APPENDIX E
Geotechnical Investigation and Soil Reports

Date:	October 15, 2008
Project No.:	278-1-1
Prepared For:	Mr. Robert Facchino II 5769 Poppy Hill Place San Jose, California 95138
Re:	Limited Geotechnical Investigation 1655 Berryessa Road San Jose, California

Dear Mr. Facchino:

This letter presents our limited geotechnical investigation and findings for characterizing the existing storm water retention basin located at 1655 Berryessa Road in San Jose, California.

For our use, we have been provided a topographic survey of the site, dated February 2008, and a storm water treatment plan, dated June 2008; both plans were prepared by Kier & Wright, Civil Engineers.

PROJECT SUMMARY

The site is bordered by railroad tracks to the east, Berryessa Road to the south, a parking lot to the west, and residential parcels to the north. The retention basin is located in the northern portion of the site. We understand the basin has been in use for approximately 30 to 50 years, or longer.

The City of San Jose has requested a characterization of the subsurface soil within the existing storm water retention basin area as it pertains to its current use. Our limited geotechnical investigation included characterizing the soil type, depth to ground water, and permeability.

EXPLORATION PROGRAM

Field Exploration

Field exploration consisted of one boring drilled on September 10, 2008, with truck-mounted, hollow-stem auger drilling equipment. The boring was drilled to a depth of approximately 15 feet and located on the basin's perimeter raised berm. The boring was backfilled with cement grout in accordance with Santa Clara Valley Water District guidelines.

The approximate location of our exploratory boring is shown on the attached Site Plan. The associated boring log is also attached.

Laboratory Testing

In addition to visual classification of samples, the laboratory program focused on obtaining data for evaluating the basin infiltration rate. Testing included moisture contents (ASTM D2216), dry densities (ASTM D2937), washed sieve analyses (ASTM D1140), and grain size distribution. In addition, one hydraulic conductivity (ASTM D5084) also was performed on a sample from a depth of approximately 11½ feet. Results of our laboratory tests are shown on the attached boring log.

SURFACE CONDITIONS

The existing retention basin is located in the northern half of the site. Based on available topographic information, the in-ground retention basin has an area of approximately ½ acre. The basin is filled with surface vegetation, primarily consisting of shrubs and grasses; there are several mature trees around the perimeter of the basin. At the time of our investigation, there was water present in portions of the basin. The retention basin is surrounded by unpaved parking and storage areas covered with aggregate base. Surrounding ground surface elevations range from Elevation 80 to 83 feet (datum unspecified). The water surface elevation is reportedly at approximately Elevation 75 to 76 feet (at the time of survey).

SUBSURFACE CONDITIONS

Beneath the surficial aggregate base, our boring encountered a layer of stiff lean clay approximately 7-feet thick underlain by an approximately 2-foot-thick layer of stiff sandy silt. Beneath the silt layer, our boring encountered stiff clay to the termination depth of 15 feet. Detailed subsurface information is included in the attached boring log.

PERCOLATION TESTING

General

As discussed above, our boring encountered predominantly clayey soils, which typically have very low vertical permeability (infiltration) rates on the order of 10^{-5} to 10^{-7} centimeters per second (cm/sec) or approximately ⅓-inch per day.

Field and Laboratory Testing

Based on our in-situ percolation test, average infiltration rates ranged from approximately 1¾ to 5¾ inch per hour (10^{-3} cm/sec). Our percolation test was performed at approximately the same depth as the basin bottom (7 feet). We also performed a hydraulic conductivity laboratory test on a sample retrieved from approximately 11½ feet (3½ feet below the basin bottom). This test was to estimate permeability of the soil at that depth. The test resulted in an average permeability of 2×10^{-7} cm/sec.

Findings and Recommendations

As discussed, our field percolation test was performed at approximately the same depth as the basin bottom. Based on test results at that depth and the soil profile shown on the attached boring log, average infiltration rates indicated a good draining condition at the basin bottom. However, the boundary conditions of the percolation test are very different than that of the basin. Therefore, we consider the laboratory permeability measurement to be more indicative of basin infiltration rates. The average permeability result for the clayey soil below the basin bottom indicated a very low permeability (non-draining) condition. In our opinion, these permeability values were representative of soils encountered in our boring.

