

# **ALR ENGINEERING & TESTING**

**Civil & Geotechnical Engineering w/ Material Testing**

18361 Symeron Road, Apple Valley, Ca. 92307

760-810-2031 Cell # - 760-242-3130 Office #

(ALREngineeringtesting@gmail.com)

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# **PRELIMINARY HYDROLOGY STUDY**

## **APN 0438-165-33**

**A 6.19 acre lot located on the South side of Rock Springs Rd,  
County of San Bernardino, State of California**

**Project:**

## **Deep Creek Road Gas Station**

**Prepared for:**

### **Mike Maida**

**c/o Steeno Design Studio  
11774 Hesperia Road, Suite B  
Hesperia, Ca 92345**

**February, 2018**

**Project No. 1801379**

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Project No. 1801379

February 2, 2018

**Mike Maida**

c/o Steeno Design Studio  
11774 Hesperia Road, Suite B  
Hesperia, Ca 92345

Attention: **Mr. Tom Steeno,**

Subject: Preliminary Hydrology Study for APN: 0438-165-33, located on the South side of Rock Springs Road, County of San Bernardino, State of California.

In accordance with your authorization, ALR Engineering & Testing has prepared a Preliminary Hydrology Study for a proposed commercial development on a 6.19 acre lot. The enclosed report contains the results of our hydrology study considerations, conclusions, and recommendations. Our efforts were directed towards providing recommendations to the County of San Bernardino for the entitlement process for the proposed development with respect to onsite storm water runoff and onsite retention.

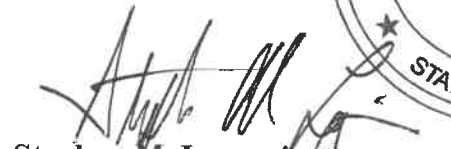
We sincerely appreciate the opportunity of being service to you on this aspect of the project. Please do not hesitate to call us should you have any questions regarding the content of the reports.

Respectfully submitted,

**ALR ENGINEERING & TESTING**



**John Longoria, EIT, QSE, NICET III, CESSWI, ICC**  
Senior Associate Engineer



**Stephan M. Longoria, FE, QSD/P**  
Registered Civil Engineer

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Google Map

Assessor’s Map

Topographic Plat

Record of Survey

Preliminary Site Plan

Apple Valley South Quadrangle Map (reduced)

FEMA FIRMette

Soil Map

Soil Description

Precipitation Data

Figure C-3

Hydrograph

**Nomenclature:**

'	feet	L <sub>o</sub>	overland flow path length
"	inch	MAP	Mean annual precipitation
<	less than	max	maximum
>	greater than	MEP	maximum extent practicable
ac	acre	mi	mile
ac-ft	acre – feet	min	minimum
APN	Assessor's parcel number	misc	miscellaneous
ARC	antecedent runoff conditions	MPD	Master Plan of Drainage
Ave	Avenue	msl	mean sea level
BMPs	best management practices	MWC	municipal water company
C	Rational Method runoff coefficient	MWD	municipal water district
Caltrans	California Department of Transportation	NPDES	National Pollutant Discharge Elimination System
CDMG	California Division of Mines & Geology	NRCS	National Resource Conservation Service
cf	cubic feet	o.d.	outside diameter
cfs	cubic feet per second	O&M	Operations and maintenance
City	City of Hesperia	PM	Parcel Map
CL	Center Line	Ped.	Pedestrian
CMP	corrugated metal pipe	Q	flow rate (cfs)
CN	SCS curve number	Qty	quantity
Cnl	open channel	R.C.E.	Registered Civil Engineer
County	County of San Bernardino	RCP	reinforced concrete pipe
C <sub>p</sub>	pan coefficient	Rd	Road
Ct	Court	req'd	required
DA	drainage area	RWQCB	California Regional Water Quality Control Board
d/s	downstream	s	second
DMA	drainage management area	SCS	Soil Conservation Service
DWR	California Department of Water Resources	sf	square feet
E	evaporation	St	Street
EGL	energy grade line	t <sub>c</sub>	time of concentration
FEMA	Federal Emergency Management Agency	t <sub>p</sub>	time from start of storm to peak runoff
FIP	Finance and Implementation Plan	t <sub>r</sub>	rain storm duration
FIRM	Flood Insurance Rate Map	T	transmissivity
ft	feet	TR	Tract Map
ft/s	feet per second	TR-20	SCS Technical Release Number 20
g	acceleration due to gravity	TR-55	SCS Technical Release Number 55
gpm	U.S. gallons per minute	UDMA	undeveloped drainage management area
gpd	U.S. gallons per day	UMP	Urban Management Plan
gpd/ft <sup>2</sup>	U.S. gallons per day per square foot	u/s	upstream
H	total hydraulic head	USACE	U.S. Army Corps of Engineers
h	horizontal	USEPA	U.S. Environmental Protection Agency
HEC	Hydrologic Engineering Center	USGS	U.S. Geological Survey
HEC- HMS	HEC-HMS Computer Program	V	volume
HGL	hydraulic grade line	v	vertical
hr	hour	ws	water surface
i	rainfall intensity	WQMP	Water Quality Management Plan
i <sub>a</sub>	initial abstraction		
i.d.	inside diameter		
imp	impervious		
in	inch		

**Introduction:**

The owner of a APN: 0438-165-33 is proposing the subdivision and the construction of a convenience store gas station. This lot is located in the County of San Bernardino on the Southwest corner of Rock Springs Rd and Deep Creek Rd. The purpose of this preliminary hydrology study is to provide the County of San Bernardino with information to consider for the land use entitlement process of developing the discretionary conditions of approval. This study will reference available data researched to discuss off site storm water runoff that may impact the lot. Another topic this study will include is a discussion about the hydrology component associated with Water Quality Management Plans. Some preliminary calculations for onsite storm water runoff will be analyzed and discussed.

**Proposed Development:**

A reduced copy of a Site Plan provided by Steeno Design Studio of the proposed development can be found in the appendix of this report. A review of the site plan found several features proposed for development. Two buildings are proposed to be constructed on site which include the convenience store and a drive through restaurant. Other proposed structures include a fuel pump canopy, a well pump house and a trash enclosure. Additional on-site improvements will include the construction of drive aisles, parking areas, walkways, landscaped planters/fingers and concrete curb/gutters.

Per Record of Survey 03-227, the net area of the lot to be subdivided was calculated to be approximately 6.285 acres (copy included). This area was based upon the space enclosed by the bearing and distance of the lines as shown in the map. It can be noted that the area listed in the County Assessor's Map (copy included) for the APN number of 6.192 ac does not match the net area determined from the RS.

The Site Plan shows the proposed property line boundaries of the new parcel for the development. The proposed net area of the parcel to be created was found to be approximately 1.50 acres. This area is subject to change depending on the requirements of the subdivision of the existing lot and offers of dedication to the County for public use. Per the site plan, 1.36 acres of this area will be covered with impervious surfaces including the items previously discussed. It is anticipated that the area of impervious surfaces may change.

**Topography:**

A topographic survey was performed by a licensed land surveyor over the area for the proposed development. In the appendix of this report is a reduced copy of the topographic survey. A review of the survey found that the project site is relatively flat, with an elevation change not exceeding more than four (4) feet from the highest point to the lowest point. The longest course water would have to flow across the lot experiences approximately two (2) feet in elevation change.

The survey also found the low point of the project site to be a sump. This condition indicates that any onsite runoff may not discharge from the property. The the sump was found to be approximately 1.33 feet in depth. If the capacity of this sump were exceeded, then the topo indicates that the water would discharge the site in the Northeast corner and flow East along Rock Springs Rd or North along Deep Creek Rd.

A review of an aerial image provided by Google Maps (copy enclosed) did not find any topographic features conveying off-site storm water runoff through the parcel. The area surrounding the lot was found to be vegetated without any signs of erosion caused by concentrated flows. Some barren soil can be seen as a result of vehicles passing through the area creating dirt roads. The project site itself was also found to be relatively flat with a depression in the Northeast corner of the lot. Approximately 1/2 of the 1.5 acres is barren land, void of vegetation due to vehicles parking or traversing the barren area.

A review of the USGS Apple Valley South Quadrangle Topographic Map did not find any blue line streams, flowlines or contours indicating the presence of swales crossing the parcel. The lot was found to be located on a relatively flat plain of land between the Mojave River and the Ord Mountain range. See reduced copy of the map in the appendix. The map indicates that any concentrated flows of water would travel North or Northwest toward the Mojave River.

