Appendix G
Part I

Preliminary Hydrology Study

FUSCOE
ENGINEERING

PRELIMINARY HYDROLOGY STUDY

SUNRISE SENIOR LIVING OF OCEANSIDE

4800 MESA DRIVE
OCEANSIDE, CA

Prepared For:

NORTH COUNTY COMMUNITY PARTNERS, LLC

Prepared By

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Date Prepared: June 2020

Job Number: 1571.003

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PRELIMINARY HYDROLOGY STUDY

FOR

Sunrise Senior Living of Oceanside

4700 Mesa Drive
City of Oceanside, California

Prepared For:

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June 8, 2020

Project No. 1571-003

TABLE OF CONTENTS

1. INTRODUCTION

This preliminary hydrology study has been prepared for the Sunrise Senior Living of Oceanside project. The project site is located at 4700 Mesa Drive in the City of Oceanside, County of San Diego, California.

The location of the site is illustrated on the Vicinity Map, Figure 1.

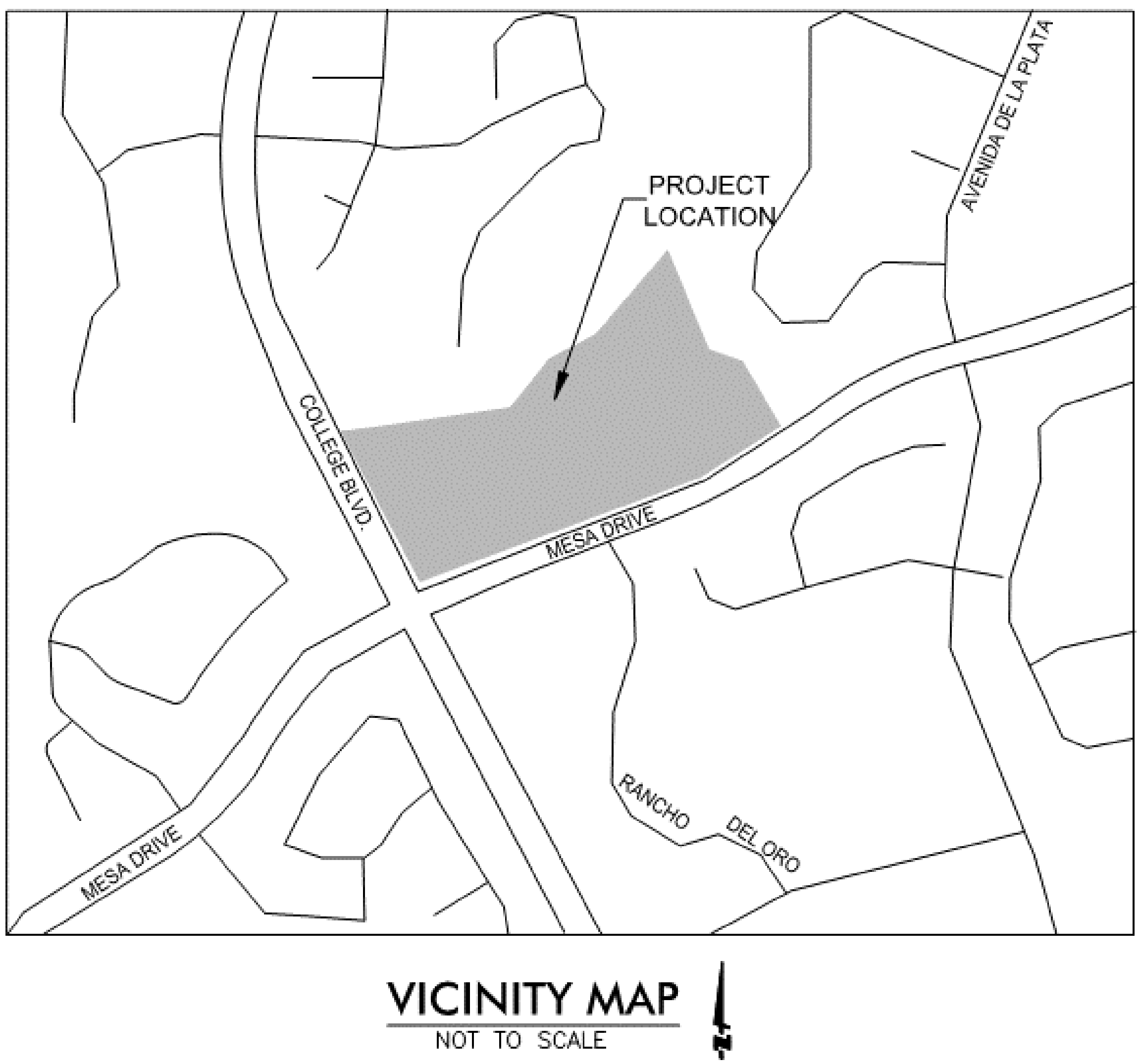


Figure 1 Vicinity Map

1.1 Project Description

The project consists of two areas, as follows:

- Sunrise of Oceanside Senior Living Facility
- West Parking Lot

Sunrise Senior Living proposes to construct a 2-story structure to be used for senior assisted living. The building will be approximately 76,000 square feet and will contain 95 dwelling units. The proposed development will also include walking paths, landscaping, and a memory garden. In addition, a parking lot with driveway access roadways are proposed at the westerly portion of the property.

The approximately 2.9-acre senior living facility site is located at the eastern side of 4700 Mesa Drive in Oceanside, CA. The proposed west parking lot construction is located near the western side of the property. The senior living facility site is legally described as Parcel "B" of Parcel Map No. 15691, in the City of Oceanside (See Appendix 1).

The property is bordered to the north, south, and east by residential properties. Immediately to the west of the proposed senior living facility, on the same property, is an existing church. This church occupies Lot "D" and a portion of Parcel "B" of Parcel Map No. 15691. The proposed parking lot will be within Lot "D", while the proposed senior living development will be constructed on and limited to Parcel "B."

Along the southern portion of Parcel "B," abutter's rights of ingress and egress to or from Mesa Drive have been dedicated or relinquished on Parcel Map No. 15691, except at the 50-foot driveway access opening.

Parcel Map No. 15691 (Draft) is included as Appendix 1

1.2 Existing Conditions

