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LAND SURVEYING | CIVIL ENGINEERING | CONSTRUCTION

DRNSTY-2018-00019

Preliminary Drainage Study

Jesse Maldonado

7575 Coyote Trail
Oak Hills, CA 92344
(909) 730-3420

For the Proposed

TPM 19923

Located on:
Larch Rd & Topaz Ave.

in the Unincorporated area of
County of San Bernardino,
State of California
APN: 0405-382-06

Job No. 2017.0149
April 05, 2018

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY ... STARK
C76523
Exp. 12-31-18
CIVIL
STATE OF CALIFORNIA
4/5/18

Introduction:

The owner of APN 0405-382-06 has proposed the subdivision of a 5.0-acre gross parcel into a tract, Tentative Tract No. 19923. This lot is in the unincorporated area of San Bernardino County, California on Larch Road at Topaz Avenue in the community of Oak Hills CA.

Site Discussion:

The proposed residential subdivision will form two numbered lots of about 2.27 and 1.96 acres net. The parcel of land is currently undeveloped with no structures on either parcel. No grading is currently proposed for the site.

Purpose:

The purpose of this study is to determine if this site is impacted by off-site drainage flows, and if so, approximately how much flow. This study will also analyze the pre-development conditions onsite to determine the rates of storm water runoff following the historic flow paths.

Existing Site Conditions:

A review of aerial imagery of the existing site conditions confirm that the proposed subdivision currently is vacant land. (see attached map 4)

A review of the Hesperia Quad Map (see attached) found this site to be clear of known major drainage channels or blueline stream. From topographic data, the site slopes north east at approximately 2%-3% and any rain fall on the property would sheet flow to the north east. It appears that the site is not affected by offsite flows from the south as historic flows appear to be minimal and are maintained by an existing flowline in Larch Road on the south boundary of the property that runs west to east to Topaz avenue where it then crosses Topaz and dissipates to the east.

Rainfall and Soil Data:

A runoff calculation using the Rational Method was performed using the San Bernardino County Hydrology Manual and Civil Design Hydrology Software. Rainfall data was obtained from the NOAA Atlas 14 Version 6 PF server. The hydrologic soils data was obtained from the USDA Natural Resources Conservation Service. The soil map identified the material in the watershed to be Hesperia Loamy Fine Sand with a hydrologic soils group classification of Type A. See Soil Map and soil classification herein. The watershed was considered developed per the zoning map. Using the information from these sources, the Rational Method was used to determine the runoff from the sub-watersheds of the catchment area.

A review of the NOAA 14 Point Precipitation Point Frequency data at a Latitude of 34.3892 and Longitude of -117.3559 for the 2-year, 10-year, 25year, and 100-year storms is as follow:

2-year 24hour Storm (inches): 2.18
10-year 24hour Storm (inches): 3.68
25-year 24hour Storm (inches): 4.64
100-year 24hour Storm (inches): 6.21

Runoff Calculations:

For the onsite pre-development runoff rate determination, a rational analysis a of the undeveloped DMA-1 was performed considering the pre-subdivided site conditions, rainfall and soil data. An SCS number was assigned based upon the storm event year and coinciding AMC value. The tabulated results below in each table show the pre-development runoff rates and estimated post developed run-off volumes generated for the project site for a 2-year, 10-year, 25-year and 100-year storm event. Post developed run-off volumes are based on assumed impervious area of 6,000 sf for each parcel.

Table 1-A

DMA 1						
Event	Q peak (cfs)	SCS	Soil	Ac.	Ap	Estimated 24hr Post Developed Run-off Volume (cf) Increase
2yr storm	0.000	32	A	5.0	1.0	558
10yr storm	2.001	32	A	5.0	1.0	3,430
25yr storm	3.644	32	A	5.0	1.0	4,397
100yr storm	7.149	32	A	5.0	1.0	4,571

