FUSCOE ENGINEERING

HYDROMODIFICATION MANAGEMENT STUDY

NEWLAND SIERRA PDS2014-MPA-14-018

January 20, 2015

County of San Diego

prepared for:

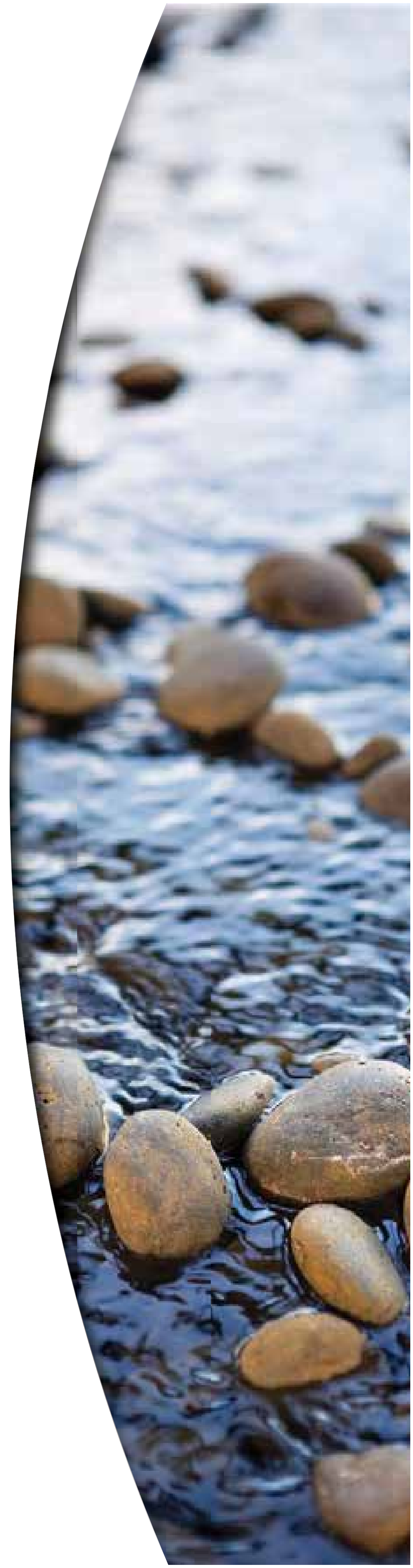
Newland Sierra
9820 Town Centre Drive, Suite 100
San Diego, CA 92021
858.455.7503

Fuscoe Engineering, Inc.
6390 Greenwich Drive, Suite 170
San Diego, California 92122
858.554.1500

www.fuscoe.com

Project Manager: Eric K. Armstrong, P.E.
Job # 02660-002-02

full circle thinking®



PRELIMINARY HYDROMODIFICATION MANAGEMENT STUDY

NEWLAND SIERRA

PDS2014-MPA-14-018

COUNTY OF SAN DIEGO, CA

Prepared By:

Kenneth T. Kozlik, PE RCE 71883 EXP: 12-31-15
Fuscoe Engineering, Inc.
6390 Greenwich Dr., Ste 170
San Diego, CA 92122

For

Newland Sierra, LLC
9820 Towne Center Drive, Suite 100
San Diego, CA 92121
858-455-7503

January 2015

TABLE OF CONTENTS

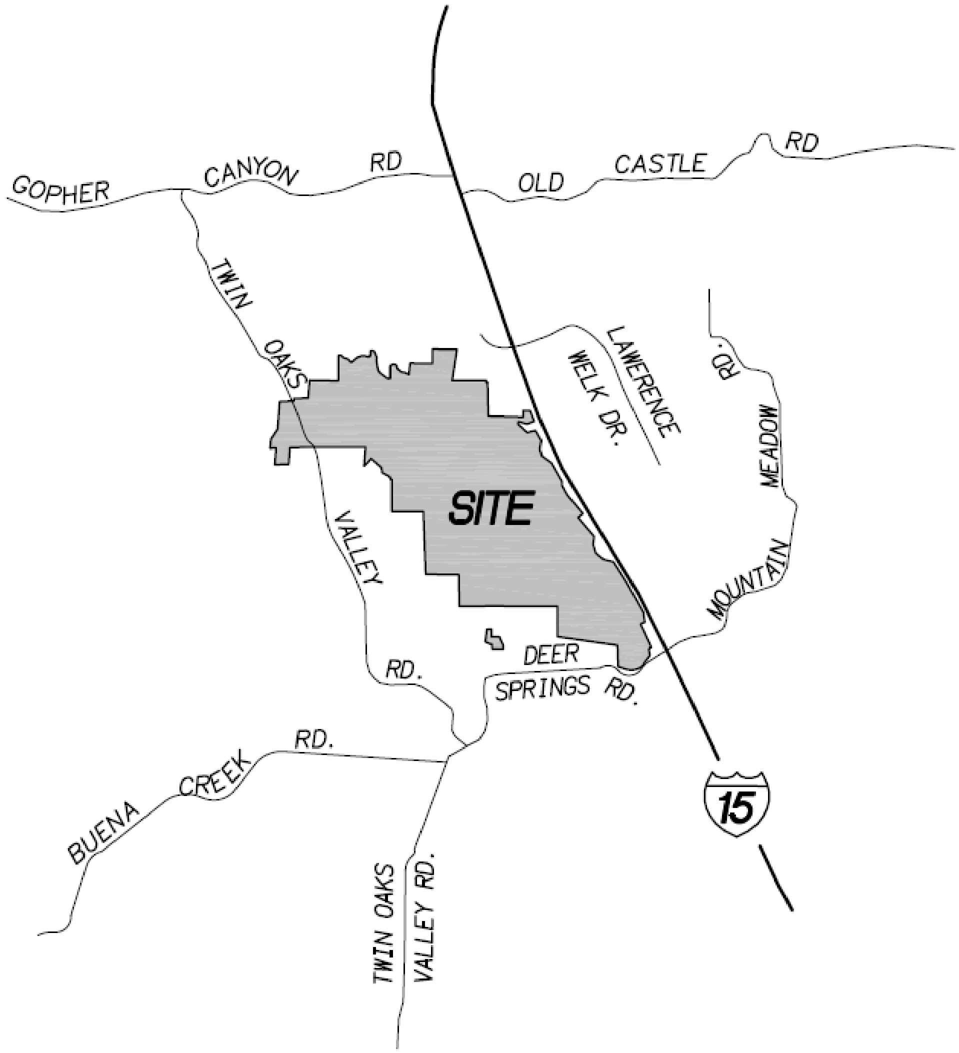


Figure 1 Vicinity Map

1.0 PROJECT DESCRIPTION

This Preliminary Hydromodification Management Study analyzes and proposes mitigation for the hydromodification impacts of the Newland Sierra project. This Study is required per the March 2011 Final Hydromodification Management Plan (HMP), the 2012 Edition of the County of San Diego's Standard Urban Stormwater Management Plan (SUSMP) and the 2007 San Diego Regional Water Quality Control Board's municipal stormwater NPDES permit to San Diego area municipal Copermitees. Although the municipal stormwater permit has been updated per Regional Water Quality Control Board Order Number R9-2013-001, per Provision E.3.d of that order, the project is subject to the requirements of the 2011 HMP and 2012 SUSMP until the County's BMP Design Manual update is complete. However, the hydromodification management strategy for Newland Sierra has been designed in anticipation of the forthcoming BMP Design Manual based on the requirement in Order Number R9-2013-001, since the project will likely not receive approval prior to the issuance of the BMP Design Manual.

The Newland Sierra Project proposes the development of a 1,985-acre mixed-use community within the unincorporated area of San Diego County. The proposed Specific Plan includes a residential component consisting of 2,135 dwelling units which equates to an overall density of 1.08 dwelling units per acre (du/ac) over the entire 1,985 acres. The Town Center also permits 81,000 square feet of general commercial uses as well as civic and park uses. The community also includes an active park system with public and private parks, public trails and a school site. The project site is bounded by Interstate 15 on the east, Deer Springs Road on the south, and Twin Oaks Valley Road on the west, with a small portion of the northwestern edge of the site traversed by Twin Oaks Valley Road. Gopher Canyon Road is located approximately 0.5 miles north of the site.

The project will include a network of public roads providing access to the various proposed neighborhoods. The two primary access points to the project will be from Deer Springs Road at Mesa Rock Road on the east and Sarver Lane on the west. Secondary access will also be provided to North Twin Oaks Valley Road via Camino Mayor. The existing site is undeveloped.