As referenced, the basin reportedly has been in use for 30 years, or longer. We understand over that time, no flooding has known to occur on-site.

As discussed, tests were performed at one location. Therefore, above results may vary and not represent the entire basin. Localized areas/depths containing higher or lower permeable materials can increase or decrease actual infiltration rates, respectively. Therefore, we recommend the potential for variations be considered when evaluating the basin capacity or performance.

CLOSURE

Findings and recommendations presented in this letter have been prepared for the sole use of Mr. Robert Facchino II, specifically for characterizing the retention basin located at 1655 Berryessa Road in San Jose, California. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices at this time and location. No warranties are either expressed or implied.

If you have any questions or need any additional information from us, please call and we will be glad to discuss them with you.

Sincerely,

Cornerstone Earth Group, Inc.

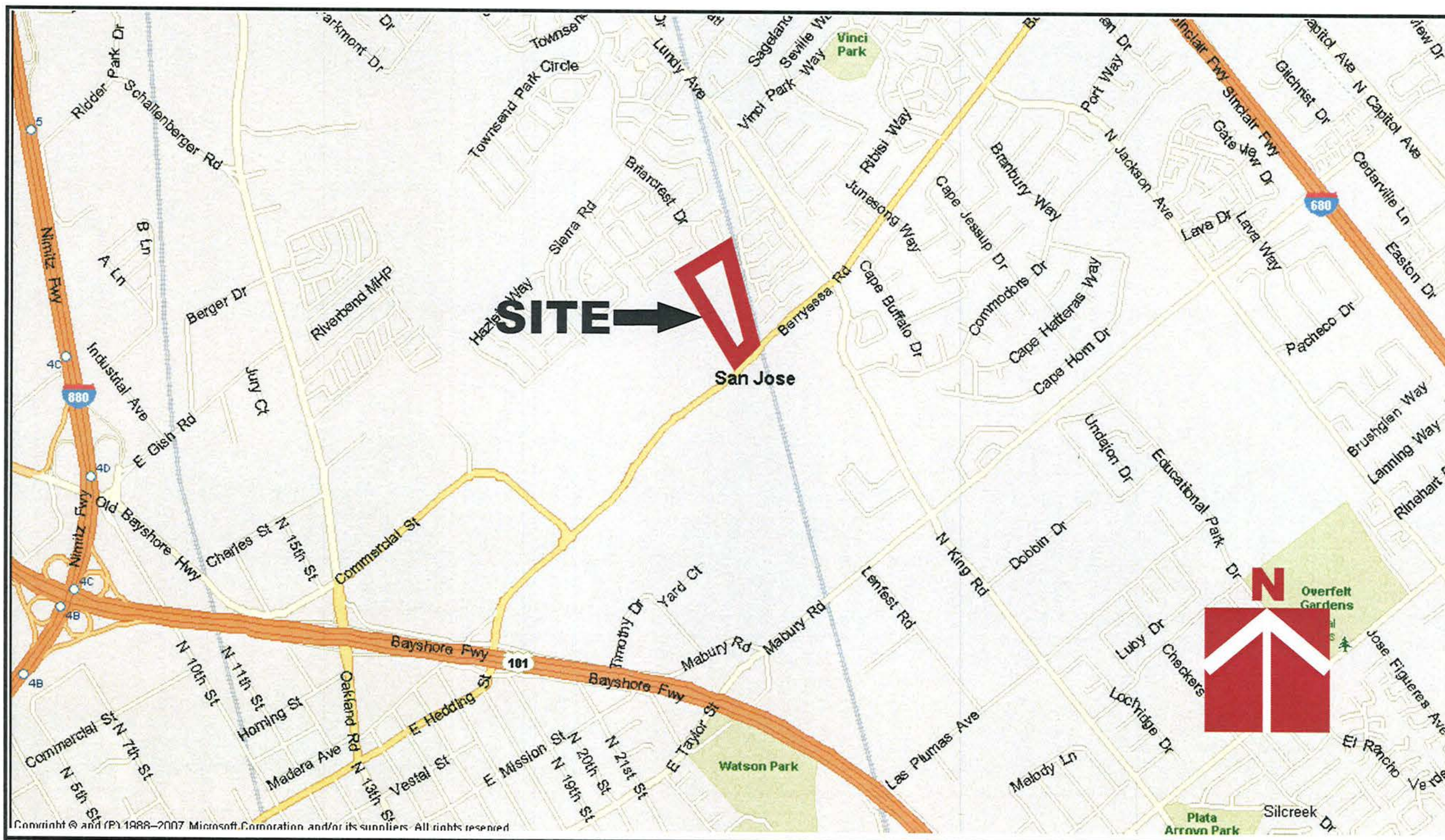
REGISTERED PROFESSIONAL ENGINEER
DANH T. TRAN
C59705
EXP. 12/31/2009
CIVIL
STATE OF CALIFORNIA