At the location of the proposed senior living facility, the area is relatively flat with a general directional flow of west to east. Along the southern edge of the property there is a landscaped slope down to Mesa Drive. A portion of this slope is collected via a concrete v-ditch that then curb drains out to Mesa Drive, with the remainder of the slope sheet flowing off-site. The northeastern edge of the property has a 2:1 landscaped slope down from the adjacent residential lots. The northwesterly portion of the senior living facility site currently drains westerly, toward an offsite slope/terrace-drain system.

A portion of the existing church parking lot drains toward the senior living facility site, and the new development will include openings to allow the parking lot drainage to continue, unimpeded.

At the location of the proposed west parking lot, the area is generally flat, and drains primarily toward Mesa Drive to the southeast, and College Boulevard to the west.

There is no apparent storm drain system within the proposed development portions of the property (other than a low-flow area drain pipe within the church area), and no public storm drain exists adjacent to the senior living facility within Mesa Drive. Most of the proposed development area consists of an earthen, graded area, with a driveway traversing around the senior living facility site.

1.3 Proposed Conditions

The proposed sites will be re-graded within the limits of the two development areas to accommodate a two-story building with associated walks and parking for the senior living facility, and a paved at-grade parking area with driveway access for the west parking lot area. The re-grading and development of the projects will result in the installation of a new private on-site storm drain system with detention, to collect and route stormwater runoff.

In the proposed condition, the main project site will generally maintain existing drainage patterns with all flows ultimately being routed to Mesa Drive. The proposed west parking lot area will continue to drain toward the westerly corner, draining to an existing City of Oceanside storm drain.

For the proposed senior living facility, stormwater runoff with be directed from the building to the surrounding parking and adjacent landscape areas before being collected in a proposed on-site storm drain system. The runoff will be routed to a stormwater treatment device and detention system before ultimately discharging onto Mesa Drive.

2. METHODOLOGY

For both the existing and proposed conditions, the peak storm discharge for drainage sub-areas were calculated using guidelines and information obtained from the San Diego County Hydrology Manual (SDCHM) – June 2003. A.E.S. Rational Method computer software was used to calculate the peak 10-year and 100-year storm events. CivilD (Bonadiman) software was used to calculate hydrographs and flood routing analyses to determine the required detention tank sizing for each site.