A field visit to the project site confirmed the sump condition. It was observed that another sump exists in the railroad underpass just North of the Deep Creek, Rock Springs Rd intersection. It was also observed that Rock Springs Rd. East of the project site climbs what historically may have been the bank of the Mojave River a very long time ago. It was also observed that Rock Springs Rd West of the project site climbs a slope as it approaches the current bank of the Mojave River before it drops down into the river. Observations from the field visit confirmed what was seen in Google Maps, that the project does not appear to be impacted by concentrated flows from offsite catchment areas.

Due to the proximity of the project site location being East of the Mojave River and below the elevation of the banks as determined from the site visit, FEMA flood hazard maps were also reviewed. The attached FIRMette from the FEMA National Flood Hazard Map 06071C6515J found the site located in a zone X flood area. Zone X flood areas are not subject to a flood hazard. Since the project site does not appear to be impacted by flood waters from the Mojave River, no mitigation with respect to FEMA will be required at this time for this project.

### **Phase II Small MS4 Permit:**

The Phase II Small Area MS4 General Permit adopted by the State and County requires all new developments to incorporate Low Impact Development (LID) Best Management Practices (BMP) the maximum extent practicable (MEP). New developments typically change pre-development hydrologic conditions by introducing impervious areas which do not typically infiltrate storm water runoff. One purpose of the WQMP is to mitigate the potential for contributing to or causing hydromodification. Hydromodification is a change to the existing drainage network caused by an increased runoff volume, velocity, frequency and a reduction in infiltration and flow time to reach peak flows.

Per Section E.12f of the Permit, Regulated Projects that create and/or replace one (1) acre or more of impervious surface shall implement hydromodification management features. Such features shall incorporate a design that demonstrates the post development runoff flow rate does not exceed the pre-development runoff flow rate. A review of Figure 1 in the section found the project site to be located in the geomorphic province of the Mojave Desert, more specifically, the Mojave River Watershed. The implementation level for hydromodification management in the Mojave Desert is a 10-year, 24-hour rain event. A hydrologic analysis of the pre and post development conditions for a 10-year rain event for this project site may be required.

### **Storm Water Runoff Data:**

To determine the flow rate and volume of storm water runoff for the proposed development, data was collected from various sources in order to develop a small area runoff hydrograph. The San Bernardino County Hydrology manual was used as a guideline for the collection of data and performing calculations. Per the addendum of the manual, precipitation data was obtained from the National Oceanic and Atmospheric Administration Precipitation Frequency Data Server (NOAA Atlas 14 Vol 6 PF server). Hydraulic Soil Group data was obtained from the USDA Natural Resources Conservation Service Web Soil Survey (WSS).

The coordinates for the project site was determined from Google Maps to be at a Latitude of 34.4142° and a Longitude of -117.2252°. These coordinates were used to locate the project site in the PF Server and

WSS to get the required data for the study. See attached Point Precipitation Frequency Estimates sheet from the NOAA web site in the appendix. According to the WSS soil map, the soil on-site was identified as 119-Cajon-Wasco Sand. The soil identified falls within hydrologic soil group A. See attached soils map and soil description. Per Figure C-3 of the hydrology manual and the soil cover complex, the two (2) curve numbers (CN) of 78 and 38 were selected for the pre-development condition based upon an antecedent moisture condition (AMC) of 2 for a 10-year storm. The CN of 78 is based upon the area of barren land and the CN of 38 for the vegetated area of annual or perennial grasses. For the developed condition, the landscaped areas were assigned a CN of 32 and 98 for the impervious areas. See attached Figure C-3 from the Hydrology manual.

### **Off-Site Runoff:**

A sump condition was found to exist onsite. Other sumps were observed to exist offsite as well. The review of the maps and exhibits under Site Discussion did not find any indication of offsite storm water runoff of significance impacting the lot. Due to the soil type and lack of erosion caused by concentrated flows, it is assumed that little runoff occurs because the soil infiltrates most of the rainfall. Drainage swales were found between Rock Springs Rd and the railroad North and to the West of the project site. These swales appeared to be in the form of ponds as no outlets were found to exist to allow water to flow into the Mojave River or North as the Topo Quad would indicate due to the railroad tracks. Due to the observed conditions, a detailed study of the surrounding area was considered unnecessary. The scope of work to develop offsite storm drain systems to mitigate the ponding water that collects in the railroad right of way is not within the scope of work for this study nor the responsibility of the developer of this small parcel of land.

### **Post Development Runoff Volume:**

The observed topographic features for the existing condition of this lot indicates that all onsite runoff is potentially contained onsite. For the proposed development, it is recommended that a retention system be required to mitigate 100% of the runoff created by the impervious surfaces for any rain event onsite. To determine an estimated volume of retention, one drainage area (DA) discharging into a basin for the post developed conditioned will be analyzed in this section of the report to provide some additional recommendations.

A detailed study to determine the post development flow rate(s) and volume is not feasible at this time for this preliminary study. The site layout is subject to change and a precise grading plan is not available. For post development, a rough estimation will be determined. Multiple post development DMAs within the DA cannot be analyzed as the area of coverage cannot be determined from a site plan. A precise grading plan that is developed during the design phase of this project will enable a final hydrology study to be performed to determine the boundaries of the DMAs and their associated runoff rates and volumes. Therefore, it is recommended that a Final Hydrology Study be performed and submitted for review based upon the final design of the project site.

It is assumed that the proposed development will create both connected and disconnected impervious areas in the DA. The connected impervious areas will be composed of what is assumed to be the front of the buildings (longitudinal length) facing the parking lots and drive aisles. Disconnected impervious areas will be composed of planter areas abutting some of the ends and rear side of some of the structures. Other disconnected impervious areas may be separated by landscaped fingers/planter between walkways and the parking areas or drive aisles. These pervious areas are small and may intercept some runoff from the structures or walkways before they are saturated and discharge the runoff into the parking areas and eventually to a basin.

Hydrology Studio was used to determine an estimated runoff volume. For the developed DA, an analysis of a 100-year, 24-hour storm event determine the post-development runoff rate to be  $Q_{100} = 1.24$  cfs and a total volume of 17,124 cf. The Kirpich method was used to determine the time of concentration and a composite curve number (CN) was developed based upon an estimation of the pervious and impervious areas.

### **Onsite Retention:**

An analysis of a 100-year, 24-hour storm event determine that a preliminary volume of 17,124 cf of storm water runoff may potentially be generated from the proposed development. A review of all available information indicates that historically any onsite runoff does not leave the project site due the sump condition observed. It is recommended that a basin or combination of structures be constructed onsite to capture, contain and infiltrate the storm water runoff. It is recommended that an allowance be granted in determining a final design capture volume based upon a final hydrology study that may reflect any site design changes.

### **Conclusion:**

Research of the available information for the proposed development determined that the project site does not appear to be impacted by offsite storm water runoff. A sump condition was found to exist onsite and it was concluded that no storm water runoff currently discharges from the lot. It is recommended that a retention basin be constructed onsite to mitigate 100% of storm water runoff from any rain fall event. The estimated retention volume required for the proposed development was found to be approximately 17,124 cf from hydrologic calculations. Due to the size of the development, a WQMP will be required. The results of the findings contained in this report indicate that an analysis of a 10-year storm to meet hydromodification requirements will not be necessary. It is estimated that the parcel of land is sufficient in size to be developed as proposed per the attached site plan. It is recommended that a final hydrology study be performed based upon an approved architectural site plan and a precise grading plan to verify the retention system volume requirements. It is recommended that double ring infiltrometer testing be performed in the location of the retention system at the bottom of the basin to determine the infiltration rate of the subsurface soils. The size of the retention system may become dependent upon the infiltration rate if it is very slow. The system shall infiltrate the minimum storm water runoff volume required within a time specified by the County of San Bernardino.