2.0 SITE INFORMATION

The following sections summarize the site conditions which relate to drainage and hydromodification, including the geotechnical conditions, drainage context, and the channel screening analysis.

2.1 GEOTECHNICAL CONDITIONS

To determine the soil types present on the project site, Natural Resources Conservation Service (NRCS) data was utilized. As can be seen in the Custom Soil Resource Report included in Appendix 1, a number of different soils types are present. The most pervasive soil type is Acid Igneous Rock Land, which makes up nearly 50% of the site. Most of the rest of the site is composed of rocky sandy loams of various classifications, with less than 3% of the site being sandy loam. These soil classifications are indicative of the mountainous nature of the site which is characterized by shallow bed rocks, steep slopes, and presence of cobble and boulders.

A hydrologic soil group analysis was performed using the NRCS soils data described above. Hydrologic soil groups A, C, and D are present onsite. The majority of the soil types belong to soil group D (93.0% of site), followed by group C (5.5%) and group A (1.5%).

San Diego County soils data was also consulted to determine the hydrologic soils groups used in this analysis. Soils data available from SanGIS was used in conjunction with the County of San Diego Hydrology Manual Soil Hydrologic Groups map and the San Diego County Soils Interpretation Study Hydrologic Soil Groups map. These sources listed some of the onsite soils as belonging to different hydrologic soils groups than the NRCS data. In fact, these County sources identify a large area of group B soils. Since these sources have been prepared and approved by the County, local San Diego County hydrologic soil group mapping is used for the purposes of this study instead of the NRCS data. Please refer to the Hydrologic Soil Group Exhibit in Appendix 1 for the soil groups used for this study.

2.2 DRAINAGE CONTEXT

The Newland Sierra project is nestled along a mountain range. As such, the site is split into several major drainage basins as creeks and tributaries originate at the high points of the range and course down the slopes. The Preliminary Drainage Study for Newland Sierra divides the project into five major drainage basins, which are tributary to three different watersheds. The watersheds include the South Fork of Moosa Canyon, San Marcos Creek, and the South Fork of Gopher Canyon. A further description of the major drainage basins for the project is given below. Please refer to the Existing Major Watersheds Exhibit in Appendix 2 as well.

The South Fork Moosa Canyon watershed is designated Basin A, and drains to the East toward Highway I-15. This watershed consists of 879 acres within the project boundary and a total of 1,265 acres for the entire

South Fork Moosa Canyon. Under existing conditions, flow is conveyed to the east through natural valleys and channels to Highway I-15. Project subbasins discharge under Highway I-15 through multiple culverts and storm drain systems. Under existing conditions, Basin A conveys a calculated maximum runoff rate (Q) of 983 cfs toward the east.

The portion of the analysis area draining to San Marcos Creek is divided into two project basins, Basin B and Basin C. Runoff from Basins B and C flows south to Deer Springs Road, where it is conveyed under the roadway through multiple culverts and channels. This watershed consists of 696 acres within the project boundary and total of 1170 acres for the San Marcos Creek watershed. The maximum runoff rate (Q) for existing conditions is 1528 cfs draining to the southwest into San Marcos Creek.

The portion of the analysis area draining to South Fork Gopher Canyon is also divided into two basins, Basin D and Basin E. Runoff from Basins D and E flows northwest toward Twin Oaks Valley Road. This watershed consists of 340 acres within the project boundary and a total of 713 acres within the area of analysis. The maximum runoff rate (Q) for existing conditions for this area is 1092 cfs.

Under developed conditions, the existing basin boundaries will be modified where there is development along the dividing line between basins. However, the grading and drainage system has been carefully designed to preserve the overall drainage patterns and the total area draining to each major basin. This will minimize impacts to the receiving watersheds by ensuring there is no net diversion between the watersheds. Please refer to the Proposed Major Watersheds and Existing and Proposed Drainage Basins exhibits in Appendix 2.

2.3 CHANNEL SCREENING ANALYSIS

Per the HMP, a channel screening analysis may be performed on the receiving channels to determine the susceptibility of the channels to erosion. The channel screening analysis can be used to determine the low-flow threshold for hydromodification mitigation- $0.1Q_2$ for high susceptibility channels, $0.3Q_2$ for medium susceptibility channels, and $0.5Q_2$ for low susceptibility channels. A channel screening analysis, entitled *Hydromodification Screening for Newland Sierra*, has been prepared for the project by Chang Consultants, and is included for reference in Appendix 3.

The channel screening analysis must be performed beginning at the project's Point of Compliance (POC), or the location at which the project discharges to a natural, unlined channel. Due to the topography of the Newland Sierra site, the project has 24 POCs. The POC locations and the courses of their receiving channels are shown on the Point of Compliance Exhibit included in Appendix 3. The POCs have been named by the corresponding hydrology node given in the Preliminary Drainage Study.

Due to the large number of POCs for the project and the fact that many of the receiving channels display similar characteristics, not all of the POCs were analyzed in the *Hydromodification Screening for Newland Sierra* by Chang Consultants. A full channel assessment was performed on a representative sample of 6 POC's. These POCs are identified on Point of Compliance Exhibit. These POCs and their associated receiving channels were chosen for analysis due to either their similarity to other channels which would likely have similar results from a channel assessment, or their unique characteristics which warranted a unique study. The table below lists the POCs which were analyzed, the major basin in which they are located, their dominant characteristics, and the erosion susceptibility determined in the *Hydromodification Screening for Newland Sierra*, and the resulting low-flow threshold.

POC	Major Basin	Characteristics	Erosion Susceptibility	Low-Flow Threshold
1064	A	Steep hillside drainage leading into major canyon which accepts runoff from several other POCs in Major Basin A. Representative POC for steep	Low	$0.5Q_2$

		hillside canyons draining to the east.		
2100	B	Deer Springs Creek, which accepts runoff from a portion of the Town Center and Deer Springs Road. Unique POC.	Low	$0.5Q_2$
2101	B	Minor drainage in an area of moderate slopes. Unique POC.	Medium	$0.3Q_2$
2380	B	Stevenson Creek, which accepts runoff from a large portion of the central area of the project. Unique POC.	Low	$0.5Q_2$
2786	C	Steep canyon draining to the northern end of Twin Oaks Valley Creek. Representative POC for steep hillside canyons draining to the west.	Low	$0.5Q_2$
2810	D	Canyon along North Twin Oaks Valley Road that drains north to Gopher Canyon. Unique POC.	Low	$0.5Q_2$

Based on the assessed erosion susceptibility of the representative POCs analyzed, the results were extrapolated to the other POCs which were not analyzed. The POCs not analyzed would likely have similar results to the representative POCs due to the similarity in topography, soils conditions, and vegetation. The table below lists the assumed erosion susceptibility for each POC based on the representative POC which is most similar.

POC	Major Basin	Characteristics	Representative POC	Erosion Susceptibility	Low-Flow Threshold
1021	A	Steep hillside canyons draining to the east.	1064	Low	$0.5Q_2$
1053	A				
1073	A				
1083	A				
1088	A				
1112	A				
1304	A				
1329	A				
1341	A				
1349	A				
1603	A				
1905	A				
2000	A				
2199	B	Steep hillside canyons draining to the west.	2786	Low	$0.5Q_2$
2219	B				
2222	B				
245	C				
2915	D				

This representative approach to the low-flow threshold determination is believed to be an appropriate level of detail for the preliminary nature of this study. Upon final engineering, a complete channel screening analysis will be performed for all project POCs.

3.0 METHODOLOGY

The hydromodification analysis for Newland Sierra has been performed in accordance with the Final Hydromodification Management Plan, dated March 2011 and utilizes the County's BMP Sizing Spreadsheet.

3.1 DRAINAGE MANAGEMENT STRATEGY

The drainage management strategy for Newland Sierra utilizes multifunction IMPs to provide water quality treatment, hydromodification mitigation, and peak detention for the developed portions of the site. Points of Compliance (POCs) have been identified where the proposed storm drain system will discharge to the surrounding natural drainage courses. If the project proposes to increase un-mitigated post-development flows to a POC, a storm water management Integrated Management Practice (IMP) was then designed to mitigate the impacts of the increase. The IMPs then discharge to the natural drainage courses. Where an IMP discharges to a natural drainage course, appropriately sized energy dissipation will be provided. Energy dissipation facilities will be sized at the time of final engineering.

