is ninety inches of water a year, sixteen inches per month during the months of June and July. (The history of Spring Valley Pond by Archie Lauchlan 1983 by spring valley Pond association). This is greater than the 66.5 inches per year for this hydrozone. Considering wave action and personal watercraft use on the Pond will add to the evaporation rate. This study will continue to base evaporation on the USGS Eto of 66.5 inches per year. Thus, if the proposed onsite Pond has a surface area of 21,642 square feet then the yearly losses would equate to (21,642*66.5/12/43560) = 2.75 afy.

D. MITIGATION MEASURES:

The project's water demand requirements can be reduced by the following innovative design features:

1. Xeriscape (waterwise landscaping): the process of landscaping, or gardening, that reduces or eliminates the need for irrigation. It is promoted in regions that do not have accessible, plentiful, or reliable supplies of fresh water. Xeriscapes can reduce water consumption by 60% or more compared to regular lawn landscapes.
2. Infusing Aquifer Through Hydromodification/Infiltration: The Mojave River Watershed Water Quality Management Plan, has become standard practice for all development in the area known as the High Desert Valleys in San Bernardino County, California.
3. Water Efficient Toilets and Faucets.
4. Reclaimed Water from the proposed Packaged Wastwater Treatment Plant.: Use of recycled water in lieu of potable water is encouraged by the State Water Board as described below:
    a. The State Water Board's Strategic Plan Update 2008-2012 includes a priority to increase sustainable local water supplies available for meeting existing and future beneficial uses by 1,725,000 acre-feet per year (afy) in excess of 2002 levels by 2015.

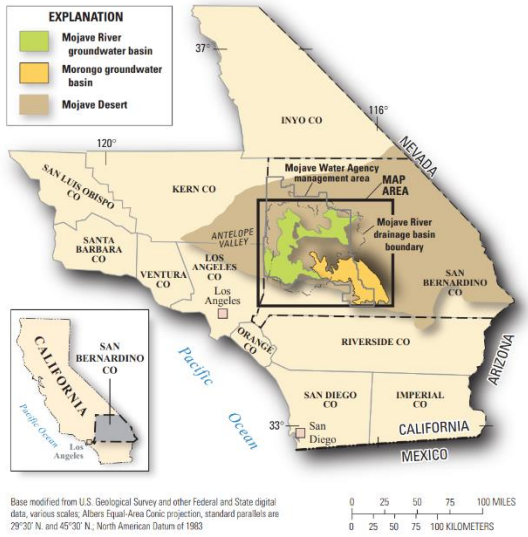
b. The State Water Board's Policy for Water Quality Control for Recycled Water states the following goals (in part): 1) Increase the use of recycled water over the 2002 level by at least 1 million afy by 2020 and by at least 2 million afy by 2030. 2) Increase the amount of water conserved in urban and industrial uses by 20 percent compared to 2007. 3) Substitute as much recycled water for potable water as possible by 2030

5. Storm Water Capture: The project is designed to use infiltrating blocks in lieu of asphalt pavement which allows infiltration to occur as storm flows are conveyed to an infiltration/retarding basin. Per the Water Quality Management Plan the project will capture 23,521 cubic feet which is 0.54 acre-feet per storm even. Considering the average yearly rainfall is 14-inches per year over a 33-days period. Then the average wet day rainfall would be (40-acres*14/12/33=) 1.42-acre feet. Thus, the project will infiltrate at a minimum 0.54 acre-feet each of the daily wet events or (33*0.54=) 17.8 afy.

E. WATER FINDINGS AND RECOMMENDATIONS

Estimated Well Flow Rate: Per the USGS Regional Water Table Map for the Mojave River Groundwater Basin, the groundwater elevation below this project is 2825. Considering the proposed well site is at an elevation of 3045 then the ground water would be 210 feet down from natural grade. Information obtained by local well driller (lic # 77235) suggests that substantial water is around 300-feet and can produce 25-125 gpm depending on well and pump size.

To meet the demand of 45,000 gpd a pump would be required to run at (45000/24/60) 31.25 gpm constantly which falls in the range listed above.



Tank Storage Capacity: To meet the required 3-day domestic use storage capacity (45,000 X 3 = 135,000 gallons). Translating this to cubic feet, we would need 18,045 cubic feet of storage. This could be achieved by using 2 tanks 30ft in dia., and 13 ft in height to achieve a total storage volume of 18,378 cubic feet.

Pond/Fire Flow Storage Capacity: A 750,000-gallon man-made pond will serve as the reservoir for the water used in the Fire Protection System. This is continuously fed by recycled water from our water treatment plant that is designed to process up to 60,000 gpd. This will be accompanied by appropriate pumps and filters necessary to maintain the proper water volume and pressure.

Water Demand Net Effect: As an IRS 501(c)(12) public benefit corporation managing its own water supply and acting as a water company, the net effect this project will have on the existing water supply

can be attributed by the overall losses in the system. Considering that In the U.S., we use only 10% of our overall water consumption for drinking and cooking (Columbia Climate School "From Wastewater to Drinking Water" by Renee Cho April 4,2011), the rest is flush down the toilet or drain.
This project will then take the remaining 90% or (45,000 gpd*0.9) 40,500 gpd and put back into the underground aquifer by means of infiltration through irrigation or an infiltration basin. Thus, the net water loses in the system will be the consumption for drinking and cooking along with the evaporation and evapotranspiration loses while infiltrating the water back into the aquifer. The net water consumption would then be as follows:

Drinking and cooking (45,000-40,000 gpd=)	-5.04 afy
Evaporation on the Pond=	-2.75 afy
Landscape Evapotranspiration =	-0.42 afy
Total Demand on the Aquifer=	-8.21 afy < 10 afy
Infiltration from Storm Water Capture =	17.8 afy
Net Effect of the proposed project =	9.59 afy added each year to the aquifer.