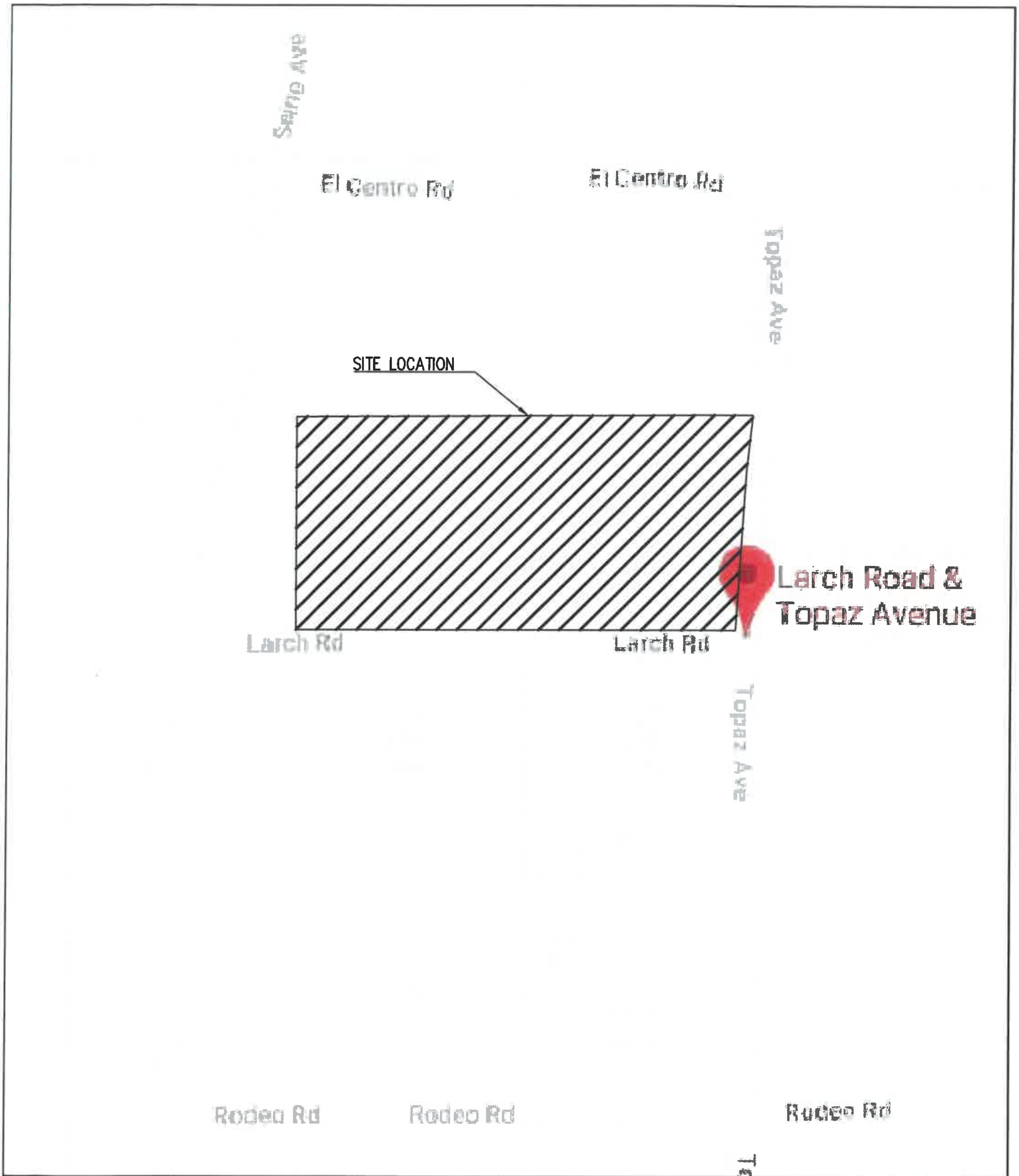
The results in Tables 1-A show the estimated amounts of runoff discharging from the site as shown in Exhibit 1 for the pre-subdivided condition from the parcel. This runoff currently follows flow paths historic in nature and will continue at this time as no grading is being proposed.

Conclusion/Recommendations:

This project site (APN: 0405-382-06) is not impacted by off-site runoff. Subdivision of the land will have no downstream impacts as is currently proposed. If residential development occurs on the subject parcels in the future the storm water runoff may be mitigated by engineered grading, flowlines, swales, and infiltration basin BMP's.

Timothy Stark, PE

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY ALAN STARK
4/5/18
C76523
Exp. 12-31-18
CIVIL
STATE OF CALIFORNIA