2.1 Soil Types

The soil type for the property was determined by evaluating the NRCS Web Soil Resource Report. The property includes Soil Types "C" and "D". The map from the Soil Resource Report was overlaid onto the hydrology map exhibits, to reflect the soil types for the various drainage subareas.

NRCS Soil Resource Report is included as Appendix 2

2.2 Runoff Coefficients

The SDCHM provides Table 3-1 for runoff coefficients either for impervious land or various types of land use. The following runoff coefficients are associated with this property:

- High Density Residential (HDR): Soil Type "C": C=0.78, Soil Type "D": C=0.79
- Landscaping and Natural Ground: Soil Type "C": C=0.30, Soil Type "D": C=0.35
- Commercial (Neighborhood Commercial): Soil Type "D": C=0.78, Soil Type "D": C=0.79

Table 3-1 "Runoff Coefficients" is included in Appendix 3 (SDCHM Reference Material)

2.3 Rational Method – Initial Time of Concentration Length

The initial time of concentration is based on sheet flow at the upstream end of a subarea. The SDCHM includes Table 3-2, which assists in the determination of maximum overland flow length and initial time of concentration (Ti). Table 3-2 provides limits of the length of the initial sheet flow to be used in hydrology studies. Initial length and Ti values are based on the average C values, along with gradient (slope) along the flowpath. Along with the table below, the AES program includes a check to ensures that the maximum initial time of concentration values are not exceeded.

Table 3-2 "Maximum Overland Flow Length & Initial Time of Concentration" from SDCHM is shown below as Figure 2.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

Figure 2 Table 3-2 from SDCHM

2.4 Rainfall Isopluvial Maps

Rainfall Isopluvial Maps were evaluated to determine the precipitation amounts for the various storm events and durations. The following precipitation values were obtained:

- 2-year P_6 = 1.4 inches
- 2-year P_{24} = 2.2 inches
- P_6/P_{24} = 64%

- 10-year P_6 = 2.0 inches
- 10-year P_{24} = 3.5 inches
- P_6/P_{24} = 57%

- 100-year P_6 = 2.8 inches
- 100-year P_{24} = 5.2 inches
- P_6/P_{24} = 54%

P_6 / P_{24} values are within the required range of 45% to 65%, as specified on page 3-7 of the SDCHM. Therefore, no adjustments to the 6-hour precipitation values are necessary.

The Rainfall Isopluvial Maps are included in Appendix 3 (SDCHM Reference Material)

3. FEMA

The property is located within FEMA Map No. 06073C0756H (effective 5/16/2012). Based on the FEMA Map, the project is located in Zone X, "Area of Minimal Flood Hazard". Since the site is not within a "Special Flood Hazard Area", a CLOMR/LOMR will not be required.

The site-specific FEMA Map is included in Appendix 4

4. CALCULATIONS/RESULTS

4.1 Pre & Post Development Peak Flow Comparison

Below are a series of tables which summarize the calculations for the existing and proposed hydrology conditions.

Existing Condition Peak Drainage Flow Rates

EXISTING MAIN SITE – 100-YR STORM			
Discharge Location	Time of Concentration (minutes)	Drainage Area (acres)	Q (Peak Discharge) CFS
Mesa Drive (node 15)	15.95	2.75	4.8
Westerly Boundary (node 21)	10.16	0.64	1.9
Total / Confluence	15.95	3.39	6.3 (Confluence)

EXISTING WEST PARKING LOT - 100YR STORM			
Discharge Location	Time of Concentration (minutes)	Drainage Area (acres)	Q (Peak Discharge) CFS
Onsite & Offsite (node 33)	10.97	2.07	3.3

Proposed Condition Peak Drainage Flow Rates

PROPOSED MAIN SITE – 100-YR STORM			
Discharge Location	Time of Concentration (minutes)	Drainage Area (acres)	Q (Peak Discharge) CFS
Onsite & Offsite (node 26)	8.62	3.39	13.6

PROPOSED WEST PARKING LOT - 100YR STORM			
Discharge Location	Time of Concentration (minutes)	Drainage Area (acres)	Q (Peak Discharge) CFS
Onsite & Offsite (node 32)	7.36	2.07	8.2