Sewer Demand: Per the State Water Resources Board Order WQ 2014-0153-DWQ The project is considered a Small Domestic System since it will operate at under 100,000 gallons per day (gpd)

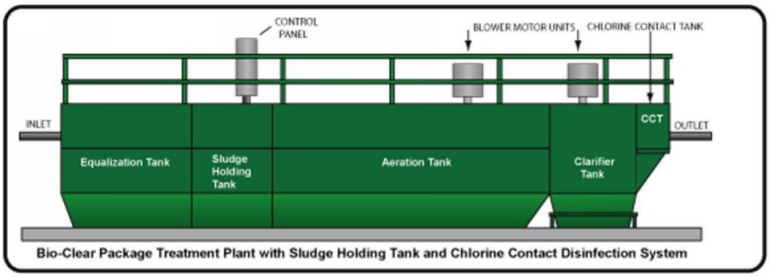


Illustration Only; Not All Components Shown

This system is design to reduce BOD and TSS levels of common household sewage from 300 mg/L and 30 mg/L respectively. With the addition of the a Tertiary Filter, BOD and TSS levels can be reduced to below 10(mg /L)0.5bod ecologic Orin gruber

Summary of Specification: Expected Flow Rate – 40,000 - 60,000 GPD

Approximate Volumes and Dimensions

Aeration Tank Volume:	60,000 gallons	36'-0"L
Equalization Tank Volume:	20,000 gallons	12'-0"L
Clarifier Tank Volume:	10,000 gallons	12'-0"L
Sludge Holding Tank:	9,000 gallons	5'-6"L
Chlorine Contact Tank:	1,250 gallons	2'-0"L

Bio-Clear System Overall Length/Width/Height 67'-6"L x 24'W x 11'H

Based on the 40,500-gpd non-used domestic water reported above becoming wastewater, the small domestic system shown above can treat the effluent and meet the requirements for use in irrigation and in the pond for fire water demand. The effluent from this plant will be used as make up water to counter pond evaporation loses (2.75 afy) and the irrigation demands of (0.42 afy) for a total of 3.17

afy, The 40,500 gpd equates to 45.4 afy minus the 3.17 afy evaporation leaves 42.2 afy of effluent required to be infiltrated though a system of leach fields and seepage pits.

Solid waste generated by the plant will also be collected by the treatment plant providers and sold as fertilizer to various farmers.

F. ENVIRONMENTAL IMPACTS:

When analyzing the 8.21 afy actual losses due to water consumption on the aquifer and the infiltration gains by employing Water Quality Management Plan Best Management Practices on site of 17.8 afy, it is evident that the project as designed will have a net increase to the aquifer of 9.59 acre-feet per year.

In addition, in a letter from Mojave Water Agency dated October 28, 2021, it was stated that "Any production in excess of 10-acre feet per year requires stipulation and adherence to the Mojave Basin Area Judgment to pay for water to mitigate the new pumping." Considering that the intent of this statement is toward water consumption for each parcel then the projects 8.21 afy consumption is less than the 20 afy allotment for the two parcels.

Thus, the project will not result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage facilities. Sufficient water supplies are available to serve the project now and in the future during normal, dry and multiple dry years; and the wastewater treatment will be provided on-site such that the regional wastewater authority will not require additional capacity to serve the project's projected demand in addition to the provider's existing commitments. Therefore, there is no significant impact.

III. ESTIMATED SOLID WASTE GENERATED BY THE PROJECT

A. CURRENT PROVIDERS

Solid Waste: The Project Site is currently within the refuse collection area of Burrtec Waste Industries. Solid Sanitary Landfill (36-AA-0045), or other active landfills as necessary. Burrtec's operators determine the final disposal location on a case-by-case basis. The project's Planned Residential Development Site refuse will be disposed of at either the San Bernardino County Victorville Sanitary Landfills that has a maximum throughput waste generation capacity of 3,000 tons per day, an expected operational life through 2047, and a remaining capacity of 81,510,000 cubic yards, or it would be served by a landfill with sufficient permitted capacity to accommodate its solid waste disposal needs.

California Assembly Bill 341 has been enacted to reduce greenhouse gas emissions by diverting commercial solid waste from landfills by recycling. It mandates businesses and public entities generating 4-cubic yards or more of trash to establish and maintain recycling services. The County of San Bernardino Solid Waste Management Division reviews and approves all new construction projects that require a Construction and Demolition Solid Waste Management Plan.

The County of San Bernardino Planning and Building & Safety division's standard Conditions of Approval (COA's) now require each project to have a waste management plan that consists of two

parts, 1) proposed projects are required to estimate the amount of tonnage to be disposed and diverted during construction. 2) Disposal/diversion receipts or certifications are required as a part of that summary. The mandatory requirement to prepare a Construction and Demolition Solid Waste Management Plan would ensure that impacts related to construction waste would be less than significant. The Proposed Project would comply with all federal, State, and local statutes and regulations related to solid waste. Solid waste produced during the construction phase or operational phase of the Proposed Project would be disposed of in accordance with all applicable statutes and regulations.

B. ENVIRONMENTAL IMPACTS:

The project will not generate solid waste more than State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals, and it will comply with federal, state and local management and reduction statutes and regulations related to solid waste.