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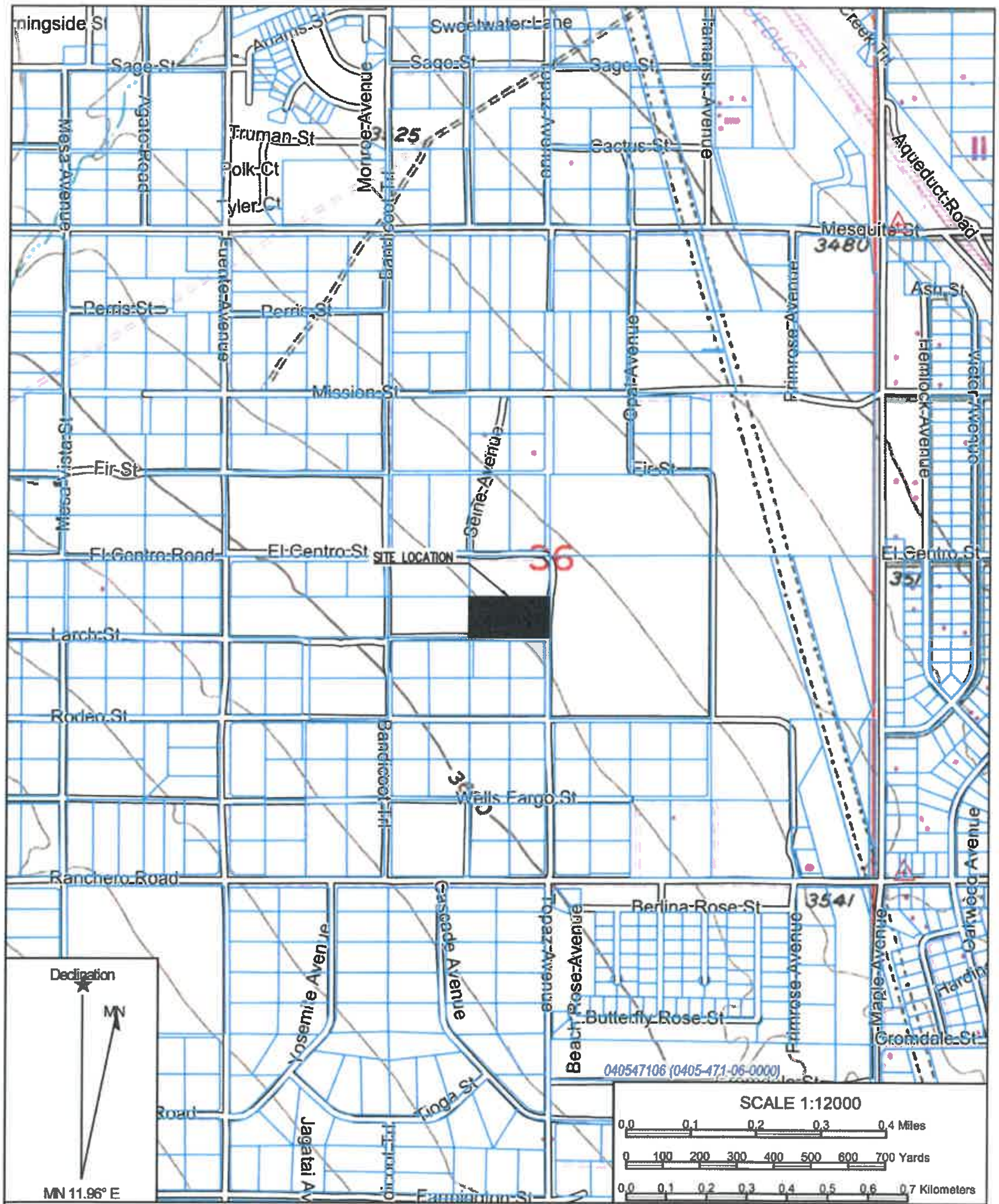
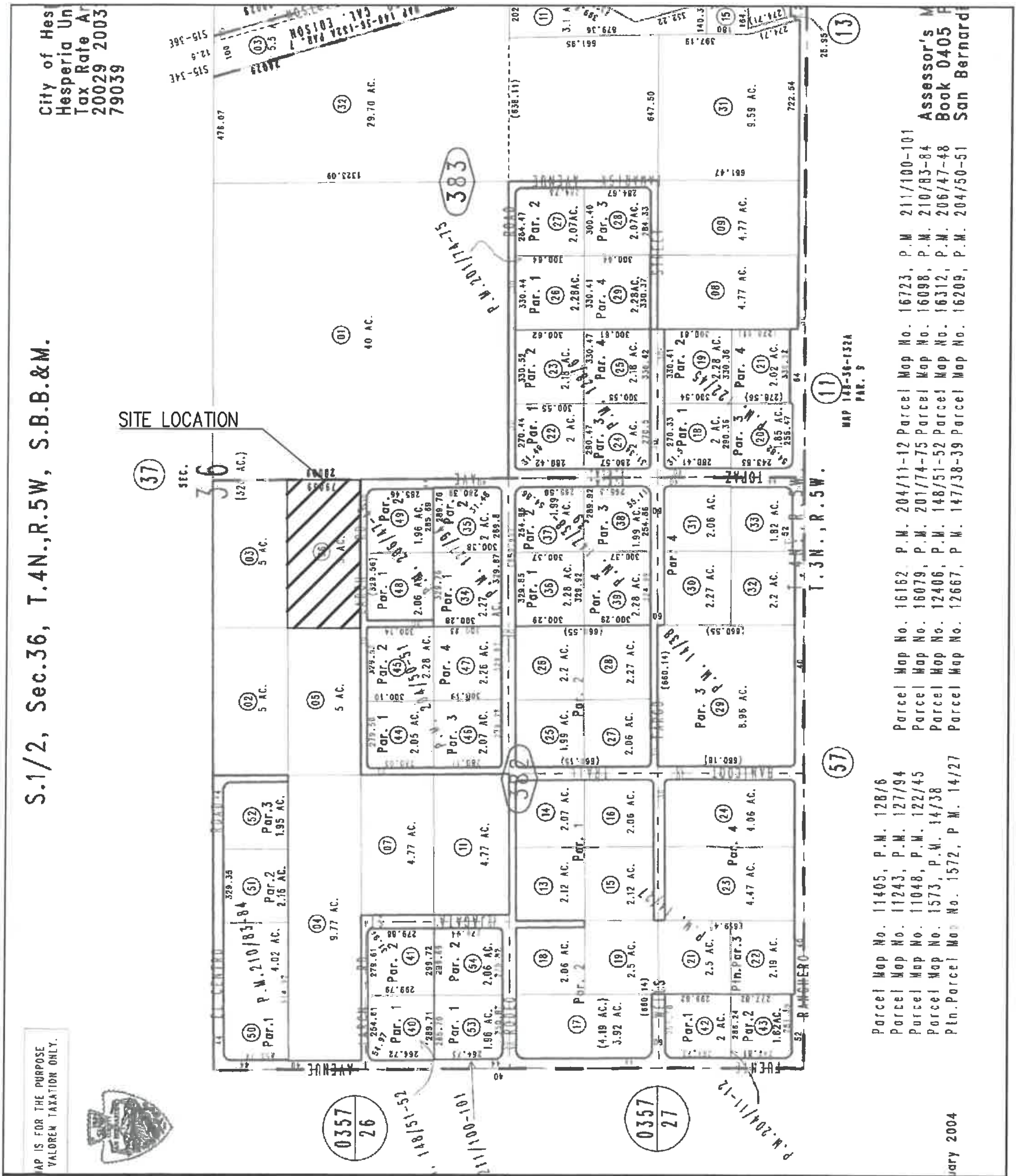
VICINITY MAP NOT TO SCALE	
APN 0405-382-06	MAP - 1
2017.0149	



Name: HESPERIA
Date: 12/05/17
Scale: 1 inch = 1,000 ft.