# APPENDICIES



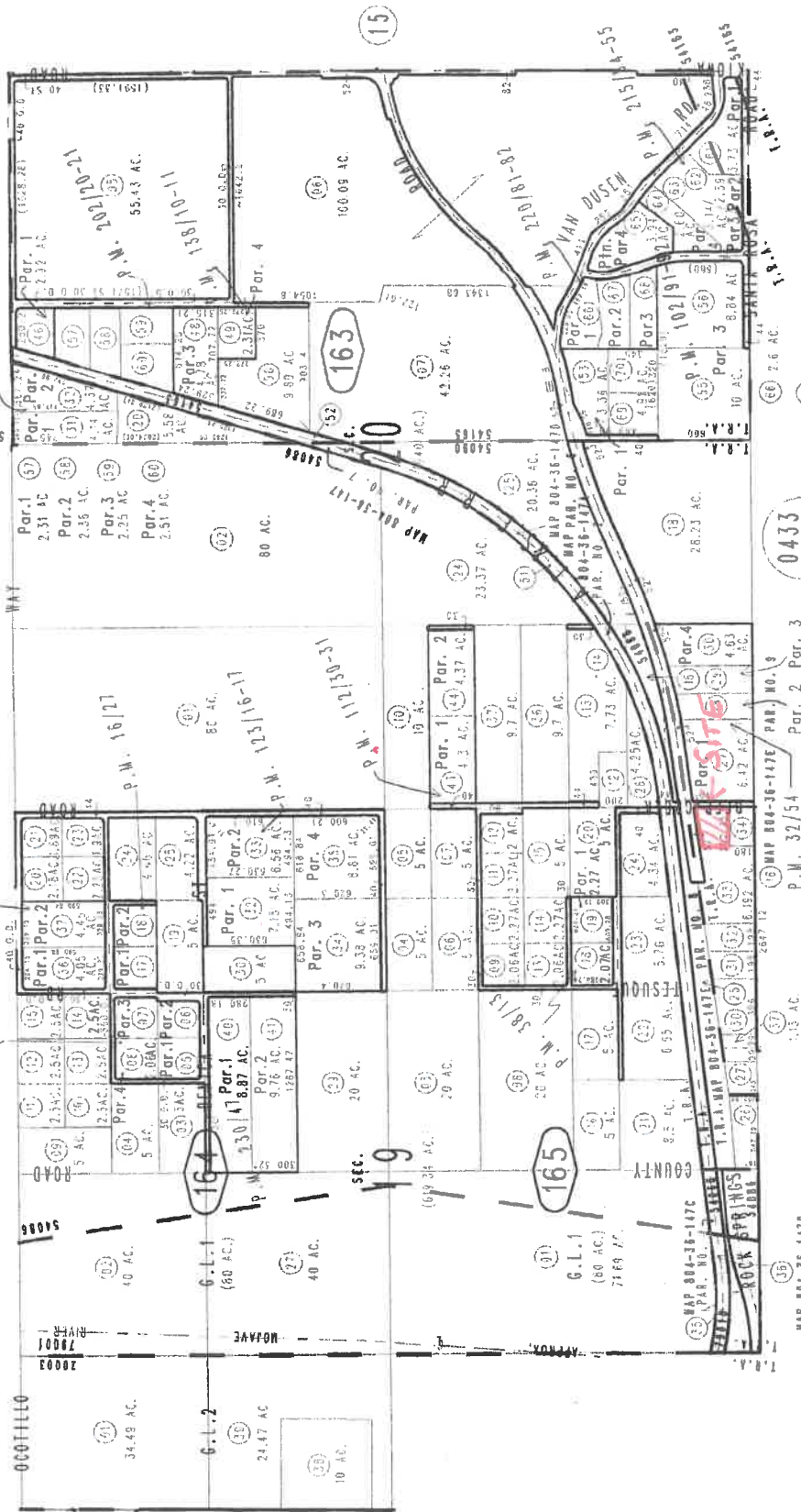
THIS MAP IS FOR THE PURPOSE  
OF AD VALOREM TAXATION ONLY.



# Pin. Fractional Sec.19 & Sec.20, T.4N.,R.3W., S.B.B.&M.

0438-16

Hesperia Unified  
City of Hesperia  
Apple Valley Unified  
Tax Rate Area  
20003 54066 54086  
54088 54090 54161  
54163 54165 79018 79001



REVISED  
07/22/16 KC  
03/24/17 KA

Assessor's Map 16  
Book 0438 Page 16  
San Bernardino County

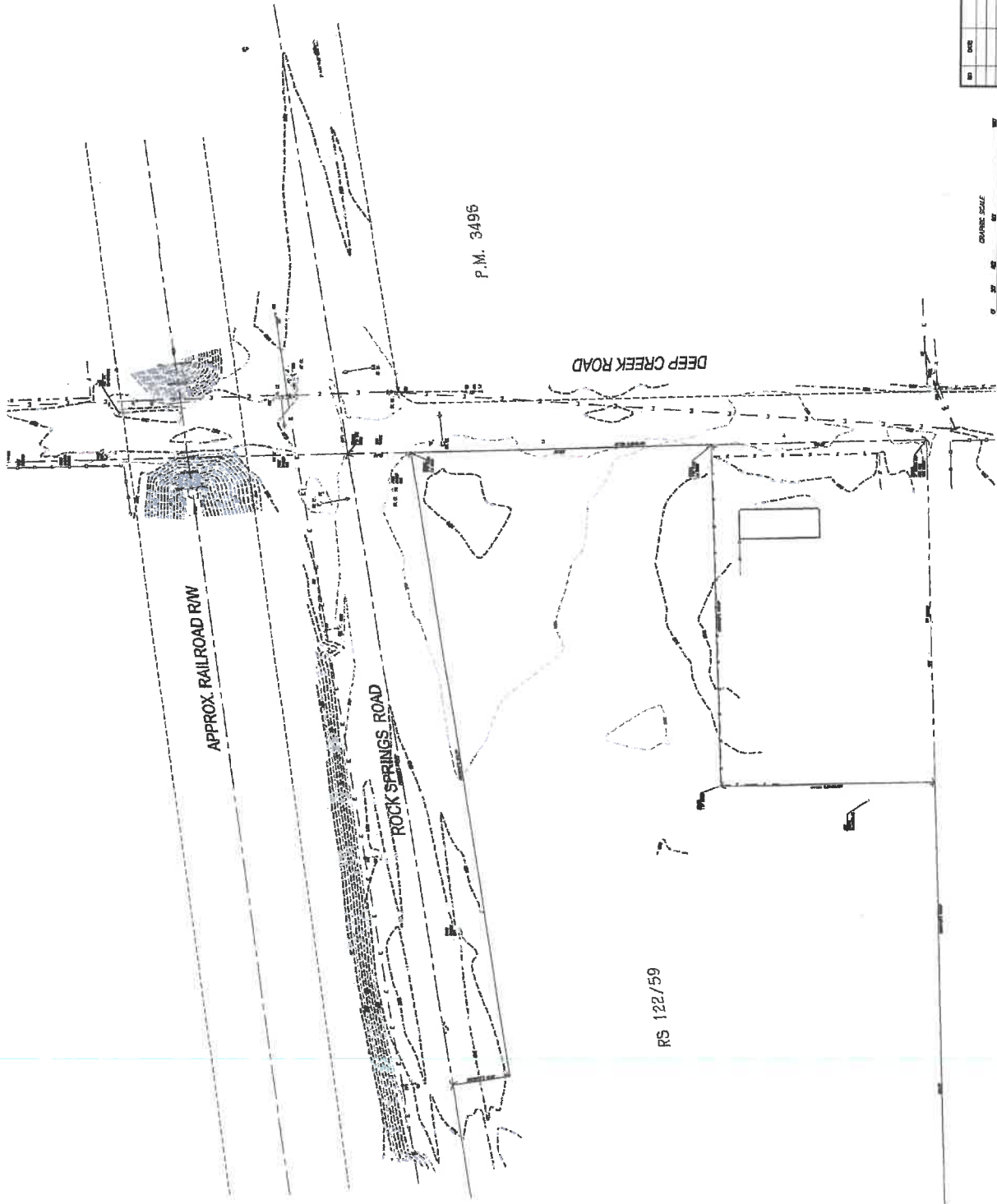
Parcel Map No. 4352, P.M. 54791	Parcel Map No. 11505, P.M. 138719-11
Parcel Map No. 4099, P.M. 38713	Parcel Map No. 11892, P.M. 134776-77
Parcel Map No. 2478, P.M. 21786	Parcel Map No. 10533, P.M. 123116-17
Parcel Map No. 3496, P.M. 32754	Parcel Map No. 10769, P.M. 11230-31
Parcel Map No. 1864, P.M. 16277	Pin. Parcel Map No. 5089, P.M. 102791-92
	Parcel Map No. 15396, P.M. 20720-21

# TOPOGRAPHIC SURVEY

SHEET 1 OF 7



SCALE 1" = 40'



### BASIS OF BEARINGS

THE BEARINGS FROM AROUND THE CORNER OF THE SOUTH LANE OF SECTION 16, T. 14N., R. 12E., S. 23M., 1897 IS 123.00°

### BENCH MARK

ONE OF SEVERAL BENCH MARKS WAS LOCATED NEAR THE CORNER OF DEEP CREEK ROAD AND ROCK SPRINGS ROAD. THE LOCATION OF THIS BENCH MARK WAS CHECKED AND FOUND TO BE CORRECT.