Flow Comparison & Detention Sizing

FLOW COMPARISON – 100-YR STORM				
LOCATION	EXISTING CONDITION (CFS)	PROPOSED CONDITION (CFS)	DIFFERENCE (CFS)	REQUIRED TANK SIZE (CF)
MAIN SITE / MESA DRIVE	4.8	13.6	8.8	24,000
WEST PARKING LOT	3.3	8.2	4.9	12,800

5. CONCLUSION

The proposed development will increase the amount of impervious surface areas on each of the two sites, which results in an increase of stormwater runoff, as compared to the existing condition. A detention tank has been sized for each site, to accommodate the peak flows, along with hydromodification mitigation. Proposed water quality basins will be designed and installed to handle storm treatment for water quality purposes. A detailed design and calculations for all proposed catch basins, concrete gutters, storm drain pipes, and water quality basins will be performed during the final engineering design phase after entitlement approval.

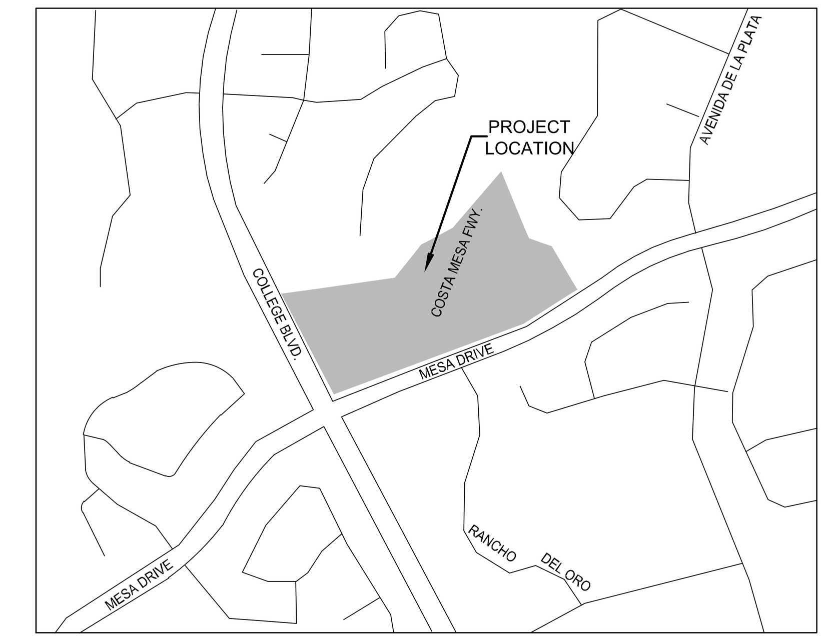
The hydrology analyses presented in this report evaluates and designs mitigations for the drainage impacts associated with the development of this project, and the calculations performed substantiate that the development can be constructed as shown on the proposed entitlement package with no detrimental effect to surrounding properties.

Appendix 1

Parcel Map No. 15691 (Draft)

TENTATIVE PARCEL MAP NO. XXXXXX

FOR PARCEL MERGER AND SUBDIVISION PURPOSES
IN THE CITY OCEANSIDE, SAN DIEGO COUNTY, STATE OF CALIFORNIA
4700 MESA DRIVE



VICINITY MAP
NOT TO SCALE

LEGEND AND ABBREVIATIONS:

- SUBJECT PROPERTY LINES
- CENTERLINES
- NO ACCESS
- ADJACENT PROPERTY LINES
- PROPOSED PARCEL LINE
- PROPOSED BUILDING LIMITS

LEGAL DESCRIPTION:

PARCEL "B" OF PARCEL MAP NO. 15691, AS PER MAP FILED JUNE 2, 1989 AS FILE NO. 89-293782, AND AS CORRECTED BY CERTIFICATE OF CORRECTION RECORDED JUNE 19, 1989 AS FILE NO. 89-322376, BOTH OF OFFICIAL RECORDS, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

TITLE INFORMATION:

THE TITLE INFORMATION SHOWN HEREON IS PER COMMITMENT FOR TITLE INSURANCE (REPORT) ORDER NO. OSA-5998753, DATED SEPTEMBER 17, 2019, AS PREPARED BY FIRST AMERICAN TITLE COMPANY, CORONA, CA (TITLE OFFICER: HUGO TELLO, TELEPHONE: 951-256-5883). NO RESPONSIBILITY OF CONTENT, COMPLETENESS OR ACCURACY OF SAID REPORT IS ASSUMED BY THIS MAP OR THE SURVEYOR.