Location: 034° 23' 21.3765" N, 117° 21' 20.2842" W
APN: 0405-382-06

CUBIT ENGINEERING 16490 WALNUT STREET, SUITE B-3 HESPERIA, CA 92345 (760) 244-2247 LAND SURVEYING | CIVIL ENGINEERING | CONSTRUCTION cubitengineering.com	TOPOGRAPHIC MAP NOT TO SCALE	
	APN 0405-382-06	MAP - 2
	2017.0149	



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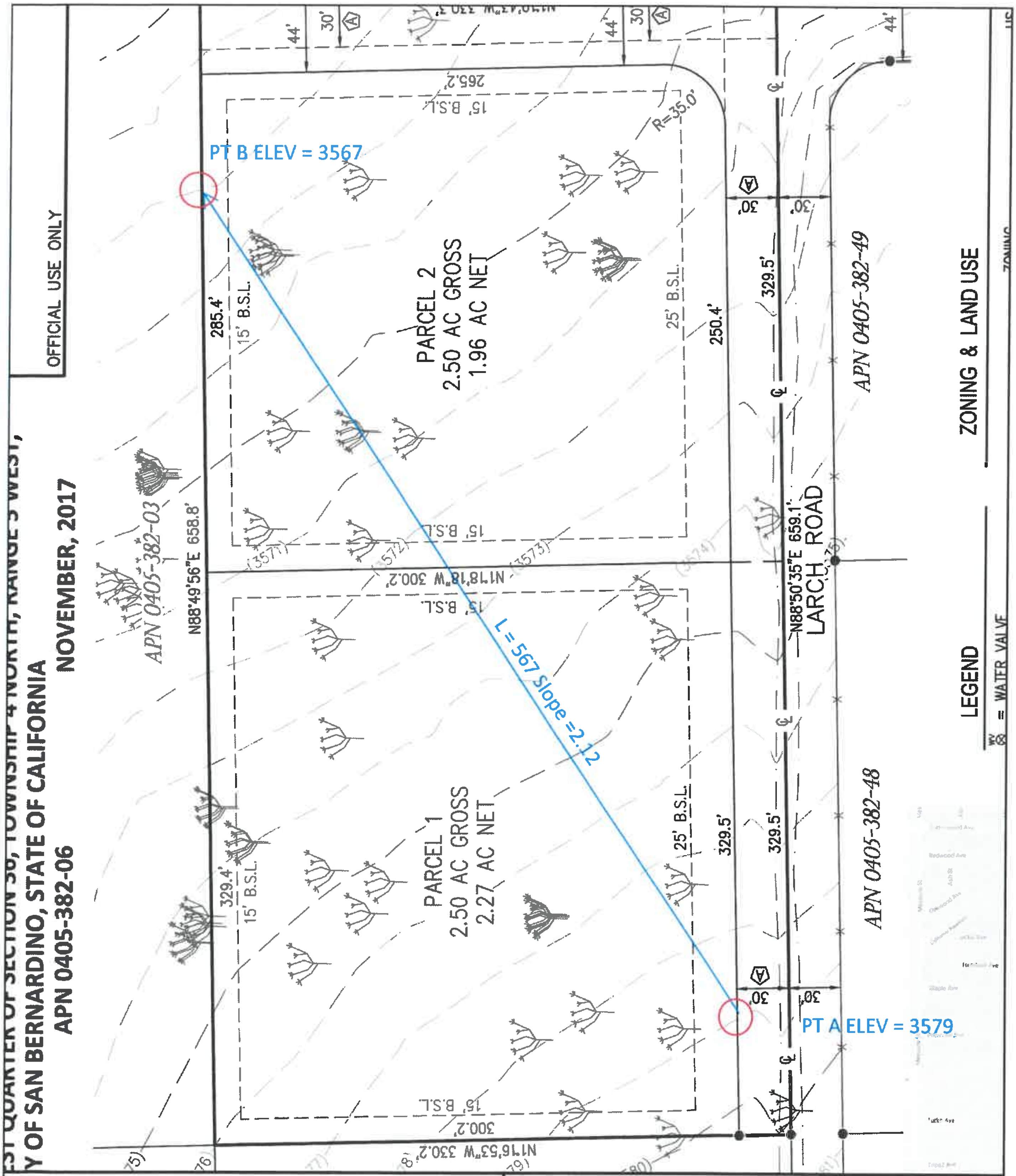
ASSESSOR'S MAP NOT TO SCALE	
APN 0405-382-06	MAP - 3
2017.0149	



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SITE PLANS
NOT TO SCALE

APN 0405-382-06

2017.0149

MAP - 4

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 7.0
Rational Hydrology Study Date: 04/05/18

Cubit Engineering
Rational Method
10yr Undeveloped
2017.0149

Program License Serial Number 4057

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.792 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.978(In/Hr)
Initial subarea data:
Initial area flow distance = 567.000(Ft.)
Top (of initial area) elevation = 3579.000(Ft.)
Bottom (of initial area) elevation = 3567.000(Ft.)
Difference in elevation = 12.000(Ft.)
Slope = 0.02116 s(%)= 2.12
TC = k(0.950)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 25.944 min.
Rainfall intensity = 1.424(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.282
Subarea runoff = 2.009(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.978(In/Hr)
End of computations, Total Study Area = 5.00 (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 = 32.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2004 Version 7.0
Rational Hydrology Study Date: 04/05/18