Danh T. Tran, P.E.
Principal Engineer

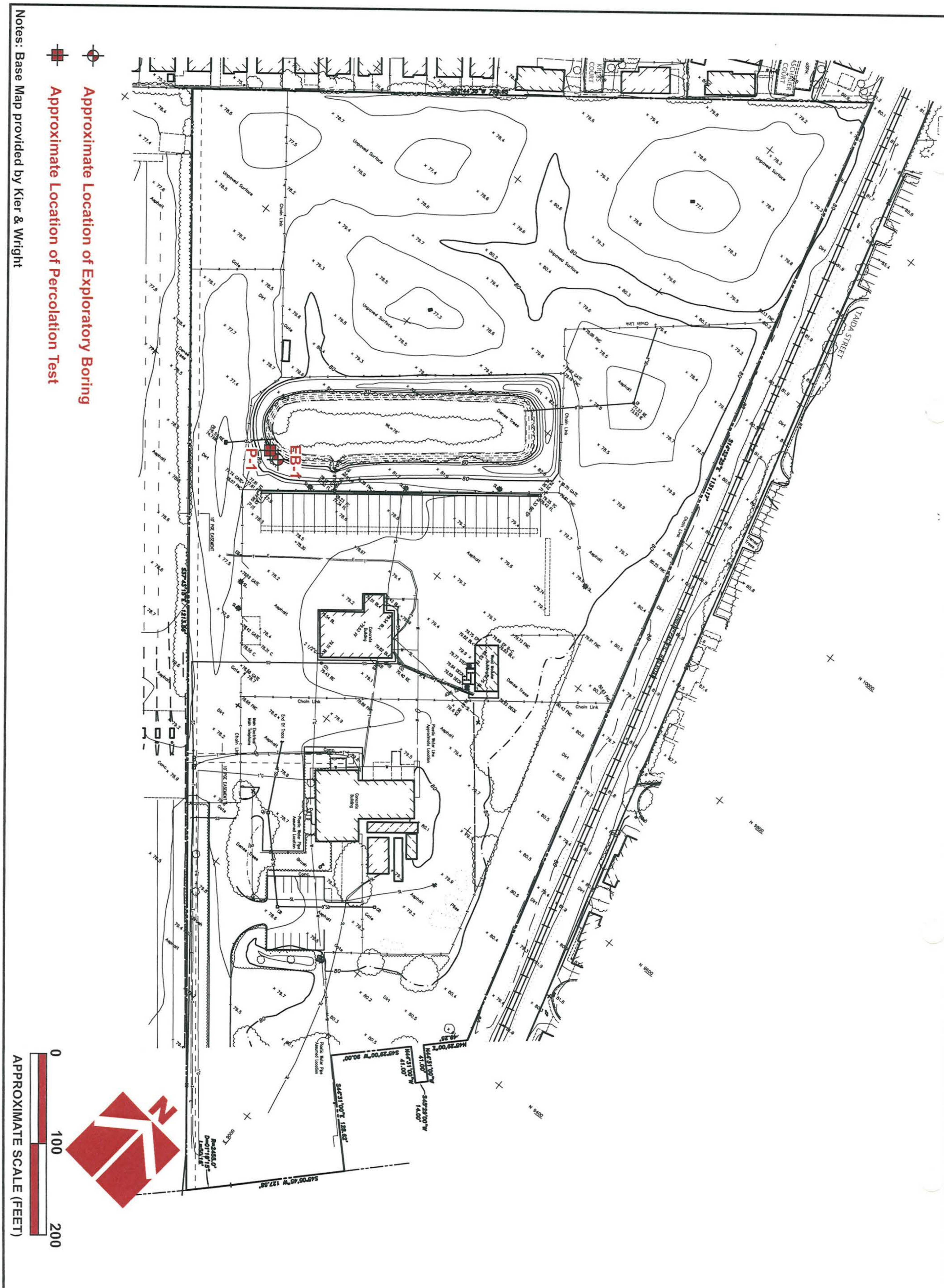
CBB:MdH:dtt

Copies: Addressee (2 and email)
Kier and Wright (3 and email)
Attn: Mr. Benjamin J. Anderson

Attachments: Figure 1, Vicinity Map
Figure 2, Site plan
Exploratory Boring Log – EB-1
Laboratory Test Results – Hydraulic Conductivity



CORNERSTONE EARTH GROUP	Vicinity Map	Project Number 278-1-1
	1655 Berryessa Road San Jose, CA	Figure Number Figure 1
		Date October 2008 · Drawn By FLL



CORNERSTONE EARTH GROUP

Site Plan	Project Number 278-1-1
1655 Berryessa Road San Jose, CA	Figure Number Figure 2
	Date October 2008 / Drawn By FLL

BORING NUMBER EB-1

CORNERSTONE EARTH GROUP

PROJECT NAME 1655 Berryessa Road
PROJECT NUMBER 278-1-1
PROJECT LOCATION San Jose, CA

DATE STARTED 9/10/08 DATE COMPLETED 9/10/08
GROUND ELEVATION BORING DEPTH 15 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc.
LATITUDE LONGITUDE
DRILLING METHOD Mobile B-53, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY DTT
AT TIME OF DRILLING Not Encountered
NOTES
AT END OF DRILLING Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

UNDRAINED SHEAR STRENGTH, ksf: ○ HAND PENETROMETER; △ TORVANE; ● UNCONFINED COMPRESSION; ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0 5.0

