GEOLOGY OF THE PUENTE HILLS REGION IN THE PUENTE QUADRANGLE

by N. R. Park

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

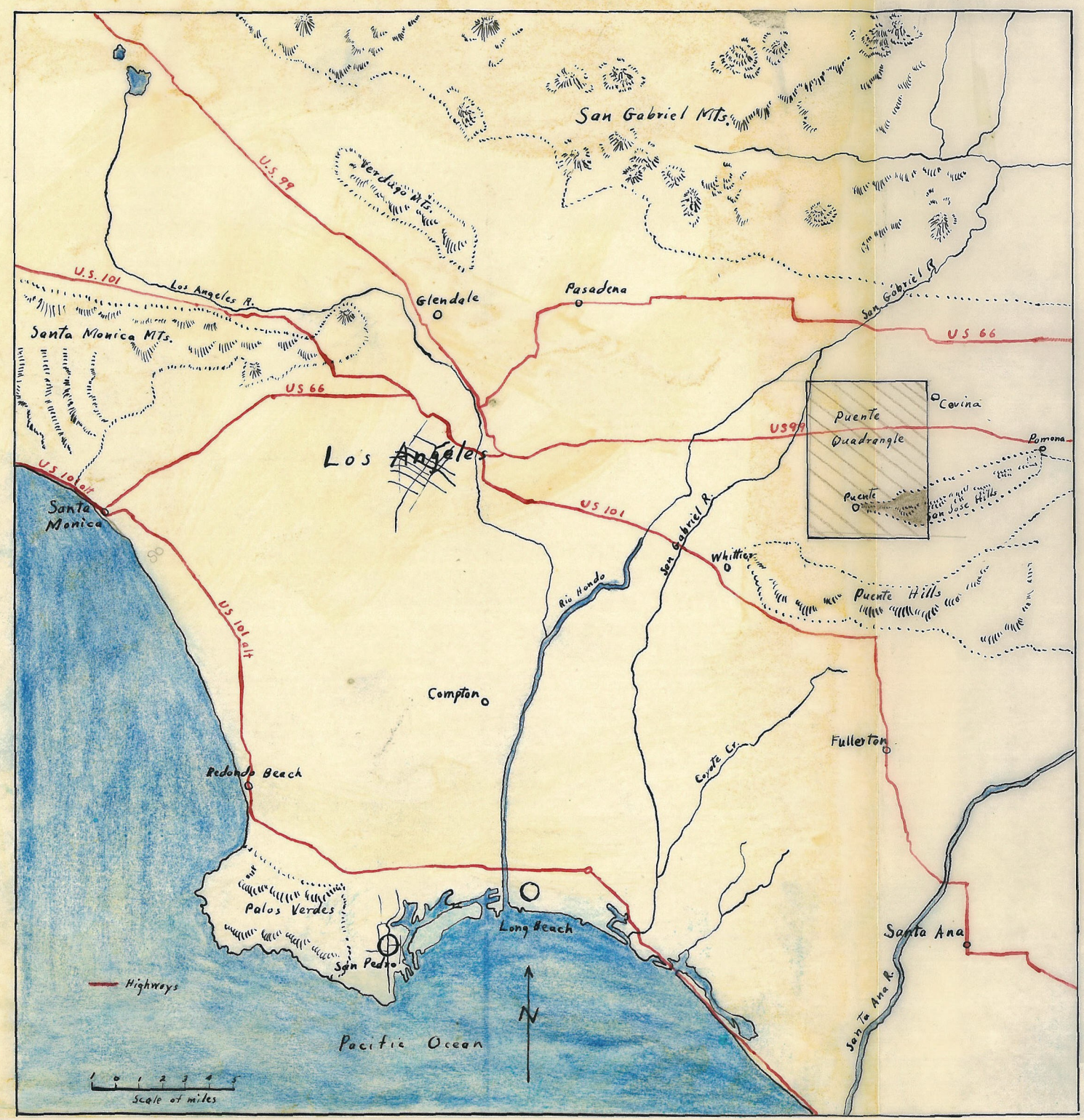
INTRODUCTION

The area mapped is located in the portion of the Puente Hills just east of the town of Puente. The problem was to map the region shaded in brown on the index map. The area hatched in brown is the Puente Quadrangle, which is the map used.

Geographical names are vaguely defined in this part of Southern California. The United States Geological Survey has called the nearly isolated group of hills between Puente and the Pass and Covina Road, part of the Puente Hills, and the large group of hills between this road and the city of Pomona, the San Jose Hills. Other definitions will be omitted from this paper in order to avoid confusion, so the name Puente Hills, as far as this region is concerned, applies only to the small cluster of hills mentioned above.