### PROPERTY

PORTION OF SECTION 16, T. 14N., R. 12E., S. 23M., AS SHOWN ON THE SURVEY MAP OF THE COUNTY OF CLATSOP, OREGON, APPROXIMATELY 1897.

### SURVEYOR'S NOTES

RECORD NUMBER 3495 IN BOOK 10, REGISTERED 12, 1907. COUNTY OF CLATSOP, OREGON. THE LOCATION OF UNDERGROUND LINES AND SERVICES ARE NOT SHOWN ON THIS SURVEY MAP. THE LOCATION OF UNDERGROUND LINES AND SERVICES ARE NOT SHOWN ON THIS SURVEY MAP. THE LOCATION OF UNDERGROUND LINES AND SERVICES ARE NOT SHOWN ON THIS SURVEY MAP.

### LEGEND

- 1" = 40'
- 2" = 80'
- 3" = 120'
- 4" = 160'
- 5" = 200'
- 6" = 240'
- 7" = 280'
- 8" = 320'
- 9" = 360'
- 10" = 400'
- 11" = 440'
- 12" = 480'
- 13" = 520'
- 14" = 560'
- 15" = 600'
- 16" = 640'
- 17" = 680'
- 18" = 720'
- 19" = 760'
- 20" = 800'
- 21" = 840'
- 22" = 880'
- 23" = 920'
- 24" = 960'
- 25" = 1000'



PREPARED BY:  
**Leonard Surveys, Inc.**  
12345 Main Street, Astoria, Oregon 97103  
Phone: 503-325-1234

NO.	DATE	DESCRIPTION

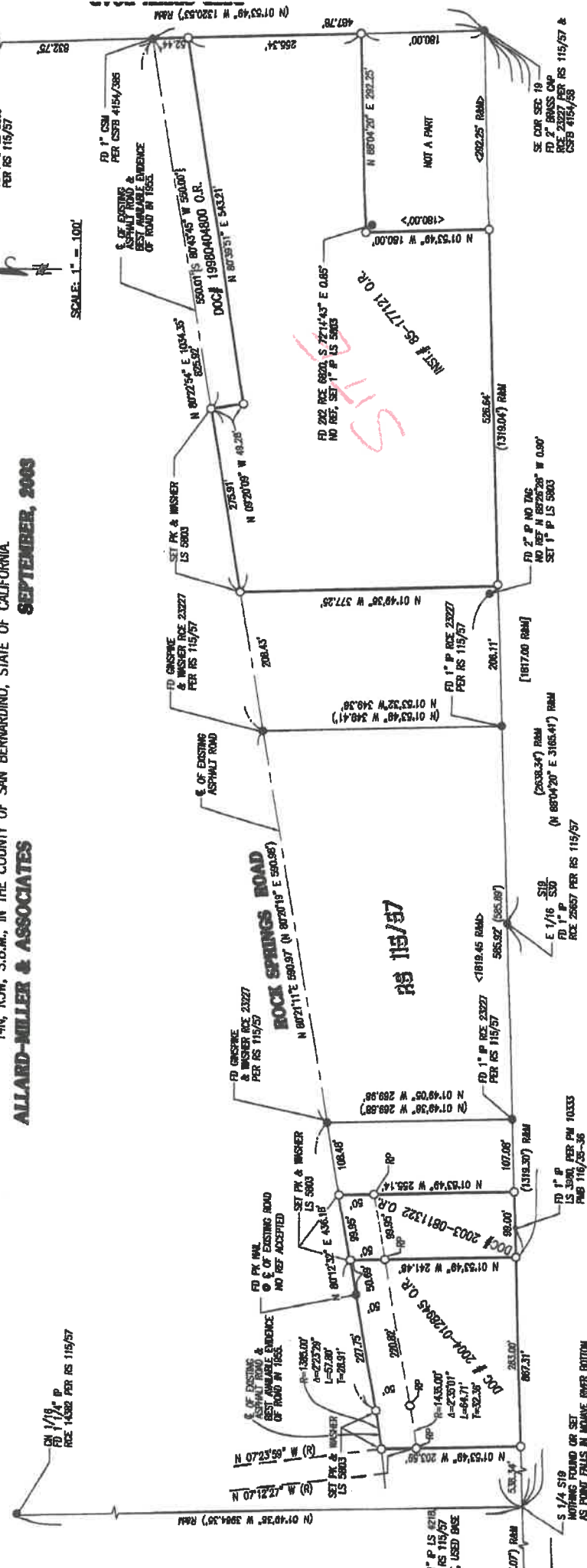


RS 122/59

# RECORD OF SURVEY 03-227

OF A PORTION OF THE S 1/2 OF THE SE 1/4 SECTION 19  
T4N, R3W, S.B.M., IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.  
ALLARD-MILLER & ASSOCIATES  
SEPTEMBER, 2003

SHEET 1 OF 1 SHEET



### SURVEYOR'S NOTES

- INDICATES FOUND MONUMENT AS NOTED.
- ( ) INDICATES RECORD DATA PER RS 115/57
- { } INDICATES RECORD DATA PER DOC. NO. 19980404800 O.R.
- <> INDICATES RECORD DATA PER INST. NO. 85-177121 O.R.
- [ ] INDICATES RECORD DATA PER DOC. NO. 2003-0811322 O.R.
- RAM RECORD AND MEASURED
- RP INDICATES REFERENCE POINT
- CSFB INDICATES COUNTY SURVEYORS FIELD BOOK.

THE PURPOSE OF THIS SURVEY IS TO MONUMENT THE BOUNDARIES OF DOC. NO. 2003-0811322 O.R. & INST. NO. 85-177121 O.R. & BOOK 4320 PAGE 68 O.R.

### COUNTY SURVEYOR'S STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8768 OF THE PROFESSIONAL LAND SURVEYOR'S ACT THIS 12th DAY OF December, 2004



DATE 12/28/04

DANIEL C. MOYE, COUNTY SURVEYOR  
COUNTY OF SAN BERNARDINO, CALIFORNIA

BY: *[Signature]* DEPUTY

### SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE PROFESSIONAL LAND SURVEYOR'S ACT AT THE REQUEST OF JOSEPHINE SOTOMAYOR SEPTEMBER 2003.

DATE 11/23/04

JOSEPH E. MILLER  
L.S. 5803, EXP. 06/30/06

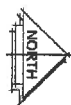
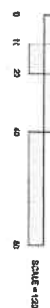
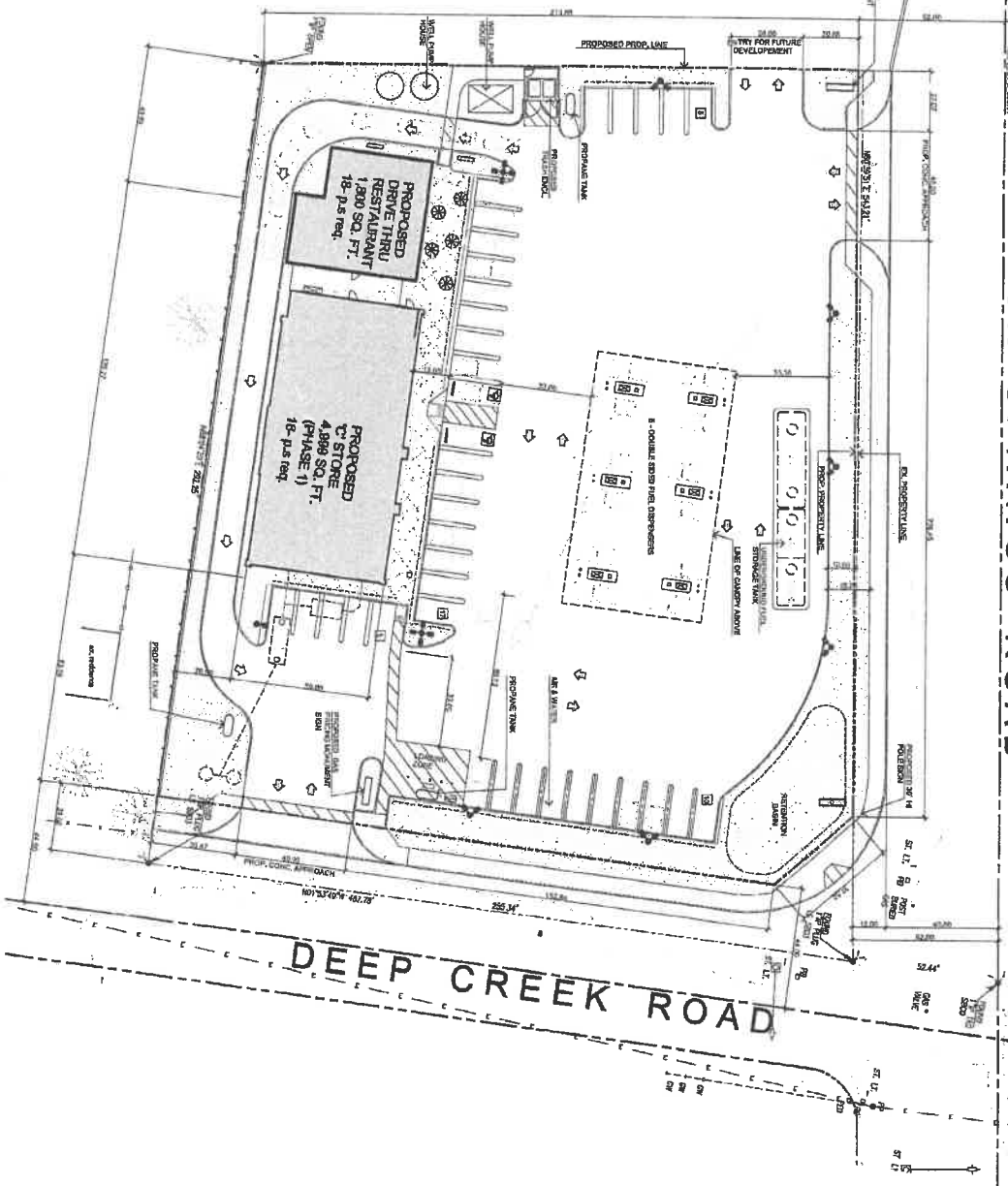
### COUNTY RECORDER'S CERTIFICATE