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT, %	PLASTICITY INDEX, %	PERCENT PASSING NO. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf
	0	3 inches aggregate base							
		Lean Clay (CL) stiff, moist, brown, trace fine gravel, low plasticity							
			14	MC-1	84	22			
	5	**Lean Clay (CL)** stiff, moist, brown with reddish brown mottles, moderate plasticity	12	MC					
			11	MC-3	93	13		59	
		Sandy Silt (ML) stiff, moist, brown with gray mottles, fine sand, low plasticity; Silt = 45%, Clay = 14%	12	MC					
	10	**Fat Clay (CH)** stiff, moist, gray with dark gray mottles, some fine to medium sand, high plasticity	11	MC-5	81	37			
		Lean Clay (CL) stiff, moist, gray with reddish brown mottles, some fine to medium sand, moderate plasticity	11	MC					
			13	MC					
			12	MC-9	94	23			
	15	Bottom of Boring at 15.0 feet.							
	20								
	25								

Hydraulic Conductivity
ASTM D 5084
Method C: Falling Head Rising Tailwater

Job No:	640-109	**Boring:**	EB-1	**Date:**	09/24/08
Client:	Cornerstone Earth Group	**Sample:**	7	**By:**	MD/PJ
Project:	1655 Berryessa Rd - 278-1-1	**Depth, ft.:**	11.5	**Remolded:**	