TITLE EXCEPTIONS:

ITEMS SHOWN AS ⟨1⟩ HAVE BEEN PLOTTED.

⟨12⟩ ABUTTER'S RIGHTS OF INGRESS AND EGRESS TO OR FROM MESA DRIVE HAVE BEEN DEDICATED OR RELINQUISHED ON PARCEL MAP NO. 15691, EXCEPT AT THE 50 FOOT DRIVEWAY ACCESS OPENING AS SHOWN ON THAT CERTAIN "CERTIFICATE OF CORRECTION" OF SAID PARCEL MAP RECORDED JUNE 19, 1989 AS INSTRUMENT NO. 89-322376, OF OFFICIAL RECORDS.

BASIS OF BEARINGS:

THE BEARINGS SHOWN HEREON ARE BASED THE ON THE CENTERLINE OF COLLEGE BOULEVARD SHOWN AS HAVING A BEARING OF NORTH 27°14'07" WEST ON MAP NO. 11409, AS FILED IN THE OFFICE OF THE COUNTY RECORDER.

SURVEYOR'S NOTES:

1) THE INDICATED DRIVEWAY NEAR THE EASTERLY LINE OF THE PROPERTY WHICH ACCESSES MESA DRIVE IS IN AN AREA WHERE ACCESS RIGHTS HAVE BEEN RELINQUISHED PER ITEM 12 OF THE REPORT.

2) THE INDICATED ELECTRIC VAULT AND ACCESSORY WALL ON THE SOUTHEASTERLY PROPERTY LINE DOES NOT HAVE AN EASEMENT LISTED WITHIN THE REPORT.

3) THE DIFFERENCES BETWEEN MEASURED DATA ON THE SURVEY AND THE LEGAL DESCRIPTION ARE DUE TO BASIS OF BEARINGS ORIENTATION, TOGETHER WITH THE VESTING DEED CONTROLLING CALLS TO SENIOR LINES. THE SENIOR LINES ARE PARAMOUNT TO BEARING AND DISTANCE CALLS IN DEEDS AND HAVE BEEN DETERMINED PURSUANT TO GOVERNING BOUNDARY LAW PRINCIPALS AND EVIDENCE FOR PROPER RETRACEMENT.

PARCEL AREA SUMMARY:

EXISTING:

	SQ FT	ACRES
LOT D:	297,767	6.84
PARCEL B:	322,369	7.40
TOTAL	620,136	14.24

PROPOSED:

	SQ FT	ACRES
LOT D:	297,767	6.84
PARCEL B:	194,255	4.46
PARCEL C:	128,262	2.94
TOTAL	620,284	14.24

EXISTING ZONING INFORMATION:

LOT D: PD-1(C) (PLANNED DEVELOPMENT DISTRICT)

PARCEL B: CL (LIMITED COMMERCIAL) AND OPEN SPACE

RECORD OWNER:

LIGHTHOUSE CHRISTIAN CHURCH OF OCEANSIDE, A CALIFORNIA NONPROFIT CORPORATION

ASSESSOR PARCEL NUMBER:

A PORTION OF 161-511-019

NO.	REVISIONS	APP'D.	DATE

PREPARED FOR:

North County Community Partners, LLC
300 S. HARBOR BLVD, STE. 808
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Name Date

REGISTERED PROFESSIONAL ENGINEER
BRITTANY ELIZABETH KNOTT
NO. C76502
CIVIL
STATE OF CALIFORNIA

TENTATIVE PARCEL MAP
NO. XXXXX
4700 MESA DRIVE
OCEANSIDE, CALIFORNIA

DRAWN:	AR
DESIGN:	AR
CHECKED:	BK
SCALE:	AS SHOWN
JOB NO.:	1571.003
DATE:	

SHEET 1 OF 1

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Appendix 2

Soil Resource Report

United States Department of Agriculture

NRCS

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 Diego County Area, California

Sunrise of Oceanside-2 sites

May 8, 2020

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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

Map Scale: 1:2,220 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

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 Diego County Area, California
Survey Area Data: Version 14, Sep 16, 2019