To preserve the flow patterns of undisturbed areas upstream of developed areas, and to minimize required IMP sizes, a dual-pipe storm drain system will be utilized. A “clean” storm drain system will convey runoff from undisturbed areas and landscaped slopes, which are considered “self-treating”, as well as collect the treated discharge from the proposed IMPs. A separate “dirty” storm drain system will direct runoff from developed areas of the site to IMPs for treatment. Where possible, runoff from developed areas will be directed to IMPs via surface flow, but in larger Drainage Management Areas (DMAs) an underground “dirty” storm drain system will be required.

The IMP selected for the project is the flow-through planter (FTP). FTPs are preferred for their combination of a medium-to-high level of treatment for all pollutants and for their ability to provide hydromodification mitigation. FTPs are also a Low Impact Development (LID) feature, using natural processes to provide stormwater treatment and flow attenuation. Biofiltration is the primary treatment mechanism in FTPs, which is encouraged by R9-2013-001 and has been selected to assist the project in compliance with the forthcoming BMP Design Manual.

FTPs are preferred for the project over standard bioretention basins due to the geologic and topographical conditions of the project site. The project’s FTPs will be lined with an impermeable membrane to prevent infiltration of runoff into the soil below the IMP. Infiltration is not recommended on the project site due to the presence of shallow bedrock and steep slopes, both natural and manufactured. Per the NRCS Custom Soils Resource Report included in Appendix 1, the typical depth to bedrock on the site is 0”-60”, with only 2.6% of the site exhibiting soils that typically have bedrock at depths of 80” or greater. While some of the topsoils have been classified by the County as hydrologic soil groups B and C, any infiltration into the topsoil would soon encounter the underlying bedrock. Although there could be fissures in the bedrock which allow intrusion of water into the rock, it is likely that infiltrated water would move laterally along the surface of the bedrock, possibly emerging as seepage where the topsoil layer thins. This could cause instability of the project’s slopes, leading to long term maintenance and safety concerns. Therefore, FTPs with impermeable liners are the preferred biofiltration IMP for the project.

The proposed FTPs will be distributed throughout the site to provide water quality treatment and hydromodification mitigation near the source of runoff, consistent with a Low Impact Development approach to storm water management. The FTP basins have been integrated into the site design of the project where possible, or have been tucked into unobtrusive locations to minimize visual and grading impacts. The proposed road network will incorporate a series of roadside swales and trails in many of the main circulation roads and loop roads within the neighborhoods. In some neighborhoods where the street slope is shallow enough, FTPs will be incorporated into the roadside swales. To provide ponding within the roadside FTPs, check dams and driveway crossings will be utilized to take up grade allowing for a flat-bottomed area for biofiltration. The subdrain pipes for the roadside FTPs will be linked, with a flow-control orifice placed on the end of the subdrain pipe where it enters a downstream catch basin or clean out.

The IMPs have been designed in accordance with the July 2014 County of San Diego Low Impact Development Handbook. The proposed IMPs combine aspects of Bioretention Areas, Bioretention Swales, and Flow-Through Planters as described in Appendix A of the LID Handbook. The presence of impermeable liners will make the IMPs function most similarly to Flow-Through Planters located in the ground, so for the purposes of this study they are referred to as Flow-Through Planters. Please refer to the typical details of the proposed FTPs and roadside FTPs below. Further information and specifications for the FTPs is located in Appendix 4.

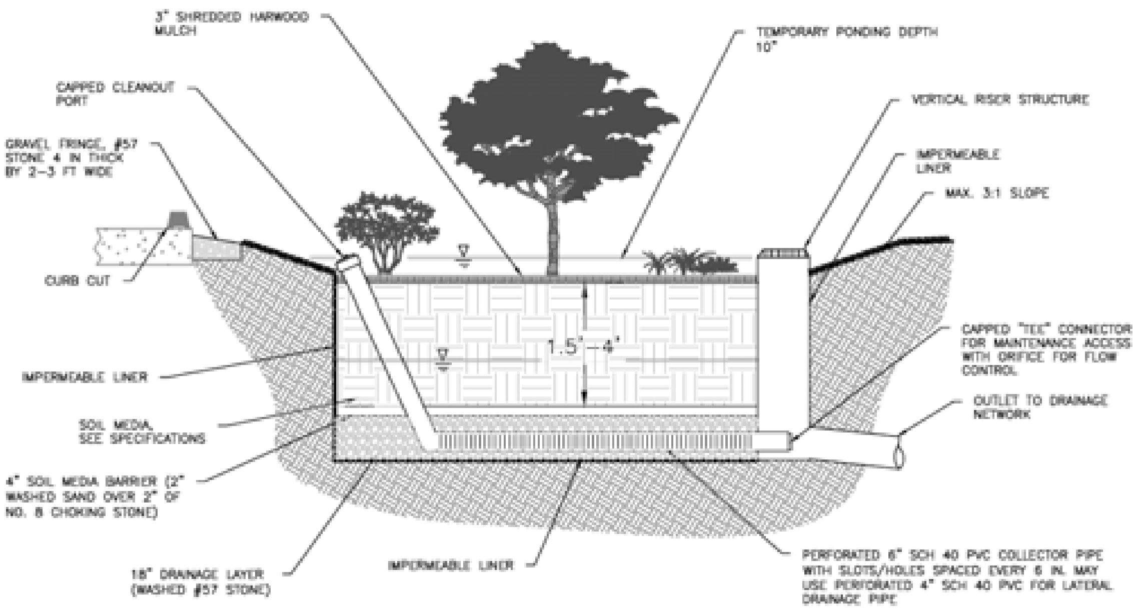


Figure 2 – Typical Flow-Through Planter Basin

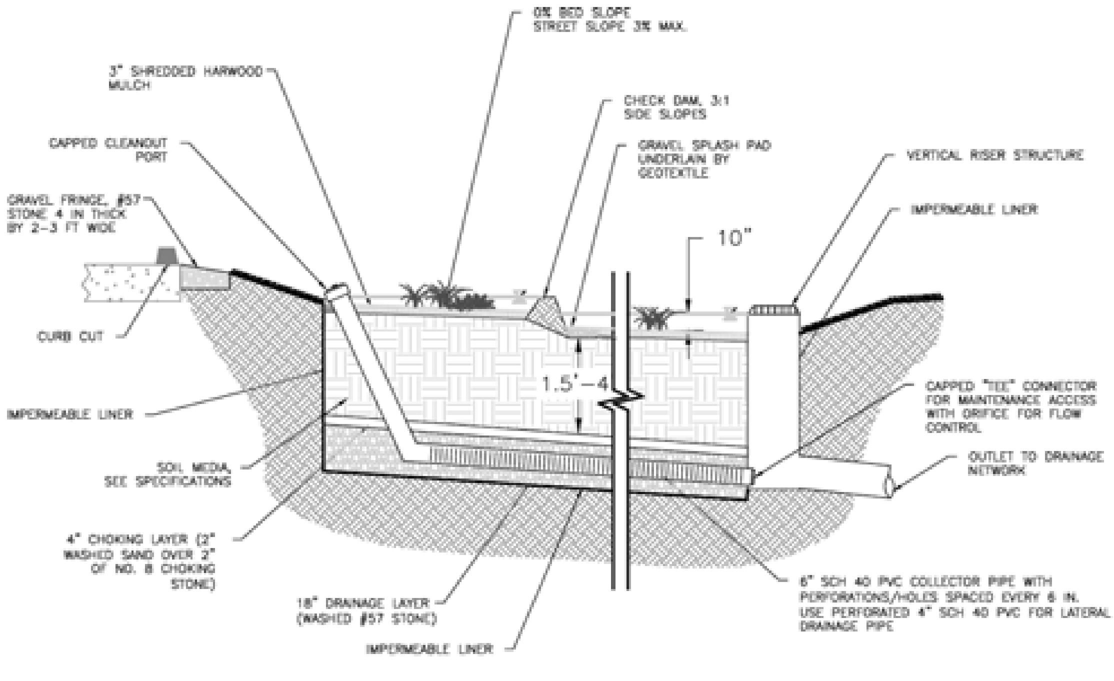


Figure 3 – Typical Roadside Flow-Through Planter

3.2 BMP SIZING SPREADSHEET INPUT

As mentioned previously, IMP sizing calculations have been performed utilizing the BMP Sizing Spreadsheet prepared by the County of San Diego. Below is a description of the various inputs required in the BMP Sizing Spreadsheet, and the values used for the project.