Visual Classification: Gray Sandy CLAY

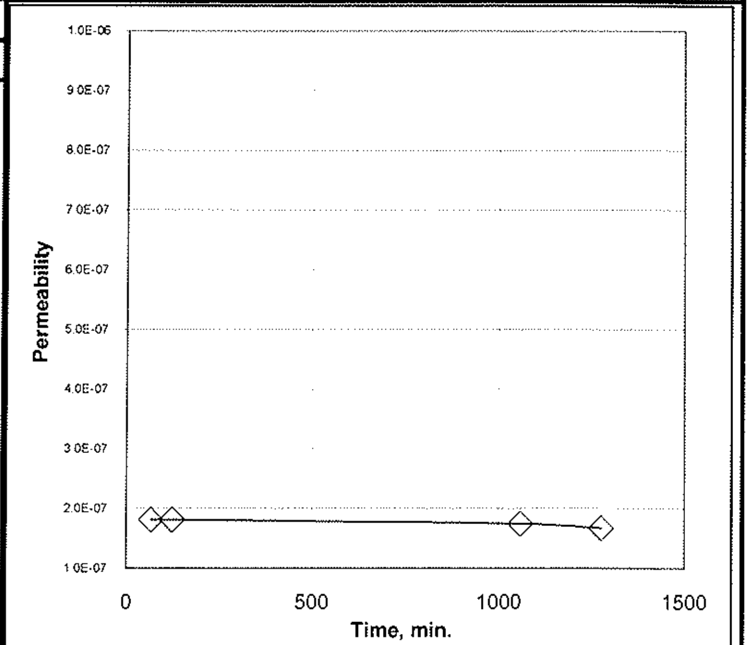
Max Sample Pressures, psi:

Cell:	Bottom	Top	Avg. Sigma3
84	79.5	77.5	5.5

B: = >0.95 ("B" is an indication of saturation)

Max Hydraulic Gradient: = 28

Date	Minutes	Head, (in)	K,cm/sec
9/18/2008	0.00	70.38	Start of Test
9/18/2008	67.00	69.68	1.8E-07
9/18/2008	125.00	69.08	1.8E-07
9/19/2008	1059.00	60.68	1.7E-07
9/19/2008	1276.00	58.78	1.7E-07



Average Permeability: 2.E-07 cm/sec

Sample Data:	Initial		Final
Height, in	2.50		2.49
Diameter, in	2.41		2.39
Area, in2	4.56		4.49
Volume in3	11.40		11.17
Total Volume, cc	186.9		183.1
Volume Solids, cc	108.1		108.1
Volume Voids, cc	78.8		75.0
Void Ratio	0.7		0.7
Total Porosity, %	42.2		41.0
Air-Filled Porosity, %	1.9		1.1
Water-Filled Porosity,%	40.3		39.8
Saturation, %	95.6		97.3
Specific Gravity	2.70	Assumed	2.70
Wet Weight, gm	367.1		364.7
Dry Weight, gm	291.8		291.8
Tare, gm	0.00		0.00
Moisture, %	25.8		25.0
Dry Density, pcf	97.4		99.5

Remarks:

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
Santa Clara Area, California, Western Part

September 11, 2021

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map (1655 Berryessa Road San Jose)

Map Scale: 1:4,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N 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: Santa Clara Area, California, Western Part
Survey Area Data: Version 9, May 29, 2020

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

Date(s) aerial images were photographed: Jun 11, 2021—Jun 16, 2021

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 (1655 Berryessa Road San Jose)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
102	Urban land, 0 to 2 percent slopes, alluvial fans	41.5	37.0%
131	Urban land-Elpaloalto complex, 0 to 2 percent slopes	4.8	4.3%
165	Urbanland-Campbell complex, 0 to 2 percent slopes, protected	63.9	56.9%
171	Elder fine sandy loam, 0 to 2 percent slopes, rarely flooded	2.0	1.8%
Totals for Area of Interest		**112.2**	**100.0%**

Map Unit Descriptions (1655 Berryessa Road San Jose)

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.