The area chosen was bounded by the San Gabriel Valley on the north, Puente Valley on the south, the east border of the Puente Quadrangle, and the town of Puente on the west. Field work was conducted in this three and one-half square miles plot for sixteen days, with the purpose being a structural field problem for a Bachelor's thesis at the California Institute of Technology. The base map, the Puente Quadrangle of the United States Geological Survey, edition of 1927, was excellent to work with, as the scale was 1:24,000, and the contour interval in the hilly country was twenty-five feet.

Index Map



Field Area is shaded in brown

Strikes and dips, accurate in most cases to plus or minus three degrees, were obtained with a Brunton Compass. The estimate does not account for the slumping of surface outcrops, nor does it apply to the attitude of poorly bedded outcrops. A few dips and strike readings do not fit in the general picture, [redacted], nor can they be explained in any way other than mistakes or minor flexures.

All of the contacts were traced as accurately as natural conditions allowed. In the parts of the region devoted to pasturage, the only hindrance to exact tracing of the contact was cactus, as outcrops were abundant and most of the rock was in place. Unfortunately, much of the area was under cultivation which removed all of the surface outcrops and destroyed any trace of the contact. The change between conglomerate and shale in these places could only be determined to within two hundred feet.

Previous Publications

The only paper previously published on the Puente and San Jose Hills giving more than a paragraph was United States Geological Survey Bulletin 768, Geology and Oil Resources of The Puente Hills Region, Southern California, by Walter A. English. English discusses this area in general, omitting a few of the minor details and giving a clear picture of the larger geologic relations of the hills between Whittier and Santiago Canyon in the Santa Ana Mountains.

System	Series	Formation	Symbol	Columnar Section	Thickness in feet	Character and Distribution
Quaternary	Recent	Valley Alluvium Unconformity	Qal		0' 0-? average is 50(?)	Unconsolidated silt, sand, and gravel in valleys and wide canyons
Tertiary	Probably Upper Miocene or perhaps Lower Pliocene (?)	Puente Upper shale Zone (1)	Tpush (1)	1000'	about 1275	Yellowish, diatomaceous shale - loosely cemented. Found on westernmost Tip of hills just east of Town of Puente.
		Puente Upper Conglomerate Zone (a)	Tpucgl (a)	2000' 3000'	450 to 1975	Rounded, tan cobbles in sandstone matrix with shale and sandstone lenses. Exposed on NW portion of the group of hills east of Puente.
		Puente Upper Shale Zone (2)	Tpush (2)	4000'	350 to 825	A narrow band of diatomaceous shale with lenses of ss. and cgl. extending north eastward Through the western Tongue of the hills.
		Puente Upper Conglomerate Zone (b)	Tpucgl (b)	5000'	600 to 1325	A fairly well consolidated and rounded conglomerate containing sh. & ss. lenses outcropping on the east side of the Pass and Covina Road.
		Puente Upper Shale Zone (3)	Tpush (3)	6000' 7000'	30 to 2000(?)	A hard, diatomaceous shale occuring in the hills NE of Rowland.
		Puente Upper Conglomerate Zone (c)	Tpucgl (c)	8000'	225 to 700	Poorly consolidated, rounded cobbles forming a U-shaped band over the anticline in the NE part of the area.
		Puente Upper Shale Zone (4)	Tpush (4)	9000'	about 1900	Loosely cemented, diatomaceous shale outcropping in NE part of the area.

PHYSICAL CONDITIONS

Relief and Elevation

The relief is low, being in general about two or three hundred feet and a maximum of five hundred feet. The valley floor at the base of the hills is about four hundred feet above mean sea level, and the maximum altitude of the region mapped is a knoll in the western part of the San Jose Hills, 954 feet above mean sea level.

The hills are round topped and the canyon bottoms flat, giving a gentle undulating topography with few steep slopes and very few sharp ridges or narrow canyons.

Drainage

In many places the streams drain into San Jose Creek which flows westward in the Puente Valley, while a few on the extreme north slope of the San Jose Hills drain into Walnut Creek, another westward flowing stream.

Vegetation

In many places the vegetation indicates the rock upon which it grows. A large quantity of cactus is found on the conglomerate slopes of uncultivated land. A tall, straight, slender, pithy type of plant is commonly found in shaly areas. Occasionally live oak trees, California Holly and needle grass are found. Hay is the chief product on cultivated land, and a hindrance to geological work in Winter and Spring months.

Good exposures are numerous on unfarmed land. The portion planted with hay shows no outcrops unless one is fortunate enough to find a little gully that recent rains have washed off the top soil exposing the underlying rock.

The region is easily accessible both to cars and on foot, cactus being the chief vegetation obstacle.