THIS MAP HAS BEEN FILED UNDER DOCUMENT NUMBER 004-0915263 THIS 12th DAY OF December 2004 AT 12:28 PM IN BOOK 133 OF Records of Survey, Page 8 IN THE AMOUNT OF \$ 7.00

LARRY WALKER  
AUDITOR-CONTROLLER/RECORDER  
COUNTY OF SAN BERNARDINO

BY: *[Signature]* DEPUTY RECORDER

# ROCK SPRINGS ROAD



SITE DATA		
<b>APN:</b> 015-162-33		
<b>LEGAL DESCRIPTION:</b> PORTION OF SECTION 16, T.7N., R.12E., S.24E., AS SHOWN ON THE 1983 ANTI-COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.		
<b>APPROXIMATE AREA:</b> 11.24 ACRES		
<b>APPROXIMATE AREA:</b> 11.24 ACRES		
<b>SITE AREA:</b> 11.24 ACRES		
<b>NET LAND AREA:</b> 6.23 ACRES		
<b>NET AREA:</b> 6.23 ACRES		
<b>PROJECT NET LAND AREA:</b> 11.24 ACRES		
<b>PROPOSED LAND AREA &amp; COVERAGE</b>		
AREA	sq. ft.	% COVERAGE
BUILDING AREA (TOTAL)	6,698	8.1%
PAVING CANOPY AREA	4,898	7.5%
LOT PAVING	4,171	6.4%
CONCRETE LANDSCAPE & CURBING	4,000	7.2%
LANDSCAPED AREA (TOTAL)	12,969	20.1%
TOTAL NET LAND AREA COVERAGE	31,637	100%
LANDSCAPED AREA (PROPOSED/REPRESENTATIVE)	1,547	NOT A PART
<b>PROVIDED PARKING DATA</b>		
REQUIRED PARKING PER 1,000 sq. ft.	8.2	2 SPACES
CONCRETE PAVING	1,100	10
ASPHALT PAVING	1,444	12
TOTAL REQUIRED	37	
PROVIDED PARKING:		
DRIVE ACCESSIBLE PAVING STALLS		2 SPACES
DRIVE ACCESSIBLE WORKING STALLS		20 SPACES
TOTAL PROVIDED		22 SPACES

PROJECT: GAS STATION DEVELOPMENT  
**DEEP CREEK ROAD GAS STATION**

708 797-  
C17489

708 797-  
C17489

STEENO ARCHITECTS & DESIGN, INC. ARCHITECTS & DESIGN PLAN NO. 2018-01 JANUARY 2018

1:100

DATE: 1/15/2018

TIME: 10:00 AM

10:00 AM

PROJECT ADDRESS:  
APRIL VALLEY, CALIFORNIA 92308

COUNTY: CALIFORNIA  
SHEET NO. 1 OF 1  
APRIL VALLEY, CALIFORNIA

1:100

A-0

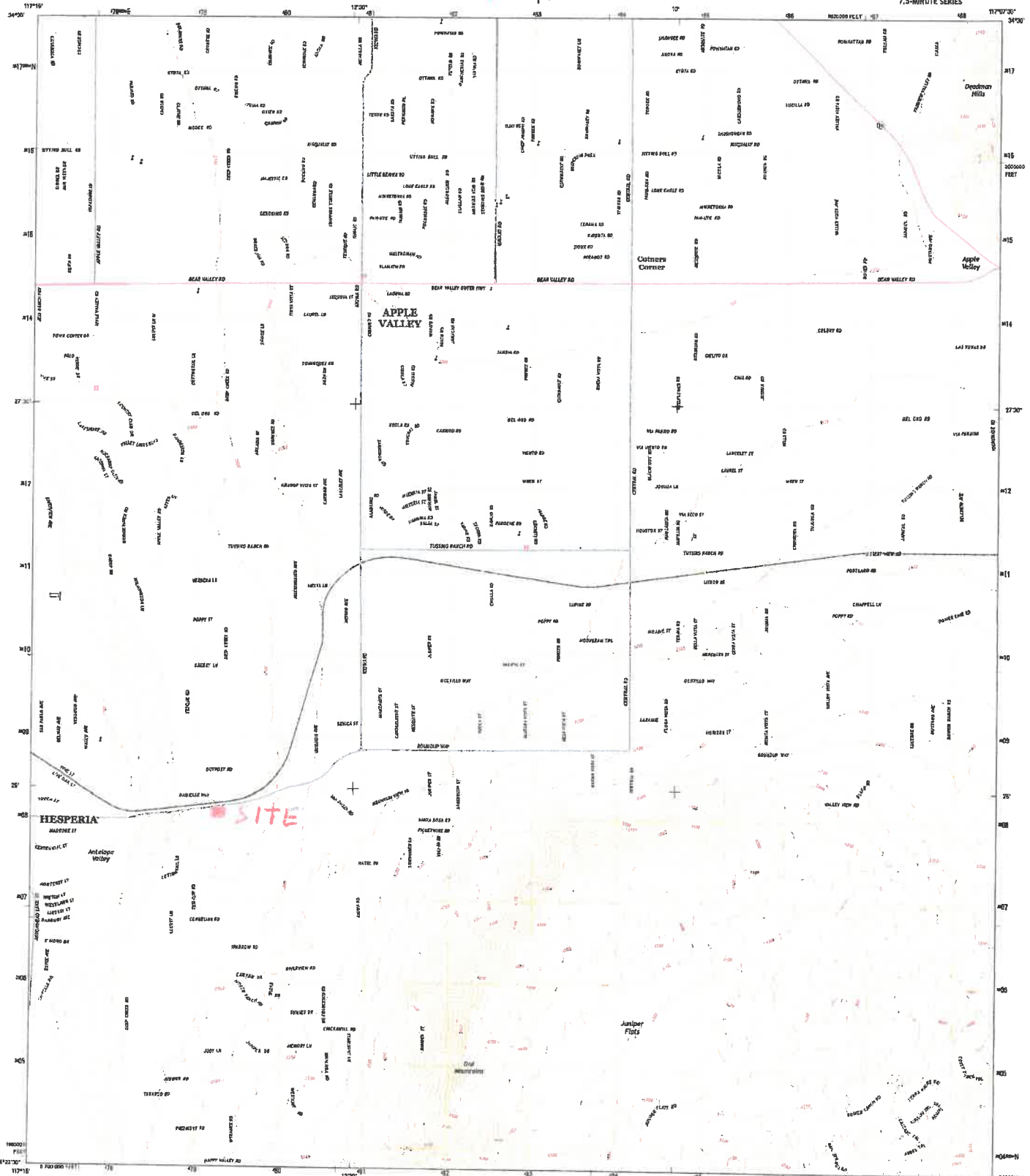
SITE PLAN



U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY



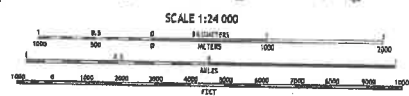
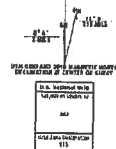
APPLE VALLEY SOUTH QUADRANGLE  
CALIFORNIA-SAN BERNARDINO CO.  
7.5-MINUTE SERIES



Produced by the United States Geological Survey  
North American Datum of 1983 (NAD83)  
North Geodetic System of 1984 (NAD83). Projection and  
1:50,000 scale (Universal Transverse Mercator, Zone 11S  
to 1000-foot (305-meter) Contour Interval of 1983 (Zone 11S))

This map is not a legal document. Boundaries may be  
determined by the map maker. Private land ownership  
information may not be shown. Obtain permission before  
making private deals.