Rain Gauge: Newland Sierra falls within the Lake Wohlford Basin per the Rainfall Basin Map included in the BMP Sizing Spreadsheet.

Channel Susceptibility: The channel susceptibility is determined as discussed in Section 2.3 above.

BMP Name: The IMPs are named using a letter corresponding to the project neighborhood and a number. For example, IMP S4 is located in the Summit neighborhood.

BMP Native Soil Type: "N/A – Impervious Liner" is used since all IMPs are proposed to be lined.

BMP Type: "Flow-Through Planter" is used due to the use of an impermeable liner which will cause the IMPs to function like Flow-Through Planters from a flow-control perspective.

DMA Name: The DMAs have been named in a fashion to represent the soil, slope, and surface conditions within the DMA. The naming convention used is given below, using DMA S1-D-S-PI as an example:

S1	D	S	P	I
IMP Name	Soil Group B, C or D	Pre-Project Slope F (Flat), M (Moderate), or S (Steep)	Pre-Project Cover I (Impervious) or P (Pervious)	Proposed Cover I (Impervious) or P (Pervious)

Area: The area of each DMA is determined based on hydrology boundaries draining to each IMP, soil group, pre-project slope, and surface conditions. The areas for each type of proposed cover is based on the impervious percentage of each neighborhood based on the proposed density of the neighborhood and Table 3-1 of the County of San Diego Hydrology Manual.

Soil Type: As described in Section 2.1 above, County of San Diego soils mapping indicates soil types B, C, and D are present on site. However, the BMP Sizing Spreadsheet does not allow FTPs to be used with type B soils. Infiltration is not recommended for the project due to factors other than soil type, so FTPs are the preferred IMP. To allow the BMP Sizing Spreadsheet to account for the contribution from DMAs will all soil types, type D soils are assumed for the area calculations in the BMP Sizing Spreadsheet. Orifice calculations do account for other soil types to ensure that runoff is discharge at an appropriate rate.

Slope: Due to the mountainous nature of the site, a pre-project slope of Steep (15% or greater) is used for all DMAs.

Post Project Surface Type/Runoff Factor: The DMAs are split into pervious and impervious areas as described above. Per the SUSMP, a runoff factor of 1.0 is used for proposed impervious areas, and 0.1 is used for proposed pervious areas.

Cover: The pre-project cover for the site is "Scrub", reflecting the natural chaparral vegetation.

4.0 CALCULATIONS/RESULTS

The tables at the beginning of Appendix 5 summarize the sizing calculations for each onsite IMP. BMP Sizing Spreadsheet output can also be found in Appendix 5. Please refer to the Hydromodification Management Exhibits in Appendix 6 for a graphical depiction of these areas.

5.0 MAINTENANCE

The flow-through planter IMPs are proposed to be in maintenance category 3 per the SUSMP. The IMPs would be placed in easements dedicated to the County, with funding provided by a Community Facility District (CFD) set up for the project. The required maintenance of the BMPs is summarized in the table below. Maintenance access roads have been provided to the IMPs from the public right-of-way, and the IMPs have been placed in public drainage easements. The table below lists inspection and maintenance tasks to be completed for the FTPs, and a sample inspection and maintenance checklist is provided in Appendix 4. Please refer to the Major Storm Water Management Plan for Newland Sierra for further information on maintenance of the IMPs.

TASK	FREQUENCY	INDICATOR MAINTENANCE IS NEEEDED	MAINTENANCE NOTES
CATCHMENT INSPECTION	Weekly or biweekly with routing property maintenance	Excessive sediment, trash, or debris accumulation on the surface of bioretention	Permanently stabilize any exposed soil and remove any accumulated sediment. Adjacent pervious areas might need to be re-graded.
INLET INSPECTION	Weekly or biweekly with routing property maintenance	Internal erosion or excessive sediment, trash, and debris accumulation	Check for sediment accumulation to ensure that flow into the FTP is as designed. Remove any accumulated sediment.
TRASH AND LEAF LITTER REMOVAL	Weekly or biweekly with routing property maintenance	Accumulation of litter and leafy debris within bioretention area	Litter and leaves should be removed to reduce the risk of outlet clogging, reduce nutrient inputs to the bioretention area, and to improve facility aesthetics.
PRUNING	One to two times per year	Overgrown vegetation that interferes with access, lines of sight, or safety	Nutrients in runoff often cause FTP vegetation to flourish.
MOWING	Two to twelve times per year	Overgrown vegetation that interferes with access, lines of sight, or safety	Frequency depends on location and desired aesthetic appeal.
MULCH REMOVAL AND REPLACMENT	One time every 2 to 3 years	2/3 of mulch has decomposed	Mulch accumulation reduces available surface water storage volume. Removal of decomposed mulch also increases surface infiltration rate of fill soil. Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches

TASK	FREQUENCY	INDICATOR MAINTENANCE IS NEEEDED	MAINTENANCE NOTES
TEMPORARY WATERING	One time every 2 to 3 days for first 1 to 2 months, sporadically after established	Until established and during severe droughts	Watering after the initial year might be required.
FERTILIZATION	One time initially	Upon planting	One-time spot fertilization for first year of vegetation.
REMOVE AND REPLACE DEAD PLANTS	One time per year	Dead plants	Within the first year, 10 percent of plants can die. Survival rates increase with time.
OUTLET INSPECTION	Once after first rain of the season, then monthly during the rainy season	Erosion at outlet	Remove any accumulated mulch or sediment. Ensure IMP maintains a drain-down time of less than 72 hours.
MISCELLANEOUS UPKEEP	Twelve times per year	Tasks include trash collection, plant health, spot weeding, removing invasive species, and removing mulch from the overflow device.	

6.0 SUMMARY AND CONCLUSIONS

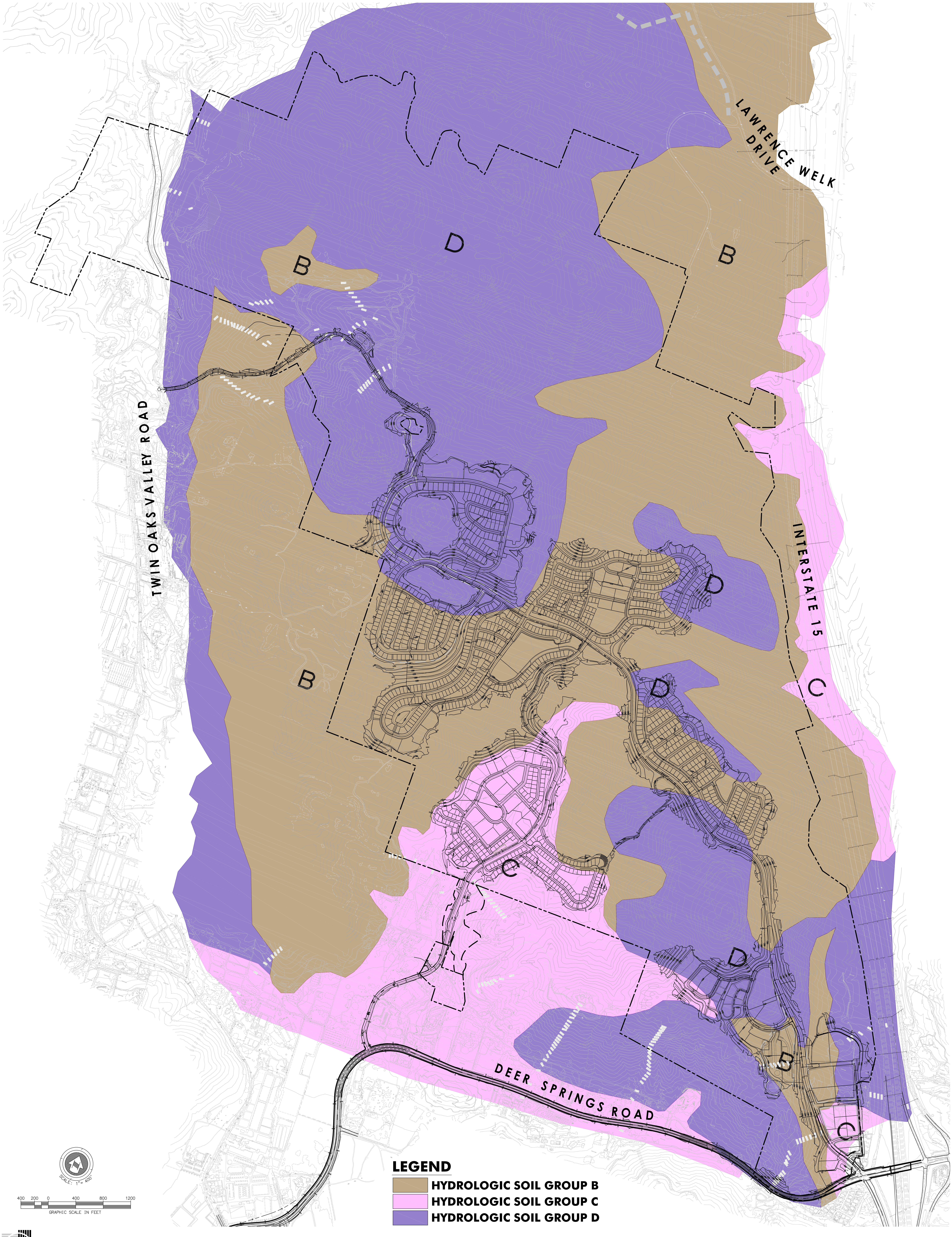
The hydromodification mitigation measures proposed for the Newland Sierra project will satisfy the requirements of the Final Hydromodification Management Plan. The storm water management strategy for the project has been designed with Low Impact Development IMPs distributed throughout the project that utilize natural processes to remove pollutants and provide hydromodification mitigation. In portions of the project where unmitigated discharges would increase, pre-project conditions will be matched through the use of flow-through planter IMPs which will reduce runoff flows and durations from the developed areas of the project to below pre-project levels for the appropriate hydromodification flow range. A channel screening analysis has been performed to determine the erosion susceptibility and corresponding low-flow threshold for the receiving channels. The IMPs have been sized using the BMP Sizing Spreadsheet. Proper energy dissipation will also be provided where necessary, and will be sized as part of final engineering. Maintenance of the IMPs will be in the 3rd maintenance category, with funding provided by a CFD. Please refer to the Major Storm Water Management Plan and Preliminary Drainage Study for further information regarding the water quality and peak detention aspects of the proposed IMPs.