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------------------------------------------------------------------------
Cubit Engineering
Rational Method
25yr Undeveloped
2017.0149
------------------------------------------------------------------------


Program License Serial Number 4057

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

------------------------------------------------------------------------
Rational hydrology study storm event year is    25.0
Computed rainfall intensity:
Storm year =    25.00   1 hour rainfall =     0.994 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.978(In/Hr)
Initial subarea data:
Initial area flow distance =   567.000(Ft.)
Top (of initial area) elevation =  3579.000(Ft.)
Bottom (of initial area) elevation =  3567.000(Ft.)
Difference in elevation =    12.000(Ft.)
Slope =    0.02116  s(%)=       2.12
TC = k(0.950)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   25.944 min.
Rainfall intensity =      1.788(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.408
Subarea runoff =      3.644(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.978(In/Hr)
End of computations, Total Study Area =            5.00 (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 =  32.0
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                         20170149 100yrUnd.out

          San Bernardino County Rational Hydrology Program

               (Hydrology Manual Date - August 1986)

 CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2004 Version 7.0
       Rational Hydrology Study        Date: 04/05/18
------------------------------------------------------------------------
Cubit Engineering
Rational Method
100yr Undeveloped
2017.0149
------------------------------------------------------------------------


Program License Serial Number 4057

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

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =     1.320 (In.)
Slope used for rainfall intensity curve b =  0.7000
Soil antecedent moisture condition (AMC) = 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000(Ft.) to Point/Station       2.000(Ft.)