DATE: April 2011  
SCALE: 1:24,000  
PROJECTION: UTM  
DATUM: NAD83  
ELEVATION: 115



CONTOUR INTERVAL: 20 FEET  
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the  
National Map Accuracy Program (NMAP) Standard, 2011.  
Availability is indicated with this product to show whether it is



ROAD CLASSIFICATION  
Expressway  
Secondary Hwy  
Ramp  
Interstate Route  
Local Road  
JRD  
US Route  
State Route

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

APPLE VALLEY SOUTH, CA  
2015



# National Flood Hazard Layer FIRMette



## 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
  - Regulatory Floodway Zone AE, AG, AH, VE, AF
- 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**
  - Area of Minimal Flood Hazard Zone X
  - Effective LOMRs
  - Area of Undetermined Flood Hazard Zone B
- GENERAL STRUCTURES**
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall

- OTHER FEATURES**
  - 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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/2/2018 at 3:36:11 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map 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.

34°25.96'N

117°13'49.45'W

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community












































117°13'11.99'W

34°24'36.28'N



## MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
 Special Point Features	 Special Line Features
 Blowout	 Water Features
 Borrow Pit	 Streams and Canals
 Clay Spot	 Transportation
 Closed Depression	 Rails
 Gravel Pit	 Interstate Highways
 Gravelly Spot	 US Routes
 Landfill	 Major Roads
 Lava Flow	 Local Roads
 Marsh or swamp	 Background
 Mine or Quarry	 Aerial Photography
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area

Survey Area Data: Version 9, Sep 11, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 1, 2015—Feb 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
119	CAJON-WASCO, COOL COMPLEX, 2 TO 9 PERCENT SLOPES*	2.2	100.0%
<b>Totals for Area of Interest</b>		<b>2.2</b>	<b>100.0%</b>

## San Bernardino County, California, Mojave River Area

### 119—CAJON-WASCO, COOL COMPLEX, 2 TO 9 PERCENT SLOPES\*

#### Map Unit Setting

*National map unit symbol:* hkr  
*Elevation:* 2,300 to 3,200 feet  
*Mean annual precipitation:* 3 to 6 inches  
*Mean annual air temperature:* 59 to 66 degrees F  
*Frost-free period:* 180 to 290 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Cajon and similar soils:* 65 percent  
*Wasco, gravelly, and similar soils:* 30 percent  
*Minor components:* 5 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Cajon

##### 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 8 inches:* sand  
*H2 - 8 to 60 inches:* sand

##### Properties and qualities

*Slope:* 2 to 9 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Somewhat excessively drained  
*Capacity of the most limiting layer to transmit water (Ksat):* High to very high (5.95 to 19.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 1 percent  
*Available water storage in profile:* Low (about 4.2 inches)

##### Interpretive groups

*Land capability classification (irrigated):* 3e  
*Land capability classification (nonirrigated):* 7e  
*Hydrologic Soil Group:* A  
*Ecological site:* Sandy (R030XF012CA)  
*Hydric soil rating:* No

## Description of Wasco, Gravelly

### 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 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  
*Natural 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  
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water storage in profile:* Low (about 6.0 inches)

### Interpretive groups

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

## Minor Components

### Cajon, sloping

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

### Wasco

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

### Riverwash

*Percent of map unit:* 1 percent  
*Landform:* Channels  
*Hydric soil rating:* Yes

## Data Source Information

Soil Survey Area: San Bernardino County, California, Mojave River Area  
Survey Area Data: Version 9, Sep 11, 2017



NOAA Atlas 14, Volume 6, Version 2  
 Location name: Apple Valley, California, USA\*  
 Latitude: 34.4142°, Longitude: -117.2252°  
 Elevation: 2892.87 ft\*\*  
 \* source: ESRI Maps  
 \*\* source: USGS



**POINT PRECIPITATION FREQUENCY ESTIMATES**

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aerials](#)

**PF tabular**

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.02 (0.840-1.24)	1.40 (1.16-1.72)	1.94 (1.60-2.39)	2.40 (1.96-2.96)	3.05 (2.41-3.90)	3.66 (2.76-4.66)	4.12 (3.11-5.51)	4.70 (3.46-6.48)	5.53 (3.90-7.93)	6.19 (4.21-9.19)
10-min	0.726 (0.600-0.888)	1.01 (0.834-1.23)	1.39 (1.15-1.71)	1.72 (1.40-2.12)	2.18 (1.73-2.79)	2.66 (1.98-3.34)	2.95 (2.23-3.95)	3.37 (2.48-4.64)	3.97 (2.80-5.69)	4.44 (3.02-6.59)
15-min	0.588 (0.484-0.716)	0.812 (0.672-0.992)	1.12 (0.924-1.38)	1.38 (1.13-1.71)	1.76 (1.39-2.25)	2.06 (1.60-2.69)	2.38 (1.80-3.18)	2.72 (2.00-3.74)	3.20 (2.25-4.58)	3.58 (2.44-5.31)
30-min	0.414 (0.342-0.506)	0.572 (0.472-0.700)	0.790 (0.650-0.970)	0.974 (0.796-1.21)	1.24 (0.980-1.58)	1.46 (1.12-1.89)	1.68 (1.27-2.24)	1.92 (1.41-2.63)	2.25 (1.59-3.23)	2.52 (1.71-3.74)
60-min	0.268 (0.222-0.328)	0.371 (0.306-0.453)	0.512 (0.422-0.628)	0.632 (0.516-0.781)	0.803 (0.635-1.03)	0.941 (0.728-1.23)	1.09 (0.821-1.45)	1.24 (0.912-1.71)	1.46 (1.03-2.09)	1.63 (1.11-2.42)
2-hr	0.190 (0.158-0.232)	0.254 (0.210-0.310)	0.341 (0.281-0.418)	0.416 (0.340-0.514)	0.522 (0.412-0.666)	0.606 (0.470-0.792)	0.696 (0.526-0.932)	0.792 (0.581-1.09)	0.924 (0.651-1.32)	1.03 (0.701-1.53)
3-hr	0.155 (0.129-0.190)	0.204 (0.169-0.250)	0.272 (0.224-0.334)	0.330 (0.269-0.408)	0.412 (0.325-0.526)	0.478 (0.370-0.624)	0.547 (0.413-0.732)	0.621 (0.456-0.853)	0.723 (0.509-1.04)	0.804 (0.547-1.19)
6-hr	0.107 (0.089-0.131)	0.140 (0.115-0.171)	0.185 (0.152-0.226)	0.222 (0.182-0.275)	0.276 (0.218-0.353)	0.319 (0.246-0.416)	0.363 (0.274-0.486)	0.411 (0.302-0.565)	0.477 (0.336-0.684)	0.529 (0.360-0.786)
12-hr	0.068 (0.057-0.084)	0.091 (0.075-0.111)	0.122 (0.100-0.149)	0.147 (0.120-0.182)	0.183 (0.144-0.233)	0.211 (0.163-0.275)	0.240 (0.181-0.321)	0.271 (0.199-0.372)	0.313 (0.220-0.448)	0.346 (0.235-0.513)
24-hr	0.045 (0.040-0.052)	0.062 (0.055-0.071)	0.084 (0.074-0.097)	0.102 (0.090-0.119)	0.128 (0.108-0.154)	0.148 (0.123-0.181)	0.168 (0.136-0.212)	0.189 (0.149-0.245)	0.219 (0.165-0.295)	0.242 (0.177-0.338)
2-day	0.026 (0.023-0.030)	0.037 (0.032-0.042)	0.050 (0.045-0.058)	0.062 (0.054-0.072)	0.078 (0.066-0.094)	0.090 (0.075-0.111)	0.103 (0.083-0.129)	0.116 (0.091-0.150)	0.134 (0.102-0.181)	0.149 (0.109-0.208)
3-day	0.019 (0.017-0.022)	0.027 (0.024-0.031)	0.037 (0.033-0.043)	0.046 (0.040-0.053)	0.057 (0.049-0.069)	0.067 (0.055-0.082)	0.076 (0.062-0.096)	0.086 (0.068-0.112)	0.100 (0.076-0.135)	0.111 (0.081-0.155)
4-day	0.015 (0.013-0.017)	0.021 (0.019-0.025)	0.030 (0.026-0.034)	0.037 (0.032-0.043)	0.046 (0.039-0.056)	0.054 (0.045-0.066)	0.062 (0.050-0.078)	0.070 (0.055-0.091)	0.081 (0.062-0.110)	0.090 (0.066-0.126)
7-day	0.009 (0.008-0.011)	0.013 (0.012-0.015)	0.019 (0.016-0.021)	0.023 (0.020-0.027)	0.029 (0.025-0.035)	0.034 (0.028-0.042)	0.039 (0.032-0.049)	0.044 (0.035-0.057)	0.052 (0.039-0.070)	0.057 (0.042-0.080)
10-day	0.007 (0.006-0.008)	0.010 (0.009-0.011)	0.014 (0.012-0.016)	0.017 (0.015-0.020)	0.022 (0.018-0.026)	0.025 (0.021-0.031)	0.029 (0.024-0.037)	0.033 (0.026-0.043)	0.039 (0.030-0.053)	0.043 (0.032-0.061)
20-day	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.013 (0.011-0.016)	0.015 (0.013-0.019)	0.018 (0.014-0.022)	0.020 (0.016-0.028)	0.024 (0.018-0.032)	0.027 (0.020-0.037)
30-day	0.003 (0.003-0.003)	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.012 (0.010-0.015)	0.014 (0.011-0.017)	0.016 (0.013-0.021)	0.019 (0.014-0.025)	0.021 (0.015-0.029)
45-day	0.002 (0.002-0.003)	0.003 (0.003-0.004)	0.006 (0.004-0.008)	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.010 (0.008-0.012)	0.011 (0.009-0.014)	0.013 (0.010-0.017)	0.015 (0.011-0.020)	0.017 (0.012-0.024)
60-day	0.002 (0.002-0.002)	0.003 (0.002-0.003)	0.004 (0.004-0.005)	0.005 (0.004-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.010)	0.009 (0.007-0.012)	0.011 (0.008-0.014)	0.013 (0.010-0.017)	0.014 (0.010-0.020)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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NOAA Atlas 14, Volume 6, Version 2  
 Location name: Apple Valley, California, USA\*  
 Latitude: 34.4142°, Longitude: -117.2252°  
 Elevation: 2892.87 ft\*\*