GEOLOGIC CONDITIONS

Stratigraphy and Lithology

The columnar section on the preceding page gives the rock succession with the maximum thicknesses shown. From English's report on this region[1] one finds that nearly all of the San Jose Hills are composed of upper Puente members except for the extreme east end.

The latest material deposited is the Quaternary alluvium unconformably overlying zone (1) of the Puente upper shale. Filling the valleys and canyons to an unknown depth, it gradually pinches out against the hill slopes. The thickness for diagrammatical purposes was assumed as fifty feet. Generally light colored, it consists of poorly sorted cobbles, gravel, sand and silt transported by [redacted] streams from the elevated land. The coarse material is mostly lenticular, and the attitude is nearly flat.

The Puente upper shale consists of four zones, indistinguishable, but at different stratigraphic horizons. Lithologically, they will be considered as one unit. These shale zones are interbedded with zones of the Puente upper conglomerate, giving gradational contacts in some places and

[1] English, Walter A, Geology and oil resources of the Puente Hills region, Southern California; with a section on the chemical character of the oil, by Paul W. Prutzman, U.S. Geol. Survey Bulletin 768, Plate I, 1926.

sharp, clearly distinguishable boundaries in others. The shale is largely siliceous as evidenced by its bluish-white color. The only recognizable dark mineral present is biotite, with feldspar as the principal light colored mineral. It often grades vertically into a brown sandy shale or even a brown sandstone. Occassionally conglomerate lenses occur, and now and then a limy bed is observed. The two lower zones appear to be better compacted since hard chips are found among the surface rubble, although most of the material is soft and crumbly. According to English[2] the shale contains a large amount of diatom skeletons. When fresh, the color of the silicious shales is white or bluish-white, the sandy shale being a yellowish-brown, both weathering to a browner color, with a rich black soil as the final product.

In considering thickness and distribution, the various zones will be discussed separately. Zone (1) dips under the valley alluvium leaving only about 1275 feet outcropping on the slopes of "P" hill (N 67° E and 3800 feet from B.M. 329 along the Southern Pacific Railroad in Puente). Zone (2) varying from 350 to 825 feet thick, outcrops in a narrow northeast trending band in the center of the cluster of hills

[2]English, W. A. op. cit., p. 37

lying between Puente and the Pass and Covina Road. The hay covered hills north of Marne Siding on the Southern Pacific Railroad contain good exposures of zone (3). As the strikes and dips were few in number, the thickness was roughly estimated as between thirty and two thousand feet. Nineteen hundred feet thick as far as the limits of the map show, zone (4) appears in the crest of the San Jose Hills, N 46° E and 5000 feet from turn 441 on the Pass and Covina Road.

The Puente upper conglomerate, interbedded with Puente upper shale, occurs also in zones which can be distinguished only by stratigraphic position. The fragmental constituents vary from one-quarter of an inch to eight inches in diameter with most of them ranging from one and one-half to four and one-half inches in diameter. They are mostly sub-rounded and sub-angular pieces, but some are rounded and a few are angular.

The rock content of the conglomerate is about fifty-four per cent granite mica gneiss, nineteen per cent granite, nineteen percent andesite and rhyolite (gray to pink and some vesicular pebbles), five per cent red basalt (partly vesicular and color ranges from scarlet to maroon), one percent vein quartz, and three percent miscellaneous rocks (such as: volcanic breccia, schists, basic igneous rocks and quartzite). The matrix is a brown sandstone containing mostly quartz and feldspar. The color, a yellow-brown, is due to ferric oxide stain. In general, the sorting is poor, although good in spots, and the rock is fairly well indurated, forming many outcrops and reef beds in uncultivated land. The derived

soil is light, brown and gravelly.

This member contains numerous thin shale lenses a fraction of an inch thick and several conglomerate lenses a few feet thick.

There are three zones of this conglomerate member and zone (a), from 450 to 1975 feet thick, outcrops east and northeast of "P" hill. Zone (b) occupies the west slope of the hills east of the Pass and Covina Road, and is 600 to 1325 feet thick. Zone (c) is 225 to 700 feet thick, forming a narrow band over the anticline in the northern part of the San Jose Hills.

Age

English[3] considers the Puente formation as Upper Miocene with a possibility of part of the upper member being lower Pliocene, but he calls the whole formation Miocene because of the absence of any unconformity.

Some fossil material was found at locality #3 (N 46° E and 4500 feet from turn 441 on the Pass and Covina Road), in a coarse sandstone lens in the upper shale. Dr. Willis Popenoe, of the California Institute of Technology, said it was too broken up to be of any use. There were some fragments of Pecten and Oyster with one fish vertebra.