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.785(In/Hr)
Initial subarea data:
Initial area flow distance =   567.000(Ft.)
Top (of initial area) elevation =  3579.000(Ft.)
Bottom (of initial area) elevation =  3567.000(Ft.)
Difference in elevation =    12.000(Ft.)
Slope =    0.02116  s(%)=       2.12
TC = k(0.950)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   25.944 min.
Rainfall intensity =      2.374(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.602
Subarea runoff =      7.149(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.785(In/Hr)
End of computations, Total Study Area =            5.00 (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 =  32.0
```

NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.3892°, Longitude: -117.3559°
Elevation: 3578.59 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.092 (0.076-0.112)	0.128 (0.106-0.156)	0.176 (0.145-0.216)	0.216 (0.176-0.267)	0.271 (0.214-0.346)	0.314 (0.243-0.409)	0.358 (0.271-0.479)	0.405 (0.297-0.557)	0.469 (0.331-0.673)	0.520 (0.354-0.772)
10-min	0.132 (0.109-0.161)	0.183 (0.152-0.224)	0.252 (0.208-0.309)	0.309 (0.253-0.382)	0.388 (0.307-0.496)	0.450 (0.348-0.587)	0.514 (0.388-0.687)	0.580 (0.426-0.798)	0.673 (0.474-0.964)	0.745 (0.507-1.11)
15-min	0.159 (0.132-0.194)	0.222 (0.183-0.271)	0.305 (0.252-0.374)	0.374 (0.306-0.462)	0.469 (0.371-0.599)	0.544 (0.421-0.710)	0.621 (0.469-0.831)	0.702 (0.516-0.965)	0.813 (0.573-1.17)	0.901 (0.613-1.34)
30-min	0.238 (0.197-0.290)	0.331 (0.274-0.405)	0.456 (0.376-0.558)	0.558 (0.457-0.690)	0.701 (0.554-0.895)	0.812 (0.629-1.06)	0.927 (0.701-1.24)	1.05 (0.770-1.44)	1.21 (0.855-1.74)	1.35 (0.916-2.00)
60-min	0.337 (0.279-0.412)	0.470 (0.388-0.574)	0.646 (0.533-0.791)	0.792 (0.648-0.978)	0.994 (0.786-1.27)	1.15 (0.892-1.50)	1.32 (0.994-1.76)	1.49 (1.09-2.04)	1.72 (1.21-2.47)	1.91 (1.30-2.83)
2-hr	0.498 (0.412-0.608)	0.667 (0.552-0.815)	0.895 (0.738-1.10)	1.08 (0.887-1.34)	1.35 (1.07-1.72)	1.56 (1.21-2.03)	1.78 (1.34-2.37)	2.01 (1.47-2.76)	2.32 (1.64-3.33)	2.58 (1.75-3.82)
3-hr	0.626 (0.518-0.764)	0.828 (0.685-1.01)	1.10 (0.907-1.35)	1.33 (1.09-1.64)	1.65 (1.30-2.11)	1.90 (1.47-2.48)	2.17 (1.64-2.90)	2.45 (1.80-3.36)	2.84 (2.00-4.07)	3.15 (2.14-4.68)