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

Date(s) aerial images were photographed: Nov 3, 2014—Feb 12, 2020

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
DaC	Diablo clay, 2 to 9 percent slopes	6.0	23.2%
DaD	Diablo clay, 9 to 15 percent slopes, warm MAAT	8.6	33.3%
DaE2	Diablo clay, 15 to 30 percent slopes, eroded, warm MAAT	7.3	28.2%
LeC2	Las Flores loamy fine sand, 5 to 9 percent slopes, eroded	3.7	14.4%
LeE2	Las Flores loamy fine sand, 15 to 30 percent slopes, eroded	0.2	0.9%
Totals for Area of Interest		**25.9**	**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 Diego County Area, California

DaC—Diablo clay, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbb8
Elevation: 30 to 3,000 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 320 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Diablo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous sandstone and shale

Typical profile

H1 - 0 to 15 inches: clay
H2 - 15 to 32 inches: clay, silty clay loam
H2 - 15 to 32 inches: weathered bedrock
H3 - 32 to 36 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 24 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 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
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 10 percent

Hydric soil rating: No

Linne

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

Olivenhain

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

DaD—Diablo clay, 9 to 15 percent slopes, warm MAAT

Map Unit Setting

National map unit symbol: 2w63f
Elevation: 110 to 910 feet
Mean annual precipitation: 11 to 21 inches
Mean annual air temperature: 58 to 64 degrees F
Frost-free period: 290 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Diablo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from calcareous shale

Typical profile

A - 0 to 15 inches: clay
Bkss1 - 15 to 28 inches: clay
Bkss2 - 28 to 40 inches: clay loam
Cr - 40 to 79 inches: bedrock

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 39 to 79 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent

Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: CLAYEY (1975) (R019XD001CA)
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Linne

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Olephant

Percent of map unit: 2 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

DaE2—Diablo clay, 15 to 30 percent slopes, eroded, warm MAAT

Map Unit Setting

National map unit symbol: 2w60s
Elevation: 890 to 2,260 feet
Mean annual precipitation: 11 to 27 inches
Mean annual air temperature: 60 to 65 degrees F
Frost-free period: 270 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Diablo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from calcareous shale

Typical profile

A - 0 to 15 inches: clay
Bkss1 - 15 to 28 inches: clay
Bkss2 - 28 to 40 inches: clay loam
Cr - 40 to 79 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 39 to 79 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: CLAYEY (1975) (R019XD001CA)
Hydric soil rating: No

Minor Components

Altamont

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Linne

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Olephant

Percent of map unit: 2 percent

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

LeC2—Las Flores loamy fine sand, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: hbd9
Elevation: 700 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 300 to 340 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Las Flores

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from siliceous calcareous sandstone

Typical profile

H1 - 0 to 14 inches: loamy fine sand
H2 - 14 to 22 inches: sandy clay, clay
H2 - 14 to 22 inches: sandy clay, clay
H3 - 22 to 38 inches: loamy coarse sand
H3 - 22 to 38 inches: weathered bedrock
H4 - 38 to 48 inches:
H5 - 48 to 52 inches:

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: About 14 inches to abrupt textural change; About 14 inches to natric; 40 to 60 inches to paralithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Sodium adsorption ratio, maximum in profile: 39.0
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: CLAYPAN (1975) (R019XD061CA)
Hydric soil rating: No

Minor Components

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

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

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

Unnamed, ponded
Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

LeE2—Las Flores loamy fine sand, 15 to 30 percent slopes, eroded

Map Unit Setting
National map unit symbol: hbdf
Elevation: 700 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 300 to 340 days
Farmland classification: Not prime farmland

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

Description of Las Flores

Setting
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Residuum weathered from siliceous calcareous sandstone

Typical profile

H1 - 0 to 14 inches: loamy fine sand
H2 - 14 to 22 inches: sandy clay, clay
H2 - 14 to 22 inches: sandy clay, clay
H3 - 22 to 38 inches: loamy coarse sand
H3 - 22 to 38 inches: weathered bedrock
H4 - 38 to 48 inches:
H5 - 48 to 52 inches:

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: About 14 inches to natric; About 14 inches to abrupt textural change; 40 to 60 inches to paralithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: CLAYPAN (1975) (R019XD061CA)
Hydric soil rating: No

Minor Components

Diablo

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

Huerhuero

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

Linne

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

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