\* source: ESRI Maps  
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NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aeriels](#)

**PF tabular**

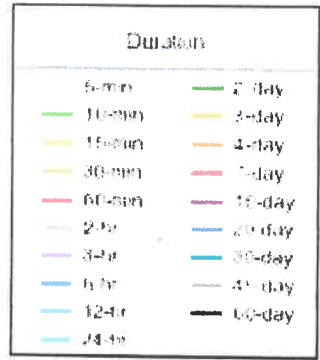
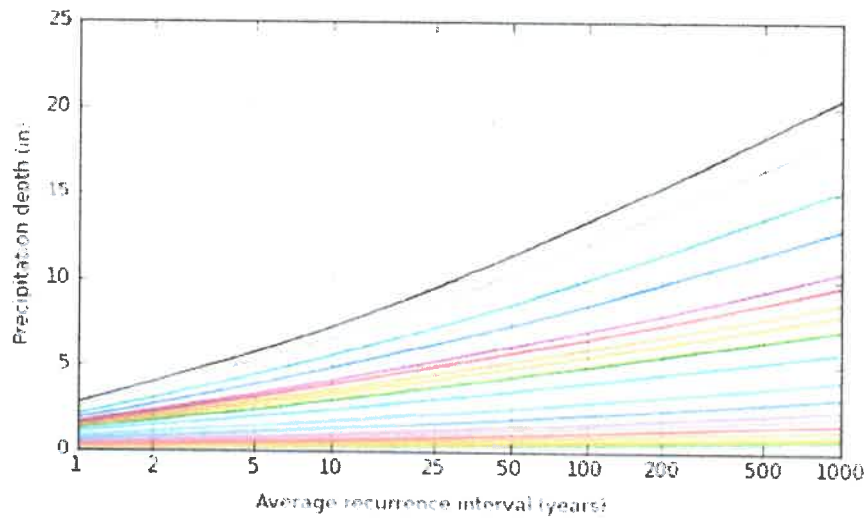
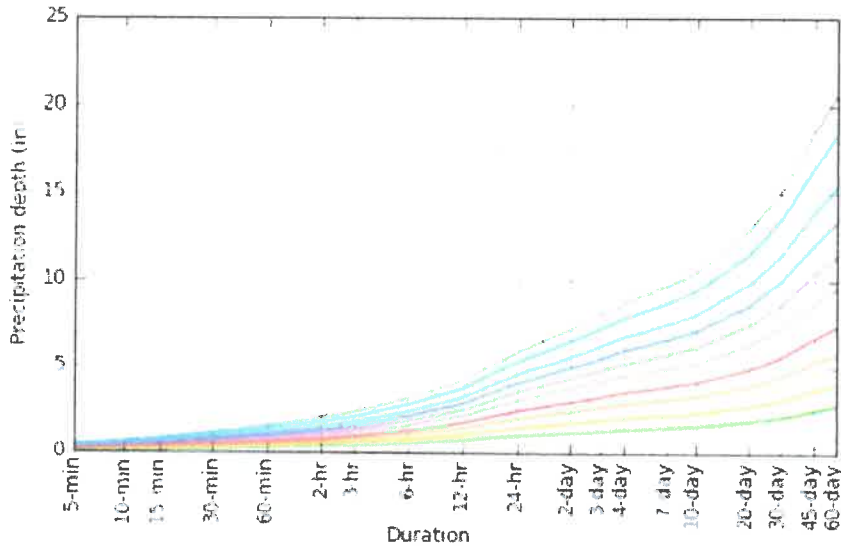
<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.085 (0.070-0.103)	0.117 (0.097-0.143)	0.162 (0.133-0.199)	0.200 (0.163-0.247)	0.254 (0.201-0.325)	0.297 (0.230-0.388)	0.343 (0.269-0.459)	0.392 (0.288-0.540)	0.461 (0.325-0.661)	0.516 (0.351-0.766)
10-min	0.121 (0.100-0.148)	0.168 (0.139-0.205)	0.232 (0.191-0.285)	0.286 (0.234-0.354)	0.364 (0.288-0.465)	0.426 (0.330-0.557)	0.492 (0.372-0.659)	0.562 (0.413-0.774)	0.661 (0.466-0.948)	0.740 (0.504-1.10)
15-min	0.147 (0.121-0.179)	0.203 (0.168-0.248)	0.281 (0.231-0.344)	0.346 (0.283-0.428)	0.440 (0.348-0.563)	0.516 (0.399-0.673)	0.595 (0.450-0.796)	0.680 (0.499-0.935)	0.799 (0.563-1.15)	0.895 (0.609-1.33)
30-min	0.207 (0.171-0.253)	0.286 (0.236-0.350)	0.395 (0.325-0.485)	0.487 (0.398-0.603)	0.620 (0.490-0.792)	0.726 (0.562-0.947)	0.838 (0.633-1.12)	0.958 (0.703-1.32)	1.13 (0.793-1.61)	1.26 (0.857-1.87)
60-min	0.268 (0.222-0.328)	0.371 (0.306-0.453)	0.512 (0.422-0.628)	0.632 (0.518-0.781)	0.803 (0.635-1.03)	0.941 (0.728-1.23)	1.09 (0.821-1.45)	1.24 (0.912-1.71)	1.46 (1.03-2.09)	1.63 (1.11-2.42)
2-hr	0.381 (0.315-0.465)	0.507 (0.419-0.621)	0.682 (0.562-0.837)	0.831 (0.679-1.03)	1.04 (0.824-1.33)	1.21 (0.939-1.58)	1.39 (1.05-1.86)	1.58 (1.16-2.18)	1.85 (1.30-2.65)	2.06 (1.40-3.06)
3-hr	0.466 (0.386-0.570)	0.614 (0.507-0.751)	0.817 (0.673-1.00)	0.990 (0.809-1.22)	1.24 (0.977-1.58)	1.44 (1.11-1.87)	1.64 (1.24-2.20)	1.86 (1.37-2.56)	2.17 (1.53-3.11)	2.41 (1.64-3.58)
6-hr	0.641 (0.530-0.783)	0.837 (0.691-1.02)	1.11 (0.910-1.36)	1.33 (1.08-1.65)	1.65 (1.31-2.11)	1.91 (1.48-2.49)	2.18 (1.64-2.91)	2.46 (1.81-3.38)	2.86 (2.01-4.10)	3.17 (2.16-4.70)
12-hr	0.825 (0.682-1.01)	1.10 (0.905-1.34)	1.46 (1.21-1.80)	1.77 (1.45-2.19)	2.20 (1.74-2.81)	2.54 (1.97-3.31)	2.89 (2.18-3.87)	3.26 (2.39-4.48)	3.77 (2.66-5.40)	4.17 (2.84-6.18)
24-hr	1.09 (0.965-1.25)	1.49 (1.32-1.71)	2.02 (1.78-2.33)	2.46 (2.15-2.86)	3.07 (2.60-3.69)	3.54 (2.94-4.35)	4.03 (3.27-5.08)	4.55 (3.58-5.89)	5.25 (3.97-7.09)	5.80 (4.24-8.11)
2-day	1.27 (1.12-1.46)	1.76 (1.56-2.03)	2.42 (2.14-2.80)	2.97 (2.60-3.46)	3.73 (3.16-4.49)	4.32 (3.59-5.31)	4.93 (4.00-6.21)	5.57 (4.39-7.21)	6.45 (4.88-8.70)	7.14 (5.22-9.97)
3-day	1.37 (1.21-1.57)	1.92 (1.70-2.21)	2.67 (2.35-3.08)	3.28 (2.88-3.82)	4.13 (3.50-4.98)	4.80 (3.98-5.90)	5.48 (4.45-6.91)	6.21 (4.90-8.05)	7.22 (5.46-9.74)	8.01 (5.85-11.2)
4-day	1.45 (1.29-1.67)	2.04 (1.81-2.36)	2.86 (2.52-3.30)	3.52 (3.09-4.11)	4.45 (3.77-5.36)	5.17 (4.29-6.36)	5.93 (4.80-7.47)	6.72 (5.29-8.70)	7.81 (5.91-10.5)	8.68 (6.34-12.1)
7-day	1.57 (1.40-1.81)	2.22 (1.97-2.56)	3.11 (2.75-3.60)	3.86 (3.38-4.49)	4.90 (4.15-5.90)	5.71 (4.74-7.02)	6.56 (5.31-8.26)	7.45 (5.87-9.65)	8.68 (6.57-11.7)	9.65 (7.06-13.5)
10-day	1.66 (1.47-1.91)	2.35 (2.08-2.70)	3.30 (2.91-3.81)	4.10 (3.59-4.77)	5.23 (4.43-6.29)	6.12 (5.08-7.52)	7.04 (5.70-8.87)	8.01 (6.31-10.4)	9.37 (7.09-12.6)	10.4 (7.63-14.6)
20-day	1.90 (1.68-2.18)	2.72 (2.40-3.13)	3.87 (3.42-4.47)	4.85 (4.25-5.65)	6.26 (5.30-7.53)	7.38 (6.13-9.08)	8.56 (6.93-10.8)	9.80 (7.72-12.7)	11.5 (8.71-15.5)	12.9 (9.41-18.0)
30-day	2.15 (1.91-2.48)	3.09 (2.74-3.56)	4.43 (3.91-5.12)	5.58 (4.89-6.51)	7.26 (6.15-8.74)	8.60 (7.14-10.6)	10.00 (8.10-12.6)	11.5 (9.05-14.9)	13.5 (10.2-18.3)	15.2 (11.1-21.2)
45-day	2.54 (2.25-2.92)	3.64 (3.22-4.19)	5.23 (4.62-6.04)	6.61 (5.79-7.71)	8.64 (7.33-10.4)	10.3 (8.55-12.7)	12.0 (9.74-15.1)	13.9 (10.9-17.9)	16.4 (12.4-22.1)	18.4 (13.4-25.7)
60-day	2.80 (2.48-3.22)	3.99 (3.53-4.60)	5.74 (5.06-6.63)	7.27 (6.37-8.47)	9.52 (8.07-11.5)	11.4 (9.44-14.0)	13.3 (10.8-16.8)	15.4 (12.1-19.9)	18.3 (13.8-24.7)	20.5 (15.0-28.7)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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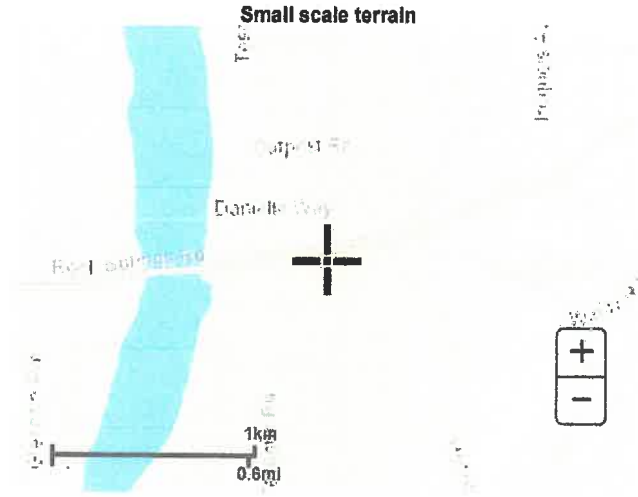
## PF graphical