6-hr	0.895 (0.741-1.09)	1.17 (0.971-1.43)	1.55 (1.28-1.90)	1.87 (1.53-2.31)	2.32 (1.83-2.96)	2.67 (2.07-3.49)	3.05 (2.30-4.08)	3.45 (2.53-4.74)	4.01 (2.83-5.75)	4.47 (3.04-6.63)
12-hr	1.18 (0.973-1.43)	1.58 (1.30-1.93)	2.12 (1.75-2.60)	2.58 (2.11-3.18)	3.22 (2.54-4.11)	3.72 (2.88-4.86)	4.26 (3.22-5.69)	4.83 (3.55-6.64)	5.63 (3.97-8.07)	6.28 (4.27-9.31)
24-hr	1.58 (1.40-1.82)	2.18 (1.93-2.52)	3.00 (2.65-3.47)	3.68 (3.23-4.29)	4.64 (3.93-5.59)	5.41 (4.49-6.65)	6.21 (5.03-7.82)	7.06 (5.56-9.14)	8.26 (6.24-11.1)	9.23 (6.74-12.9)
2-day	1.85 (1.64-2.13)	2.58 (2.28-2.97)	3.57 (3.15-4.13)	4.42 (3.87-5.15)	5.62 (4.76-6.77)	6.59 (5.47-8.10)	7.62 (6.17-9.60)	8.73 (6.88-11.3)	10.3 (7.79-13.9)	11.6 (8.48-16.2)
3-day	1.98 (1.76-2.28)	2.77 (2.45-3.19)	3.86 (3.41-4.46)	4.79 (4.20-5.59)	6.13 (5.20-7.39)	7.23 (6.00-8.88)	8.39 (6.80-10.6)	9.66 (7.61-12.5)	11.5 (8.68-15.5)	13.0 (9.49-18.1)
4-day	2.13 (1.89-2.46)	2.99 (2.65-3.44)	4.17 (3.69-4.83)	5.19 (4.55-6.05)	6.66 (5.64-8.02)	7.86 (6.52-9.66)	9.15 (7.41-11.5)	10.5 (8.31-13.7)	12.6 (9.50-17.0)	14.2 (10.4-19.9)
7-day	2.39 (2.12-2.75)	3.35 (2.96-3.86)	4.67 (4.12-5.40)	5.81 (5.09-6.77)	7.45 (6.31-8.97)	8.79 (7.30-10.8)	10.2 (8.29-12.9)	11.8 (9.29-15.3)	14.0 (10.6-19.0)	15.9 (11.6-22.2)
10-day	2.56 (2.27-2.95)	3.58 (3.17-4.12)	4.99 (4.40-5.77)	6.20 (5.43-7.23)	7.95 (6.74-9.58)	9.38 (7.79-11.5)	10.9 (8.84-13.7)	12.6 (9.91-16.3)	15.0 (11.3-20.2)	17.0 (12.4-23.7)
20-day	3.05 (2.70-3.51)	4.28 (3.79-4.93)	5.98 (5.28-6.91)	7.45 (6.52-8.68)	9.56 (8.10-11.5)	11.3 (9.38-13.9)	13.2 (10.7-16.6)	15.2 (12.0-19.7)	18.1 (13.7-24.4)	20.5 (15.0-28.7)
30-day	3.59 (3.18-4.13)	5.02 (4.44-5.78)	7.00 (6.18-8.09)	8.72 (7.63-10.2)	11.2 (9.49-13.5)	13.2 (11.0-16.3)	15.4 (12.5-19.4)	17.8 (14.0-23.1)	21.3 (16.1-28.7)	24.1 (17.6-33.7)
45-day	4.28 (3.79-4.92)	5.92 (5.24-6.83)	8.22 (7.26-9.50)	10.2 (8.94-11.9)	13.1 (11.1-15.8)	15.5 (12.8-19.0)	18.0 (14.6-22.7)	20.8 (16.4-27.0)	24.9 (18.8-33.6)	28.3 (20.7-39.5)
60-day	4.90 (4.34-5.64)	6.69 (5.92-7.71)	9.18 (8.11-10.6)	11.3 (9.94-13.2)	14.5 (12.3-17.5)	17.1 (14.2-21.0)	19.9 (16.1-25.1)	23.0 (18.1-29.8)	27.5 (20.8-37.1)	31.3 (22.9-43.7)