Santa Clara Area, California, Western Part

102—Urban land, 0 to 2 percent slopes, alluvial fans

Map Unit Setting

National map unit symbol: 2l7vm
Elevation: 0 to 300 feet
Mean annual precipitation: 14 to 30 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 275 to 325 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land, basins: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Basins

Setting

Landform: Alluvial fans, basin floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Disturbed and human transported material

Minor Components

Xerorthents, anthropogenic fill

Percent of map unit: 2 percent
Landform: Alluvial fans, basin floors
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

131—Urban land-Elpaloalto complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1nszz
Elevation: 10 to 390 feet
Mean annual precipitation: 14 to 24 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 275 to 325 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 70 percent
Elpaloalto and similar soils: 23 percent

Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Disturbed and human transported material

Description of Elpaloalto

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metamorphic and sedimentary rock and/or alluvium derived from metavolcanics

Typical profile

Oi - 0 to 8 inches: slightly decomposed plant material
A - 8 to 17 inches: clay loam
Bw1 - 17 to 26 inches: silty clay loam
Bw2 - 26 to 35 inches: silty clay loam
Bw3 - 35 to 47 inches: silty clay loam
Bw4 - 47 to 71 inches: silty clay loam
C - 71 to 94 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
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
Maximum salinity: Nonsaline to slightly saline (0.4 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Very high (about 13.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Still

Percent of map unit: 5 percent
Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Talf

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hangerone, drained

Percent of map unit: 2 percent
Landform: Basin floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

165—Urbanland-Campbell complex, 0 to 2 percent slopes, protected

Map Unit Setting

National map unit symbol: 1qsvl
Elevation: 0 to 240 feet
Mean annual precipitation: 14 to 24 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 275 to 325 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 70 percent
Campbell, protected, and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Disturbed and human-transported material

Description of Campbell, Protected

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metamorphic and sedimentary rock and/or alluvium derived from metavolcanics

Typical profile

Ap - 0 to 10 inches: silt loam
A1 - 10 to 24 inches: silt loam

A2 - 24 to 31 inches: silty clay loam
A3 - 31 to 38 inches: silty clay loam
2A - 38 to 51 inches: silty clay loam
2Bw1 - 51 to 71 inches: silty clay
2Bw2 - 71 to 79 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
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 content: 15 percent
Maximum salinity: Nonsaline to slightly saline (1.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Clear lake

Percent of map unit: 5 percent
Landform: Basin floors
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Newpark

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

171—Elder fine sandy loam, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

National map unit symbol: 1qsvn
Elevation: 0 to 430 feet

Mean annual precipitation: 14 to 24 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 275 to 325 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Elder, rarely flooded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elder, Rarely Flooded

Setting

Landform: Streams
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from metamorphic and sedimentary rock and/or alluvium derived from metavolcanics

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A1 - 1 to 5 inches: fine sandy loam
A2 - 5 to 18 inches: fine sandy loam
A3 - 18 to 31 inches: fine sandy loam
A4 - 31 to 51 inches: fine sandy loam
Ab1 - 51 to 55 inches: fine sandy loam
Ab2 - 55 to 67 inches: fine sandy loam
Ab3 - 67 to 85 inches: fine sandy loam
Bw - 85 to 87 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively 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: RareNone
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Caninecreek, gravelly substratum, rarely flooded

Percent of map unit: 8 percent
Landform: Streams
Landform position (three-dimensional): Talf
Down-slope shape: Linear

Across-slope shape: Linear
Hydric soil rating: No

Water

Percent of map unit: 2 percent
Landform: Streams
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Unranked

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties (1655 Berryessa Road San Jose)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than