PDS-based depth duration-frequency (DDF) curves  
Latitude: 34.4142°, Longitude: -117.2252°



# Maps & aerals

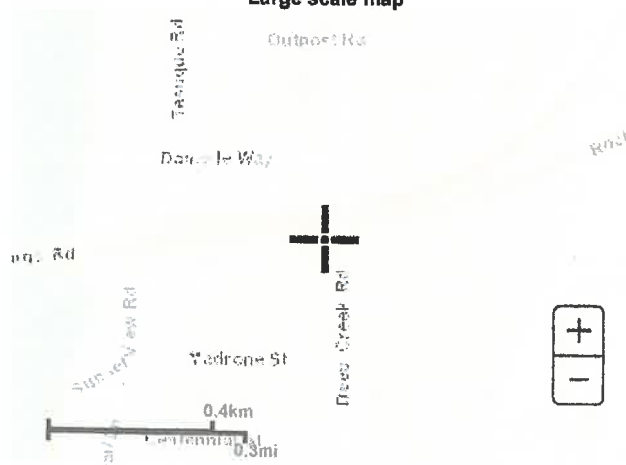
### Small scale terrain



### Large scale terrain

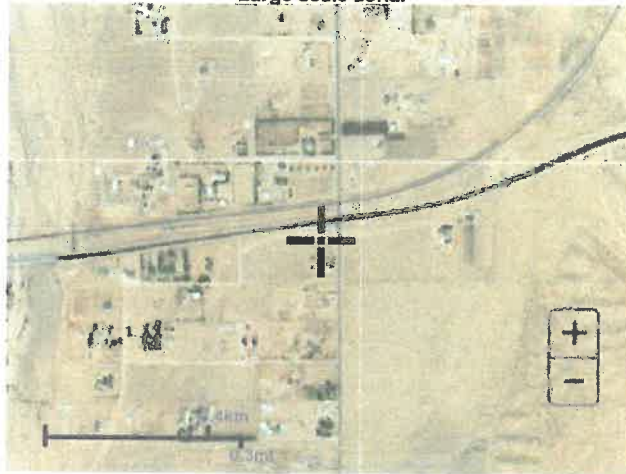


### Large scale map





**Large scale aerial**



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[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
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Questions? [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

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**Curve (I) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II**

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<b><u>NATURAL COVERS -</u></b>					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<b><u>URBAN COVERS -</u></b>					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<b><u>AGRICULTURAL COVERS -</u></b>					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

**SAN BERNARDINO COUNTY**  
**HYDROLOGY MANUAL**

**CURVE NUMBERS**  
**FOR**  
**PERVIOUS AREAS**

# Hydrograph Report

Project Name: Rock Springs Rd

Hydrology Studio v 2.0.0.52

03-09-2018

## Post Development

### Hyd. No. 3

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.239 cfs
Storm Frequency	= 100-yr	Time to Peak	= 7.90 hrs
Time Interval	= 3 min	Runoff Volume	= 17,124 cuft
Drainage Area	= 1.5 ac	Curve Number	= 92*
Tc Method	= Kirpich	Time of Conc. (Tc)	= 5.99 min
Basin Slope	= 0.5 %	Hydraulic Length	= 395 ft
Total Rainfall	= 4.0300 in	Design Storm	= Type IA
Storm Duration	= 24 hrs	Shape Factor	= 645

#### Composite CN Worksheet

AREA (ac)	CN	DESCRIPTION
1.36	98	Impervious
0.14	32	Pervious
1.5	92	Weighted Average

**Qp = 1.24 cfs**