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

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

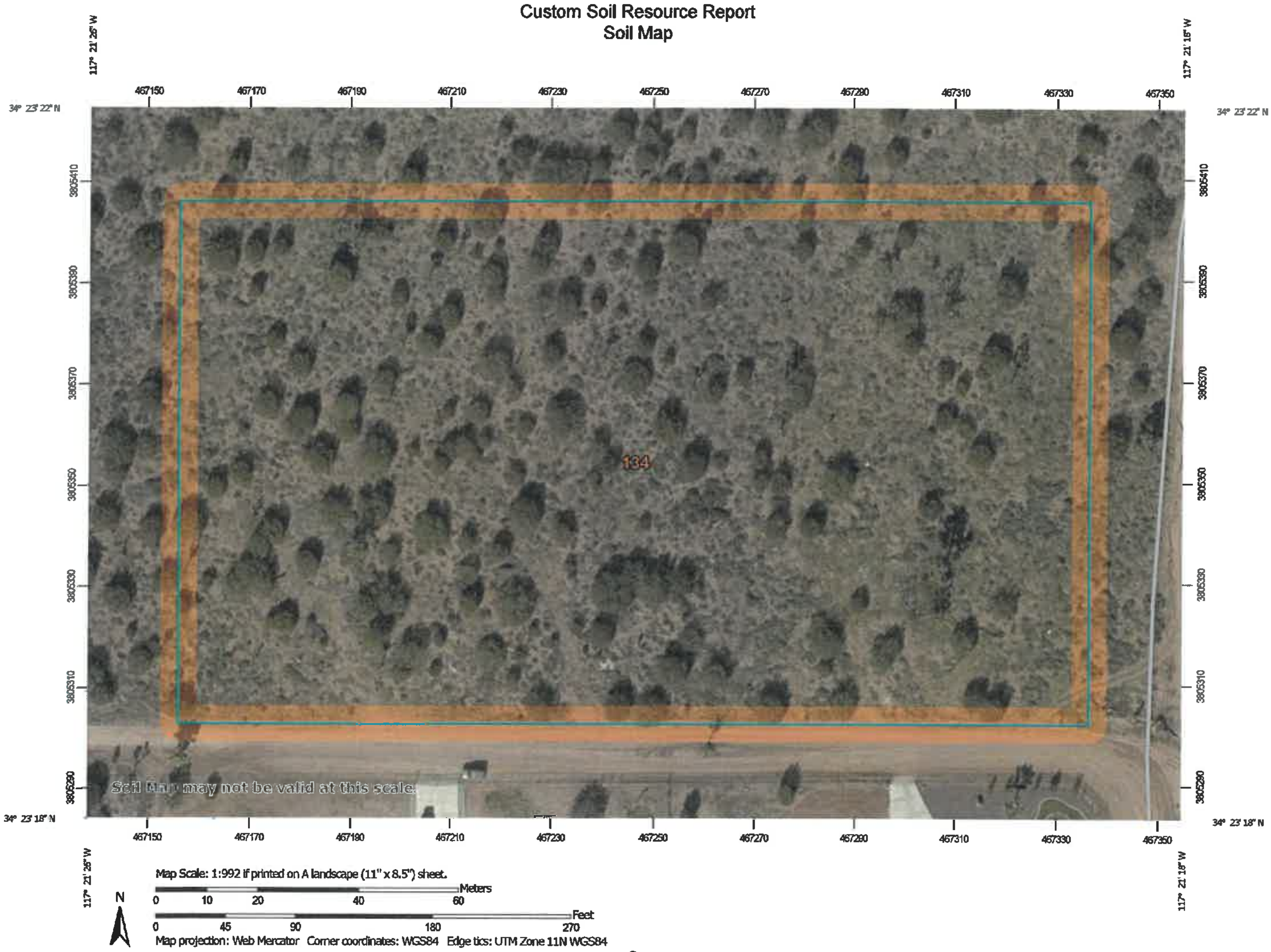
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


117° 21' 26" W
117° 21' 18" W
34° 23' 22" N
34° 23' 18" N
467150
467170
467190
467210
467230
467250
467270
467290
467310
467330
467350
3805410
3805390
3805370
3805350
3805330
3805310
3805290
134
Soil Map may not be valid at this scale.
Map Scale: 1:992 if printed on A landscape (11" x 8.5") sheet.
Meters
0 10 20 40 60
Feet
0 45 90 180 270
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

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

MAP LEGEND	MAP INFORMATION
	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
134	HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES	4.6	100.0%
Totals for Area of Interest		**4.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Bernardino County, California, Mojave River Area

134—HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hks7
Elevation: 200 to 4,000 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

Hesperia and similar soils: 85 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hesperia

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 sources

Typical profile

H1 - 0 to 6 inches: loamy fine sand
H2 - 6 to 60 inches: sandy loam, coarse sandy loam
H2 - 6 to 60 inches:

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
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: COARSE LOAMY (R030XE006CA)
Hydric soil rating: No

Minor Components

Cajon

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

Wrightwood

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

Bull trail

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

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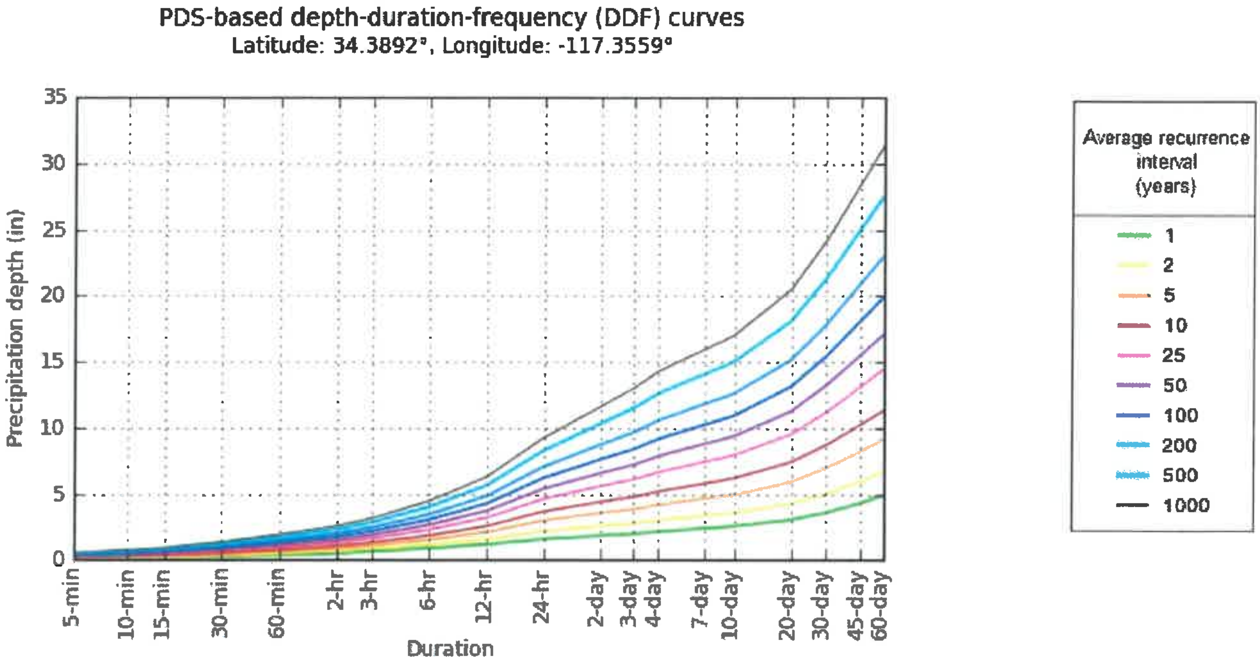
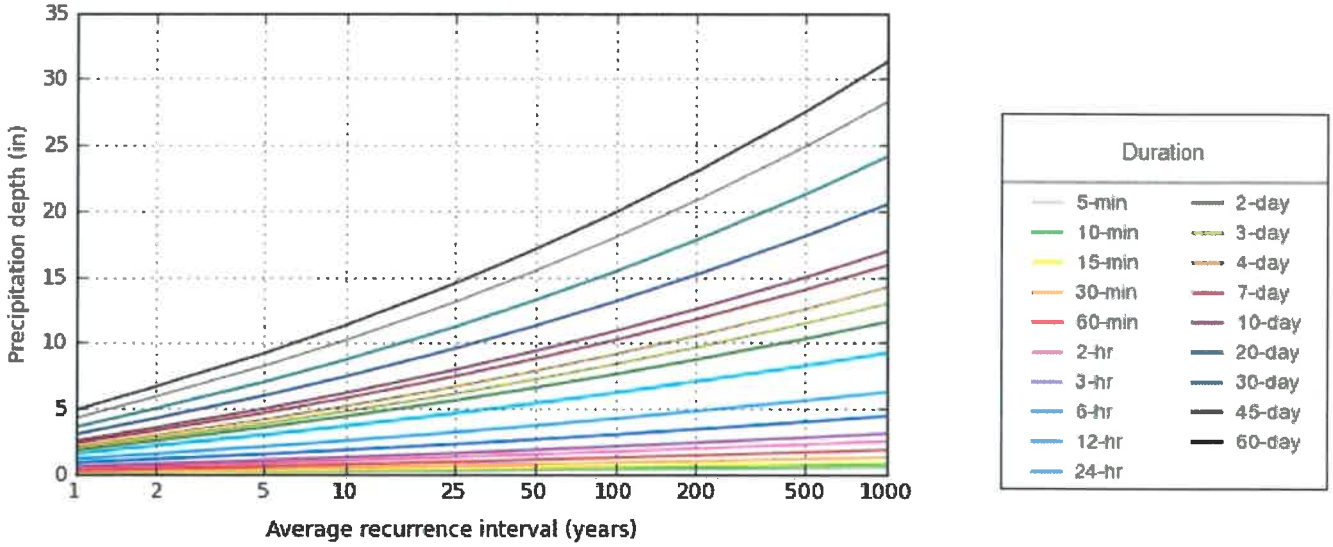




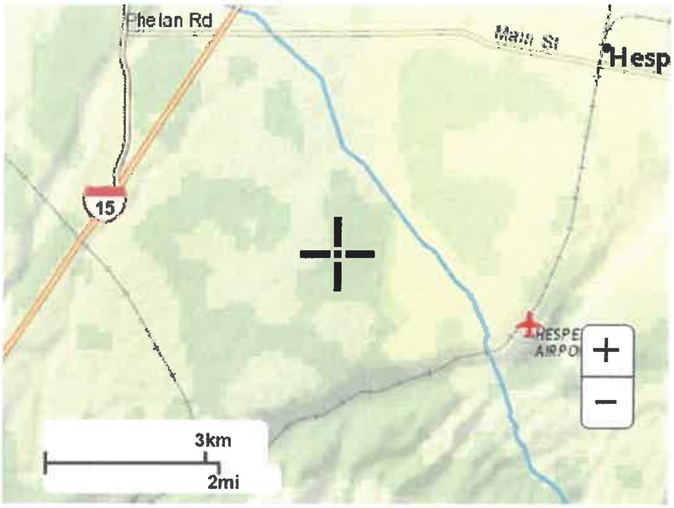
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Fri Apr 6 03:23:34 2018

Back to Top

Maps & aerials

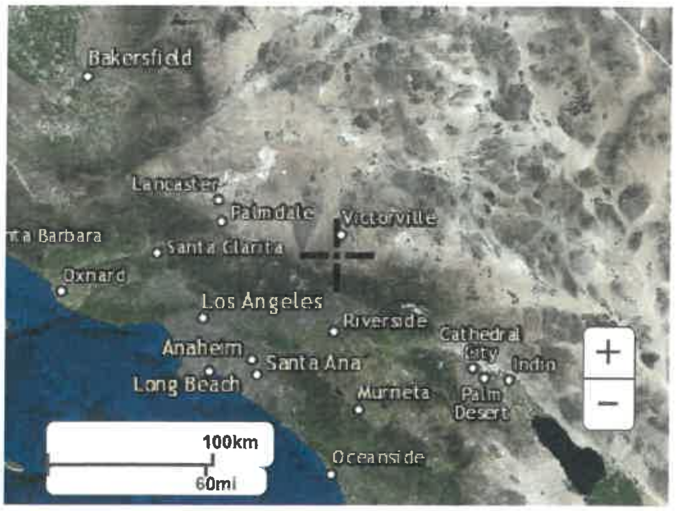
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



Back to Top

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