9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Santa Clara Area, California, Western Part														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
102—Urban land, 0 to 2 percent slopes, alluvial fans														
Urban land, basins	—	—	—	—	—	—	—	—	—					
131—Urban land-Elpaloalto complex, 0 to 2 percent slopes														
Urban land	—	—	—	—	—	—	—	—	—					
Elpaloalto	0-8	-35-	-50-	0-15- 25	0.10-0.20-0.30	42.00-373.00-705.00	0.30-0.45-0.60	—	65.0-75.0-95.0			5	6	48
	8-17	-29-	-44-	20-27- 35	1.35-1.40-1.45	1.40-10.00-14.00	0.15-0.17-0.21	3.0- 4.5- 6.0	1.0- 2.0-3.0	.32	.32			
	17-26	- 3-	-59-	27-38- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	1.0- 1.4-2.0	.37	.37			
	26-35	- 1-	-59-	27-40- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.5- 0.7-1.0	.37	.37			
	35-47	- 4-	-56-	27-40- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.3- 0.4-0.8	.37	.37			
	47-71	-10-	-51-	27-39- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.3- 0.4-0.8	.37	.37			
	71-94	-17-	-50-	25-33- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.2- 0.3-0.5	.37	.37			

Physical Soil Properties–Santa Clara Area, California, Western Part														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
165—Urbanland-Campbell complex, 0 to 2 percent slopes, protected														
Urban land	—	—	—	—	—	—	—	—	—					
Campbell, protected	0-10	- 7-	-69-	20-24- 35	1.35-1.40-1.45	1.40-5.00-14.00	0.15-0.17-0.21	3.0- 4.5- 6.0	2.0- 3.4-4.0	.37	.37	5	6	48
	10-24	- 7-	-67-	25-26- 35	1.35-1.40-1.45	1.40-5.00-14.00	0.15-0.17-0.21	3.0- 4.5- 6.0	1.0- 1.4-2.0	.49	.49			
	24-31	- 7-	-65-	25-28- 35	1.35-1.40-1.45	1.40-3.00-14.00	0.15-0.18-0.21	6.0- 7.5- 9.0	0.5- 0.7-1.0	.49	.49			
	31-38	- 7-	-64-	25-29- 35	1.35-1.40-1.45	1.40-3.00-14.00	0.15-0.18-0.21	6.0- 7.5- 9.0	0.3- 0.4-0.8	.49	.49			
	38-51	- 7-	-64-	27-29- 35	1.35-1.40-1.45	1.40-3.00-14.00	0.15-0.18-0.21	6.0- 7.5- 9.0	0.3- 0.4-0.5	.49	.49			
	51-71	- 8-	-52-	35-40- 50	1.30-1.35-1.40	0.42-1.00-1.40	0.14-0.16-0.17	9.0-10.5-12.0	0.2- 0.3-0.4	.37	.37			
	71-79	- 7-	-48-	35-45- 50	1.30-1.35-1.40	0.42-1.00-1.40	0.14-0.16-0.17	9.0-10.5-12.0	0.1- 0.2-0.3	.32	.32			

Physical Soil Properties–Santa Clara Area, California, Western Part														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
171—Elder fine sandy loam, 0 to 2 percent slopes, rarely flooded														
Elder, rarely flooded	0-1	-35-	-50-	0-15- 25	0.10-0.20-0.30	42.00-373.00-705.00	0.30-0.45-0.60	—	65.0-75.0-95.0			5	3	86
	1-5	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 2.0-3.0	.20	.20			
	5-18	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 2.0-3.0	.20	.20			
	18-31	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.5-2.0	.24	.24			
	31-51	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.5-2.0	.24	.24			
	51-55	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.5-2.0	.24	.24			
	55-67	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.3-1.8	.24	.24			
	67-85	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	0.5- 0.8-1.0	.24	.24			
	85-87	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	0.5- 0.8-1.0	.24	.24			

Physical Soil Properties (1655 Berryessa Road San Jose)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity

(Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Santa Clara Area, California, Western Part														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
102—Urban land, 0 to 2 percent slopes, alluvial fans														
Urban land, basins	—	—	—	—	—	—	—	—	—					
131—Urban land-Elpaloalto complex, 0 to 2 percent slopes														
Urban land	—	—	—	—	—	—	—	—	—					
Elpaloalto	0-8	-35-	-50-	0-15- 25	0.10-0.20-0.30	42.00-373.00-705.00	0.30-0.45-0.60	—	65.0-75.0-95.0			5	6	48
	8-17	-29-	-44-	20-27- 35	1.35-1.40-1.45	1.40-10.00-14.00	0.15-0.17-0.21	3.0- 4.5- 6.0	1.0- 2.0-3.0	.32	.32			
	17-26	- 3-	-59-	27-38- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	1.0- 1.4-2.0	.37	.37			
	26-35	- 1-	-59-	27-40- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.5- 0.7-1.0	.37	.37			
	35-47	- 4-	-56-	27-40- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.3- 0.4-0.8	.37	.37			
	47-71	-10-	-51-	27-39- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.3- 0.4-0.8	.37	.37			
	71-94	-17-	-50-	25-33- 40	1.35-1.40-1.45	1.40-2.00-4.00	0.17-0.19-0.21	3.0- 4.5- 6.0	0.2- 0.3-0.5	.37	.37			

Physical Soil Properties–Santa Clara Area, California, Western Part														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
165—Urbanland-Campbell complex, 0 to 2 percent slopes, protected														
Urban land	—	—	—	—	—	—	—	—	—					
Campbell, protected	0-10	- 7-	-69-	20-24- 35	1.35-1.40-1.45	1.40-5.00-14.00	0.15-0.17-0.21	3.0- 4.5- 6.0	2.0- 3.4-4.0	.37	.37	5	6	48
	10-24	- 7-	-67-	25-26- 35	1.35-1.40-1.45	1.40-5.00-14.00	0.15-0.17-0.21	3.0- 4.5- 6.0	1.0- 1.4-2.0	.49	.49			
	24-31	- 7-	-65-	25-28- 35	1.35-1.40-1.45	1.40-3.00-14.00	0.15-0.18-0.21	6.0- 7.5- 9.0	0.5- 0.7-1.0	.49	.49			
	31-38	- 7-	-64-	25-29- 35	1.35-1.40-1.45	1.40-3.00-14.00	0.15-0.18-0.21	6.0- 7.5- 9.0	0.3- 0.4-0.8	.49	.49			
	38-51	- 7-	-64-	27-29- 35	1.35-1.40-1.45	1.40-3.00-14.00	0.15-0.18-0.21	6.0- 7.5- 9.0	0.3- 0.4-0.5	.49	.49			
	51-71	- 8-	-52-	35-40- 50	1.30-1.35-1.40	0.42-1.00-1.40	0.14-0.16-0.17	9.0-10.5-12.0	0.2- 0.3-0.4	.37	.37			
	71-79	- 7-	-48-	35-45- 50	1.30-1.35-1.40	0.42-1.00-1.40	0.14-0.16-0.17	9.0-10.5-12.0	0.1- 0.2-0.3	.32	.32			

Physical Soil Properties–Santa Clara Area, California, Western Part														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
171—Elder fine sandy loam, 0 to 2 percent slopes, rarely flooded														
Elder, rarely flooded	0-1	-35-	-50-	0-15- 25	0.10-0.20-0.30	42.00-373.00-705.00	0.30-0.45-0.60	—	65.0-75.0-95.0			5	3	86
	1-5	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 2.0-3.0	.20	.20			
	5-18	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 2.0-3.0	.20	.20			
	18-31	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.5-2.0	.24	.24			
	31-51	-69-	-16-	10-15- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.5-2.0	.24	.24			
	51-55	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.5-2.0	.24	.24			
	55-67	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	1.0- 1.3-1.8	.24	.24			
	67-85	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	0.5- 0.8-1.0	.24	.24			
	85-87	-71-	-17-	10-13- 18	1.40-1.50-1.60	14.00-20.00-42.00	0.13-0.14-0.15	0.0- 1.5- 3.0	0.5- 0.8-1.0	.24	.24			

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