[3]English, W.A., Op. Cit., pp. 37 and 39

Dr. Chester Stock reported the discovery of a Hipparion tooth in the Puente upper shale[4] south of Covina. The species was determined to be Hipparion mohavense Merriam whose type locality is the Ricardo. Stock states, "The Ricardo fauna has been regarded as lower Pliocene in age. In recent years, however, the assemblage has been considered as belonging perhaps to the late Miocene rather than to the early Pliocene". Upon this basis the upper Puente is late Miocene.

After considering the evidence presented by both men, the upper Puente members will be considered as upper Miocene in this paper.

[4]Stock, Chester, A tooth of Hipparian mohavense from the Puente Formation, California, Carnegie Institution of Washington Publication No. 393, pages 49 to 53, 1928.

STRUCTURE

The general structure of the San Jose Hills as mapped by English, is a series of broad folds trending in an east-west direction. He found few faults.

In the Puente Hills, one small fault was found and no fracturing was noticeable in the San Jose Hills. Folds are the chief effect of diastrophism. The competent conglomerate beds kept the folds on a broad scale, but there has been a large amount of minor flexures in the shale member.

The fault is located due north of Rowland and trends N 19° W, dipping steeply eastward. It is a small fault with a horizontal slip of 150 feet, as shown by the displacement of the anticlinal axis, and a horizontal shift of the magnitude of one thousand feet when considering the drag effects in the shale bed. The west block has moved northward with respect to the east block. The vertical component can only be estimated since the stratigraphy cannot be determined accurately enough to give the correct displacement. The west block has sunk with respect to the east by a maximum of 2500 feet, probably less. This value was arrived at by considering the position of the shale bed in an anticline before faulting took place, and comparing it with the place it may be at present. This computed displacement was assumed as maximum. The field evidences for this fault are:

(1). The sudden cutting out of the shale zone (3).

(2). The marked change in attitude of the beds on

either side of the fault.

The actual fracture was not found, nor was there any gouge or other material commonly found along a fault plane. This reverse fault dies out northward because zone (2) of the shale continues on across its strike without a break.

Most of the folds are open and broad with the exception of the overturned anticline east of the faults. The average dip of the folded beds is between 35 and 40 degrees. The anticline east of the fault is considered overturned because:

(1). Areas of very intense crumpling (denoted by ~~ on the map) accompanied by minor thrusting are found in the sides of the canyon east of the fault (locality #2, N 2° E and 3700 feet from Rowland School).

(2). Structural explanation of the shale bed would be difficult if the anticline were not overturned.

The broad folds consist of a syncline between two anticlines, all three of which are trending approximately N 80° W and plunging approximately thirty degrees westward. A secondary syncline separating the Puente Hills from the San Jose Hills, plunges about 37 degrees northward and trends N 18° W. It is shallow and the axis is only approximately located.

There are two areas showing landsliding (locality #4;

N 23°E and 5000 feet from turn 441 on the Pass and Covina Road, and locality #5; N 4° W and 4300 feet from the same point) which is shown by hummocky topography. The contact between shale zone (3) and conglomerate zone (b) north of locality #5 has been pushed northward about five hundred feet and overturned.

The island of conglomerate just south of locality #5 is just a large lens.

GEOLOGIC HISTORY

During the deposition of the interbedded shale and conglomerate, the earth's surface alternately rose and fell. The depth of the sea was never very great. Conglomerate was deposited near the shore line when the sea was shallow. As the sea-bottom sank, shale was laid down where conglomerate was previously dumped.

The deposition of the Puente members was stopped by an uplift in Pliocene time accompanied by folding. Since the fault cuts the axis of an ~~antiloine~~ anticline and overturns part of it, it is post-folding. The landsliding is probably Recent because topographic evidence is still present. The uplands are at the present undergoing erosion, and the loose material is carried by streams into the canyons and valleys where it is deposited as alluvium.

SUMMARY

The Puente Hills and San Jose Hills is a readily accessible area of gently ~~undulating~~ undulating topography.

Several interbedded zones of both conglomerate and shale form the upper members of the Puente formation. The indurated conglomerate contains rounded fragments, and the silicous shale is soft and crumbly.

The folds, the chief effect of diastrophism, are broad with the exception of an anticline overturned by the single small fault. The fault dips steeply eastward, and the east-west folds plunge westward.

The sediments were first deposited upon an alternately rising and falling coast line, followed by uplift and folding. Faulting cut the folding and land-sliding occurred in early Recent. Quaternary alluvium is now accumulating.

STRUCTURE SECTIONS

Scale 1"=1000'

1000 0 2000 Feet

Elevation — feet above mean sea level