7.0 APPENDICES

Appendix 1	*Soils Data*
Appendix 2	*Major Watershed Exhibits*
Appendix 3	*Channel Screening Analysis*
Appendix 4	*IMP Details and Specifications*
Appendix 5	*BMP Sizing Spreadsheet Calculations*
Appendix 6	*Hydromodification Management Exhibits*

Appendix 1

Soils Data



NEWLAND SIERRA
HYDROLOGIC SOIL GROUP EXHIBIT

United States Department of Agriculture

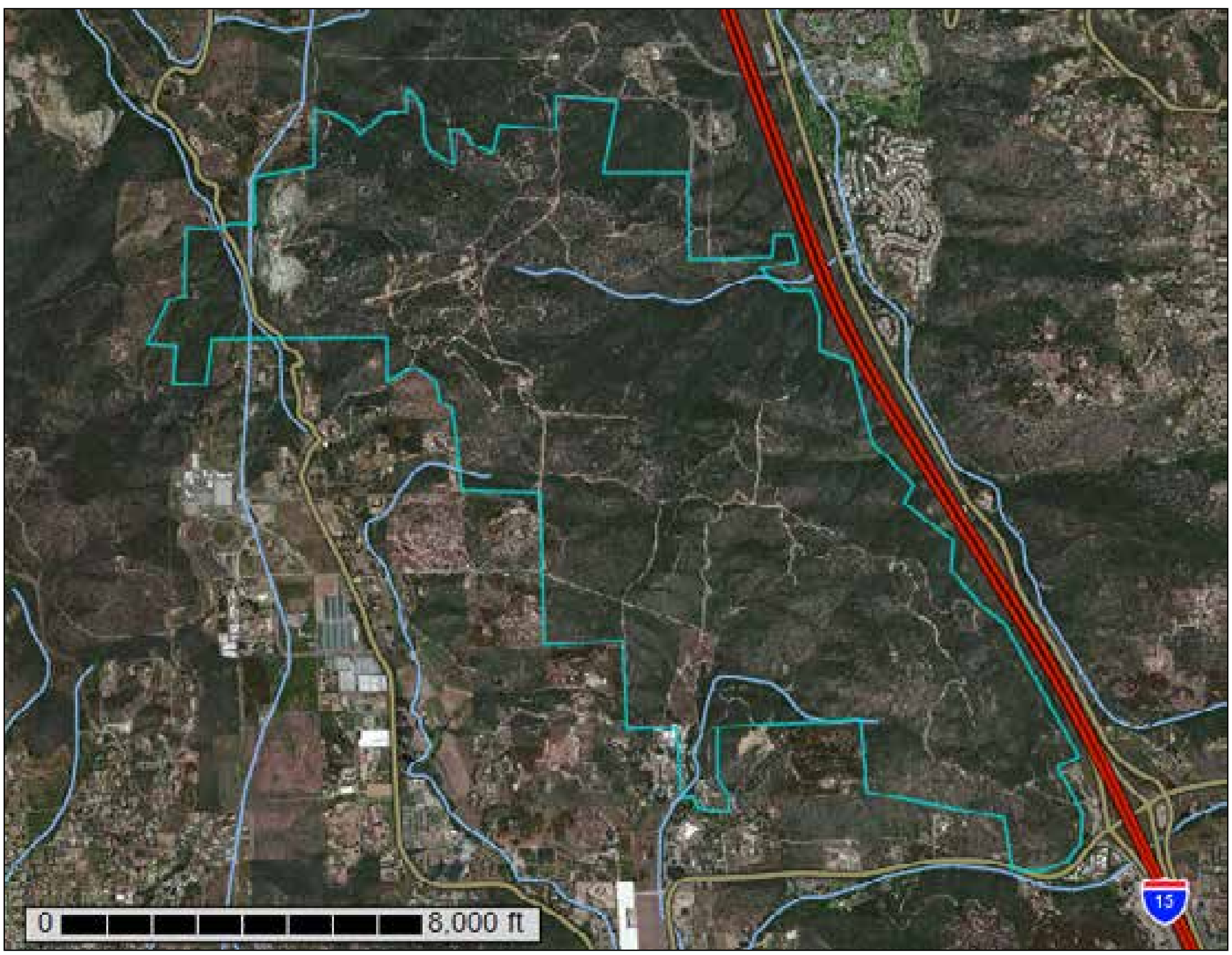
NRCS

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



December 11, 2014

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 (http://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.

