SOILS

Baldwin Hills Project

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INTRODUCTION

The following report summarizes findings of the preliminary geologic and soils engineering investigation performed on the subject property.

The soils found on the site are primarily of the Ramona Series and consist of loam and clay loam (map VI-1). Ramona Soils of this association which occur in the Los Angeles Basin are well drained and have slow subsoil permeability. The Soil Conservation Service's Land Capability Classification System identifies the Ramona Series with accompanying slope considerations as Class IVe-1. Soils in Class IV can be used for cultivation, but there are very severe limitations on the choice of crops. Subclass e is high risk of erosion. Capability unit 1 indicates slope considerations are responsible for the erosion risk. Land Capability Classification is an agricultural suitability based system and should not be used in inventories unless explained as such. This natural residual soil in the project area blankets bedrock and a paleosol called Fox Hills Relict Paleosol.

SOILS DESCRIPTIONS AND INTERPRETATIONS

General Description

According to the United States Department of Agriculture (USDA), the soils series in the Baldwin Hills are generally 1.5 meters (60 inches) ± thick including a surface layer of about 0.45 meters (18 inches) and subsoil of about 0.75 meters (30 inches) thick. The sustratum forms the rest of the soil and is underlain by bedrock or a change in sediment type. The surface layer usually contains organic matter. The amount varies according to distance from a source area. The subsoil is generally redder than the surface soil, more dense and compact, and ranges in texture from clay loam to clay. The soils are a reflection of the underlying bedrock. Where the clay loam predominates, the underlying bedrock consists of fine sand, siltstone and claystone of the Pliocene Pico Formation. The Pleistocene, San Pedro and Inglewood Formations underlie areas where loam predominates. Variations may occur as a result of topography. Soil type development may be disrupted or contaminated by the admixture of material from another source such as erosion material from upslope or by windblown deposition.

The surface layer of the clay loam consists generally of brown to dark gray loam. However, locally the surface layer contains clay adobe and occasional gravel. Its subsoil consists of a brown to a dark brown clay loam and clay which intergrades to hardpan which contains small lime concentrations.

Colluvium blankets the slope north of the west end of the proposed connector road and is present in the canyons. The colluvium conceals the traces of the Inglewood Fault in the vicinity of the proposed connector road. The colluvium consists of dark reddish-brown, moist, dense clayey sand. The colluvium was not penetrated by the test pits excavated by Kovacs-Byer and Associates for this project. but is expected to be less than 6.1 metters (20 feet) thick. Laboratory test results indicate that the colluvium is subject to excessive consolidation because of clay upon soaking and has a very low saturated shear strength because of sand.

Alluvial fan deposits underlie the fill in the vicinity of the western end of the proposed connector road. The alluvial fan deposits consist of yellow-brown, moist, and dense sandy silt. Portions of the deposit are moderately well indurated and are poorly bedded.

The secondary ridge south of the proposed connector road is capped by up to 15 feet of ancient soil called the Fox Hills Relict Paleosol (CDMG, 1980). The deposit resembles alluvial terrace deposits and is called a cap deposit by Castle (1960, USGS open file report). The paleosol consists of poorly sorted brown to red-brown, moist, dense clayey sand and gravel.

Bedrock underlying the site consists of poorly to well indurated sandstone and conglomerate of the San Pedro Formation overlying well indurated siltstone and sandstone. The San Pedro sandstone and conglomerate is mapped as part of the Palos Verdes Formation by the California Department of Water Resources (1964) and by the unpublished geologic map of the Baldwin Hills from the collection of U.S. Grant. R.O. Castle has mapped this unit as poorly consolodated gravelly sand of Quaternary Age (USGS 1960). Saul and Weber have mapped this unit as the Baldwin Hills Sandy Gravel (CDMG 1980). The sandstone and conglomerate is light brown, thickly bedded, medium to coarse-grained, poorly indurated, and dense.

The well indurated siltstone and sandstone unit is mapped as part of the Quaternary Inglewood Formation (CDMG 1980). The unpublished map of the Baldwin Hills, from the collection of Grant, maps this unit as the Tertiary Pico Formation. Castle (1960) has mapped this unit as Tertiary-Quaternary, moderately well-consolidated, clayey sand and silt.

Constraints and Sensitivities

The soils covering the Baldwin Hills are mostly residual, that is they were formed in place by weathering of sedimentary bedrock and alluvial sediments. These soils are presently being dissected after having been unlifted by geologic process. Although originally well developed and continuous, the residual soils have been partially or completely removed or covered by erosion and grading. Artificial fill designates areas where the soil may be covered by man placed fill material. In some areas, the soil may have been partially removed prior to the placement of fill. In several places, much difficulty exists in distinguishing where the residual soils have been removed either by the works of man, as by grading or by natural means, as by erosion.