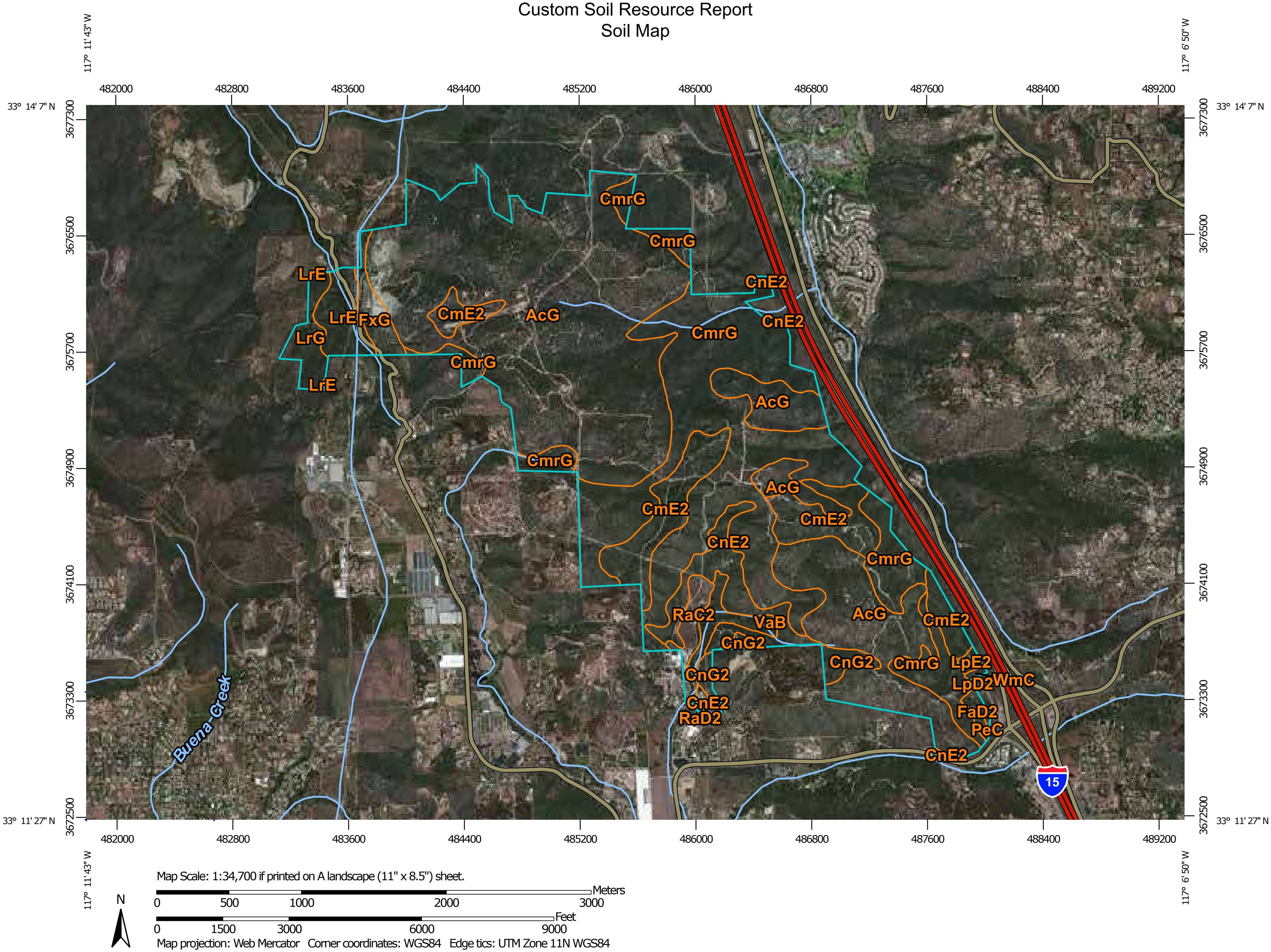
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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.

Custom Soil Resource Report
Soil Map



Map Scale: 1:34,700 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 1500, 3000, 6000, 9000

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.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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 8, Sep 17, 2014

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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

San Diego County Area, California (CA638)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AcG	Acid igneous rock land	983.4	49.1%
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded	169.0	8.4%
CmrG	Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes	575.0	28.7%
CnE2	Cieneba-Fallbrook rocky sandy loams, 9 to 30 percent sl opes, eroded	81.5	4.1%
CnG2	Cieneba-Fallbrook rocky sandy loams, 30 to 65 percent s lopes, eroded	25.8	1.3%
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	7.9	0.4%
FxG	Friant rocky fine sandy loam, 30 to 70 percent slopes	26.7	1.3%
LpD2	Las Posas fine sandy loam, 9 to 15 percent slopes, erod ed	0.2	0.0%
LpE2	Las Posas fine sandy loam, 15 to 30 percent slopes, ero ded	4.6	0.2%
LrE	Las Posas stony fine sandy loam, 9 to 30 percent slopes	41.8	2.1%
LrG	Las Posas stony fine sandy loam, 30 to 65 percent slope s	31.8	1.6%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	0.7	0.0%
PeC2	Placentia sandy loam, 5 to 9 percent slopes, eroded	0.2	0.0%
RaC2	Ramona sandy loam, 5 to 9 percent slopes, eroded	20.6	1.0%
RaD2	Ramona sandy loam, 9 to 15 percent slopes, eroded	0.4	0.0%
VaB	Visalia sandy loam, 2 to 5 percent slopes	29.7	1.5%
WmC	Wyman loam, 5 to 9 percent slopes	1.8	0.1%
Totals for Area of Interest		**2,001.0**	**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

AcG—Acid igneous rock land

Map Unit Setting

National map unit symbol: hb7x
Elevation: 650 to 4,000 feet
Mean annual precipitation: 8 to 15 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Acid igneous rock land: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Acid Igneous Rock Land

Setting

Landform: Mountains
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Acid igneous rock

Typical profile

H1 - 0 to 4 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 75 percent
Depth to restrictive feature: 0 to 4 inches to lithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

CmE2—Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded

Map Unit Setting

National map unit symbol: hb9t
Elevation: 500 to 4,000 feet
Mean annual precipitation: 8 to 35 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 110 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cieneba and similar soils: 60 percent
Rock outcrop: 30 percent

Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cieneba

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and granodiorite

Typical profile

H1 - 0 to 8 inches: coarse sandy loam
H2 - 8 to 12 inches: weathered bedrock

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 4 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
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
Available water storage in profile: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow loamy (1975) (R019XD060CA)

Description of Rock Outcrop

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Typical profile

H1 - 0 to 4 inches: unweathered bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Minor Components

Vista

Percent of map unit: 5 percent

Las posas

Percent of map unit: 5 percent

CmrG—Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hb9v
Elevation: 500 to 4,000 feet
Mean annual precipitation: 8 to 35 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 110 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cieneba and similar soils: 45 percent
Rock outcrop: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Typical profile

H1 - 0 to 4 inches: unweathered bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Description of Cieneba

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and granodiorite

Typical profile

H1 - 0 to 8 inches: coarse sandy loam
H2 - 8 to 12 inches: weathered bedrock

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: 4 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained

Runoff class: Medium
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
Available water storage in profile: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow loamy (1975) (R019XD060CA)

Minor Components

Las posas

Percent of map unit: 5 percent

Vista

Percent of map unit: 5 percent

CnE2—Cieneba-Fallbrook rocky sandy loams, 9 to 30 percent sl opes, eroded

Map Unit Setting

National map unit symbol: hb9w
Elevation: 300 to 4,000 feet
Mean annual precipitation: 8 to 35 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 110 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Fallbrook and similar soils: 40 percent
Cieneba and similar soils: 40 percent
Rock outcrop: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cieneba

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and granodiorite

Typical profile

H1 - 0 to 10 inches: coarse sandy loam
H2 - 10 to 20 inches: weathered bedrock

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 4 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
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
Available water storage in profile: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow loamy (1975) (R019XD060CA)

Description of Fallbrook

Setting

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

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 24 inches: sandy clay loam, loam
H2 - 6 to 24 inches: weathered bedrock
H3 - 24 to 28 inches:

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Description of Rock Outcrop

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Minor Components

Vista

Percent of map unit: 5 percent

CnG2—Cieneba-Fallbrook rocky sandy loams, 30 to 65 percent s lopes, eroded

Map Unit Setting

National map unit symbol: hb9x
Elevation: 300 to 4,000 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Cieneba and similar soils: 40 percent
Fallbrook and similar soils: 35 percent
Rock outcrop: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cieneba

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and granodiorite

Typical profile

H1 - 0 to 10 inches: coarse sandy loam
H2 - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: 4 to 20 inches to paralithic bedrock
Natural drainage class: Somewhat excessively drained

Runoff class: Medium
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
Available water storage in profile: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow loamy (1975) (R019XD060CA)

Description of Fallbrook

Setting

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

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 24 inches: sandy clay loam, loam
H2 - 6 to 24 inches: weathered bedrock
H3 - 24 to 28 inches:

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Description of Rock Outcrop

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Minor Components

Vista

Percent of map unit: 5 percent

FaD2—Fallbrook sandy loam, 9 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hbbv
Elevation: 200 to 3,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Fallbrook

Setting

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

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 12 inches: loam, sandy loam
H2 - 6 to 12 inches: sandy clay loam, clay loam
H3 - 12 to 28 inches: loam, sandy loam
H3 - 12 to 28 inches: weathered bedrock
H4 - 28 to 47 inches:
H4 - 28 to 47 inches:
H5 - 47 to 51 inches:

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Minor Components

Vista

Percent of map unit: 10 percent

Cieneba

Percent of map unit: 2 percent

Bonsall

Percent of map unit: 2 percent

Las posas

Percent of map unit: 1 percent

FxG—Friant rocky fine sandy loam, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: hbc5
Elevation: 500 to 5,800 feet
Mean annual precipitation: 8 to 25 inches
Mean annual air temperature: 45 to 64 degrees F
Frost-free period: 110 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Friant

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from metasedimentary rock

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 12 inches: sandy loam, fine sandy loam
H2 - 3 to 12 inches: unweathered bedrock
H3 - 12 to 16 inches:

Properties and qualities

Slope: 30 to 70 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
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
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: Shallow loamy (1975) (R019XD060CA)

Minor Components

Exchequer

Percent of map unit: 10 percent

Cieneba

Percent of map unit: 2 percent

Rock outcrop

Percent of map unit: 2 percent

Escondido

Percent of map unit: 1 percent

LpD2—Las Posas fine sandy loam, 9 to 15 percent slopes, erod ed

Map Unit Setting

National map unit symbol: hbdn
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 24 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Las posas and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Posas

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basic igneous rock

Typical profile

H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 33 inches: clay loam, clay
H2 - 4 to 33 inches: weathered bedrock
H3 - 33 to 37 inches:

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

LpE2—Las Posas fine sandy loam, 15 to 30 percent slopes, ero ded

Map Unit Setting

National map unit symbol: hbdp
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 240 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Las posas and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Posas

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basic igneous rock

Typical profile

H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 33 inches: clay loam, clay
H2 - 4 to 33 inches: weathered bedrock
H3 - 33 to 37 inches:

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Minor Components

Bancas

Percent of map unit: 5 percent

Fallbrook

Percent of map unit: 2 percent

Escondido

Percent of map unit: 2 percent

Friant

Percent of map unit: 1 percent

LrE—Las Posas stony fine sandy loam, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: hbdq
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 240 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Las posas and similar soils: 85 percent
Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Posas

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basic igneous rock

Typical profile

H1 - 0 to 4 inches: stony fine sandy loam
H2 - 4 to 33 inches: clay loam, clay
H2 - 4 to 33 inches: weathered bedrock
H3 - 33 to 37 inches:

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Loamy west (R020XD024CA)

Minor Components

Bancas

Percent of map unit: 4 percent

Fallbrook

Percent of map unit: 2 percent

Escondido

Percent of map unit: 2 percent

Friant

Percent of map unit: 2 percent

LrG—Las Posas stony fine sandy loam, 30 to 65 percent slope s

Map Unit Setting

National map unit symbol: hbds
Elevation: 200 to 3,000 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 240 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Las posas and similar soils: 85 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Posas

Setting

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

Typical profile

H1 - 0 to 4 inches: stony fine sandy loam
H2 - 4 to 33 inches: clay loam, clay
H2 - 4 to 33 inches: weathered bedrock
H3 - 33 to 37 inches:

Properties and qualities

Slope: 30 to 65 percent
Depth to restrictive feature: 20 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 high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: Shallow loamy west (R020XD029CA)

Minor Components

Bancas

Percent of map unit: 4 percent

Fallbrook

Percent of map unit: 2 percent

Escondido

Percent of map unit: 2 percent

Friant

Percent of map unit: 2 percent

PeC—Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19

Map Unit Setting

National map unit symbol: 2tyyn
Elevation: 150 to 2,950 feet
Mean annual precipitation: 13 to 18 inches
Mean annual air temperature: 62 to 64 degrees F
Frost-free period: 270 to 360 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Placentia

Setting

Landform: Terraces, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Alluvium derived from granitoid

Typical profile

A1 - 0 to 4 inches: sandy loam
A2 - 4 to 13 inches: sandy loam
Bt1 - 13 to 21 inches: sandy clay
Bt2 - 21 to 34 inches: sandy clay
BC - 34 to 53 inches: sandy clay loam
C - 53 to 63 inches: sandy clay loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 25.0
Available water storage in profile: High (about 9.2 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Claypan (1975) (R019XD061CA)

Minor Components

Bonsall
Percent of map unit: 5 percent

Fallbrook
Percent of map unit: 5 percent

Ramona
Percent of map unit: 4 percent

Typic natrixeralfs, occasionally ponded
Percent of map unit: 1 percent
Landform: Depressions

PeC2—Placentia sandy loam, 5 to 9 percent slopes, eroded

Map Unit Setting
National map unit symbol: hbfk
Elevation: 50 to 2,500 feet
Mean annual precipitation: 12 to 18 inches
Frost-free period: 200 to 300 days
Farmland classification: Farmland of statewide importance

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

Description of Placentia

Setting
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear

Across-slope shape: Convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 32 inches: sandy clay
H3 - 32 to 63 inches: clay loam, sandy clay loam
H3 - 32 to 63 inches:

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
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
Salinity, maximum in profile: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 25.0
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Claypan (1975) (R019XD061CA)

Minor Components

Bonsall

Percent of map unit: 5 percent

Fallbrook

Percent of map unit: 5 percent

Ramona

Percent of map unit: 4 percent

Unnamed, ponded

Percent of map unit: 1 percent
Landform: Depressions

RaC2—Ramona sandy loam, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: hbft
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Ramona

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 60 inches: sandy clay loam, clay loam
H2 - 10 to 60 inches: sandy clay loam, sandy loam
H3 - 60 to 74 inches:
H3 - 60 to 74 inches:

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 16.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Minor Components

Fallbrook

Percent of map unit: 5 percent

Greenfield

Percent of map unit: 5 percent

Placentia

Percent of map unit: 5 percent

RaD2—Ramona sandy loam, 9 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hbfv
Elevation: 250 to 3,500 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ramona

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 60 inches: sandy clay loam, clay loam
H2 - 10 to 60 inches: sandy clay loam, sandy loam
H3 - 60 to 74 inches:
H3 - 60 to 74 inches:

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 16.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Minor Components

Greenfield

Percent of map unit: 5 percent

Placentia

Percent of map unit: 5 percent

Fallbrook

Percent of map unit: 5 percent

VaB—Visalia sandy loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: hbh3
Elevation: 0 to 1,500 feet
Mean annual precipitation: 9 to 30 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Visalia

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 12 inches: sandy loam
H2 - 12 to 40 inches: sandy loam, fine sandy loam
H2 - 12 to 40 inches: very fine sandy loam
H3 - 40 to 60 inches:

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
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

Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A

Minor Components

Greenfield

Percent of map unit: 5 percent

Grangeville

Percent of map unit: 5 percent

Tujunga

Percent of map unit: 2 percent

Placentia

Percent of map unit: 2 percent

Unnamed

Percent of map unit: 1 percent
Landform: Flood plains

WmC—Wyman loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbhl
Elevation: 300 to 2,500 feet
Mean annual precipitation: 9 to 25 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Wyman

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Basic alluvium derived from granite

Typical profile

H1 - 0 to 13 inches: loam
H2 - 13 to 40 inches: clay loam

H3 - 40 to 67 inches: loam
H4 - 67 to 72 inches: fine sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Minor Components

Placentia

Percent of map unit: 5 percent

Ramona

Percent of map unit: 5 percent

Visalia

Percent of map unit: 3 percent

Las posas

Percent of map unit: 2 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

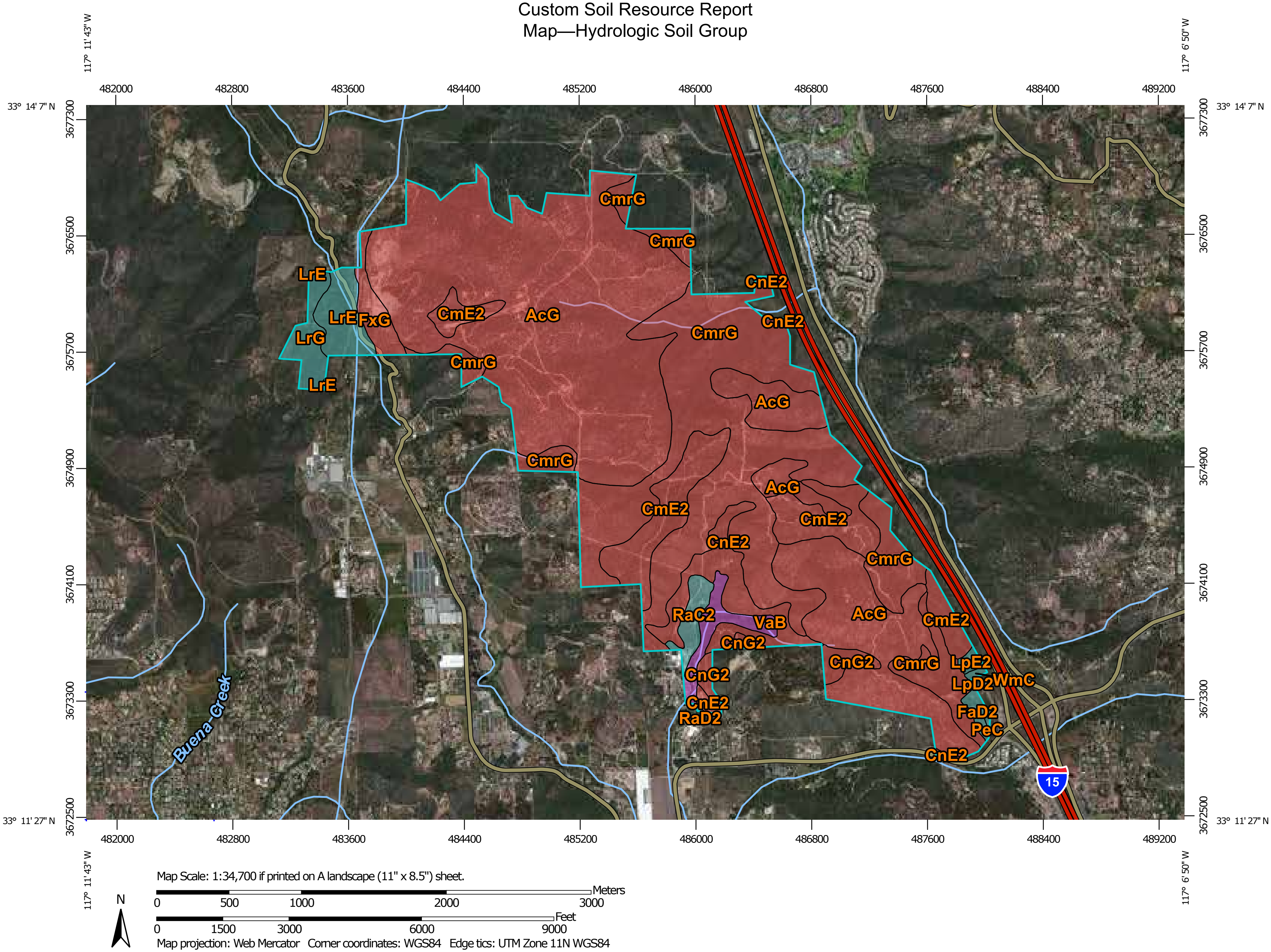
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



Map Scale: 1:34,700 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 1500, 3000, 6000, 9000

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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 8, Sep 17, 2014

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AcG	Acid igneous rock land	D	983.4	49.1%
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes , eroded	D	169.0	8.4%
CmrG	Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes	D	575.0	28.7%
CnE2	Cieneba-Fallbrook rocky sandy loams, 9 to 30 percent sl opes, eroded	D	81.5	4.1%
CnG2	Cieneba-Fallbrook rocky sandy loams, 30 to 65 percent s lopes, eroded	D	25.8	1.3%
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	C	7.9	0.4%
FxG	Friant rocky fine sandy loam, 30 to 70 percent slopes	D	26.7	1.3%
LpD2	Las Posas fine sandy loam, 9 to 15 percent slopes, erod ed	C	0.2	0.0%
LpE2	Las Posas fine sandy loam, 15 to 30 percent slopes, ero ded	C	4.6	0.2%
LrE	Las Posas stony fine sandy loam, 9 to 30 percent slopes	C	41.8	2.1%
LrG	Las Posas stony fine sandy loam, 30 to 65 percent slope s	C	31.8	1.6%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	0.7	0.0%
PeC2	Placentia sandy loam, 5 to 9 percent slopes, eroded	D	0.2	0.0%
RaC2	Ramona sandy loam, 5 to 9 percent slopes, eroded	C	20.6	1.0%
RaD2	Ramona sandy loam, 9 to 15 percent slopes, eroded	C	0.4	0.0%
VaB	Visalia sandy loam, 2 to 5 percent slopes	A	29.7	1.5%
WmC	Wyman loam, 5 to 9 percent slopes	C	1.8	0.1%
Totals for Area of Interest			**2,001.0**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

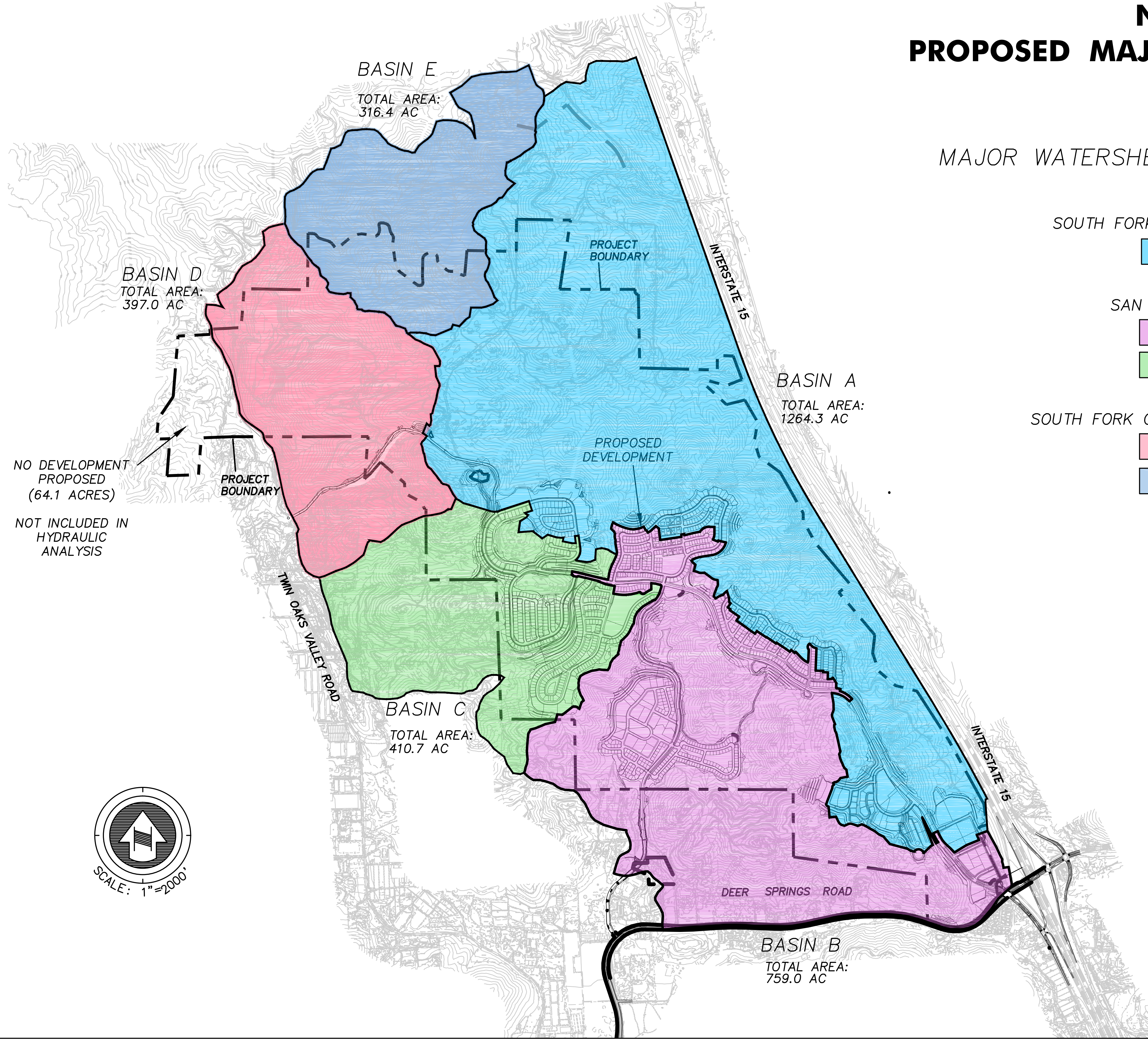
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix 2
Major Watersheds Exhibits

FIGURE 3.0.2
NEWLAND SIERRA
PROPOSED MAJOR WATERSHEDS



MAJOR WATERSHED TRIBUTARY AREA:

SOUTH FORK MOOSA CANYON TRIBUTARY:

1264.3 AC	MAJOR BASIN A

SAN MARCOS CREEK TRIBUTARY:

759.0 AC	MAJOR BASIN B
410.7 AC	MAJOR BASIN C

SOUTH FORK GOPHER CANYON TRIBUTARY:

397.0 AC	MAJOR BASIN D
316.4 AC	MAJOR BASIN E