Soils investigations have identified contaminated soils resulting from both drilling and oil production activities. The contaminants include various types of grease and oils associated with the performance and maintenance of a drilling rig, rock cuttings stained with oil which were derived from the actual drilling process, the drilling mud consisting of bentonite and added chemicals used to bring the cuttings to the surface and oil spills associated with the production phase. These contaminated soils are not a suitable media for the location of structure foundations or sites for landscaping. Preliminary estimates indicate that over 130,000 cubic yards of contaminated soil must be removed to reach uncontaminated soils. Table VI-1 describes various properties of loam and clay loam type soils and table VI-2 describes their potential engineering uses.

SOILS MAP

Preparation of the soils map involved modifying information about soils of the Los Angeles Area compiled by Nelson in 1919. A 1970 blue-line aerial photographic print at a scale of 1:4800 was used to determine graded areas and a geologic map prepared by Engineering Geology Consultants, Inc. was used to determine the extent of artificial fill in the graded areas. Rock Land is designated on the map where bedrock is exposed either by natural processes or by grading.

Other information sources used to modify the original soil information include a 1969 USDA report and general soil map of Los Angeles County and 1970 soils survey for the Antelope Valley area. Los Angeles County Soils Engineering Section soil reports and reports and reports by private consultants for areas inferred to have the same soils as the study areas were also used.

Conflicting designations for the soil types occurring in the Baldwin Hills area present in the USDA publications and in Nelson's 1919 study. According to the dominant texture, the soil types could be grouped into two categories as shown on the accompanying

TABLE VI - 1 GENERALIZED SOIL TYPES & PROPERTIES

PROPERTY	ARTIFICIAL FILL	LOAM	CLAY LOAM	ROCK LAND
PERCENTAGE PASSING SIEVE				
Larger than 3"	Variable (see Geology)	95-100	98-100	Variable (see Geology)
#4	"	85-100	90-100	"
#10	"	80-95	90-100	"
#40	"	60-70	85-95	"
#200	"	40-55	60-80	"
CLASSIFICATION				
Dominant USDA Texture	Variable (see Geology)	Loam	Clay Loam	Variable (see Geology)
Unified	"	SM to ML	CL	"
AASHO	"	A - 4	A - 6	"
MAXIMUM DRY DENSITY (lbs. per cubic foot)	Variable (see Geology)	95-115	100-120	Variable (see Geology)
OPTIMUM MOISTURE (%)	Variable (see Geology)	9-15	15-22	Variable (see Geology)
ATTERBERG VALUES				
Liquid Limit	Variable (see Geology)	0-35	30-40	Variable (see Geology)
Plastic Index	"	0-10	15-20	"
TYPICAL DEPTH (inches)	Variable (see Geology)	60	72	Variable (see Geology)
ALLOWABLE SOIL PRESSURE	"	Moderate 1000-2000	Moderate 1000-2000	"
CORROSIVITY	"	Low	Moderate	"
SHRINK-SWELL POTENTIAL	"	Low	Moderate	"
PERMEABILITY (inches/hour)	"	0.63 (moderate)	0.20-0.63 moderately slow	"
WATER HOLDING CAPACITY (inches per inch of soil)	"	0.14-0.17	0.14-0.19	"
REACTION (pH value)	"	6.1-7.3 (slightly to neutral)	6.6-7.8 (neutral to mildly alkaline)	"
SANITARY ABSORPTION CAPACITY (sq. foot per 100 gallons)	"	40	40-60	"
SALINITY (Mmhos cm. @ 25° C.)	"	0-2	0-2	"
RUNOFF	"	Slow to Medium	Slow	"
EROSION HAZARD	"	Slight to Moderate	Slight	

TABLE VI - 2 ENGINEERING USES

	ARTI-FICIAL FILL [1]	LOAM	CLAY LOAM	ROCK LAND [1]
Topsoil		Fair: Loam and Clay Loam	Unsuitable	
Suitability as Source of:				
-Sand & Gravel		Unsuitable	Unsuitable	
-Road Fill		Fair	Fair	
Road Location		Most features favorable	Slow permeability moderate shrink-swell	
Soil Features Affecting Water Retention				
-Embankments		Low strength & low stability; subject to piping & cracking	Low strength medium compressibility, low stability	
-Reservoir Area		Moderate slow permeability in subsoil	Slow permeability	
Irrigation		High water-holding capacity; moderate slow permeability	High water-holding capacity, slow permeability	

[1] Too varied to be mentioned.

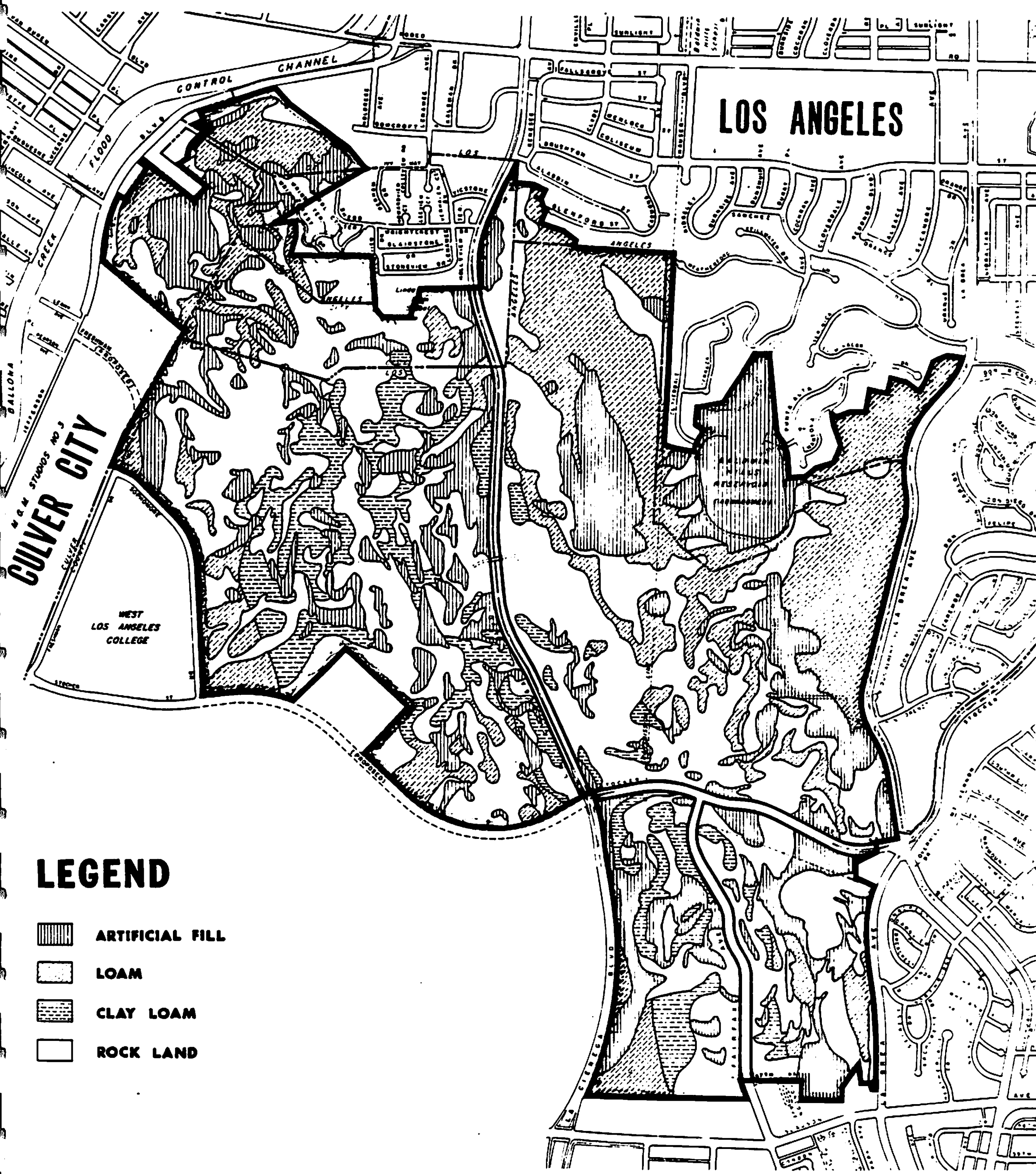
soil map (map VI-1). If the soil contains a high percentage of silt and clay, it has been included in the "clay loam" category. Soil with a large percentage of sand has been included in the "loam" category. Conflicting soil-type designations have been resolved by basically following the USDA 1969 designation. As a result, the soil categories on the accompanying generalized soil map as would be expected in properties, and may include a soil horizon designated by the other category.

Reproduction and enlargement of source maps produced some distortation in matching maps for manual transfer of data. Additionally, areas smaller than about 465 square meters (5,000 square feet) have been omitted, creating error in a few soil contact lines. Elevations are not shown on the map. The soil map should be adequate for land-use planning of the Baldwin Hills.

The USDA soil surveys for the Malibu and Antelope Valley areas, with modification based on the Portland Cement Associations and the 1962 Soil Primer form the basis of information in tables VI-1 and VI-2. The soil descriptions in Nelson's report have been matched as closely as possible to soil types described in the USDA surveys. These tables include the range of the soil properties and their use.

RECOMMENDATIONS

The soil map should be restricted to planning uses. Any use for design purposes should be supplemented field exploration and laboratory testing. As an example, the limitation of determining the



NORTH

0 400 1200 1600 feet

SOILS

BALDWIN HILLS PROJECT

MAP VI-1

stoniness of the soils is high since available literature only mentions the presence of gravels as being in an area which may include the Baldwin Hills. Areas of gravelly soil are present within the project area. Their exact locations cannot be ascertained without detailed field mapping.

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