March 1, 2012

Mike O'Connell, P.E.
275 Juanita Avenue
Pacifica, California 94044

**Subject: Preliminary Geotechnical Report**
**900 Rosita Road, Pacifica, California**

## PROPOSED DEVELOPMENT:

The purpose of this report is to identify soil conditions at the site, potential impacts per the Environmental Checklist that relate to geology and soils, and to provide preliminary design parameters. The proposed development consists of a three story single family home and a detached garage.

## SITE CONDITIONS:

The site is nearly level. There are no structures on the site, but there is a severely distressed paved road and curb and gutter that will be removed as part of the development. The earthen materials observed include a thin layer of top soil over approximately 21 inches of dark brown and brown loam. Below that a yellowish brown clay loam was found. The materials may include Qam medium-grained alluvium and Qac coarse-grained alluvium. The site soils are moderately expansive.

Liquefaction is not likely. There are no known active faults through the site or within 50' of proposed construction (California Division of Mines and Geology). The San Andreas Fault is the most likely to produce greatest intensity during a seismic event. The San Andreas Fault is located approximately 4 miles to the northeast and produced an estimated magnitude 8.3 earthquake in 1906 which lasted between 40 and 60 seconds and is considered by many to be the maximum credible earthquake. Other faults that have the potential to produce a significant seismic event are the San Gregorio-Seal Cove fault mapped approximately 2 miles to the southwest and the Hayward fault mapped approximately 22 miles to the northeast.

Given the level terrain of the property and proximity to the upward slopes of Montara Mountain, landslides are not likely at the site. Due to the lack of topography, the development should not result in substantial soil erosion if proper drainage is installed.

## FIELD EXPLORATION:

An exploratory test pit was dug near the center of the site, within the footprint of the proposed residence. The test put was 2' deep. We encountered a thin layer of top soil, approximately 21" of dark brown loam, and yellowish brown clay below that.

## SEISMIC DESIGN:

The following seismic design criteria should be used be the project engineer based on the 2010 California Building Code:

- Latitude and Longitude: 37.5856, -122.4977
- Site Soil Class: D
- Soil Factors: Fa=1.0, Fv=1.5
- Spectral Response Acceleration Values: Ss=1.970, S1=0.921 (Site Class B)

## FOUNDATION DESIGN:

We recommend that the proposed development be supported on conventional continuous spread footings. The footings should be a minimum of 15" wide and extend at least 18" deep to bear on the native alluvial soil. They should be designed for an allowable bearing pressure of 1,500 PSF for dead and live loads, with a 1/3 increase for wind and seismic loads. A passive equivalent pressure of 150 PCF beginning at the ground surface and a coefficient of friction of 0.25 can be used to resist sliding.

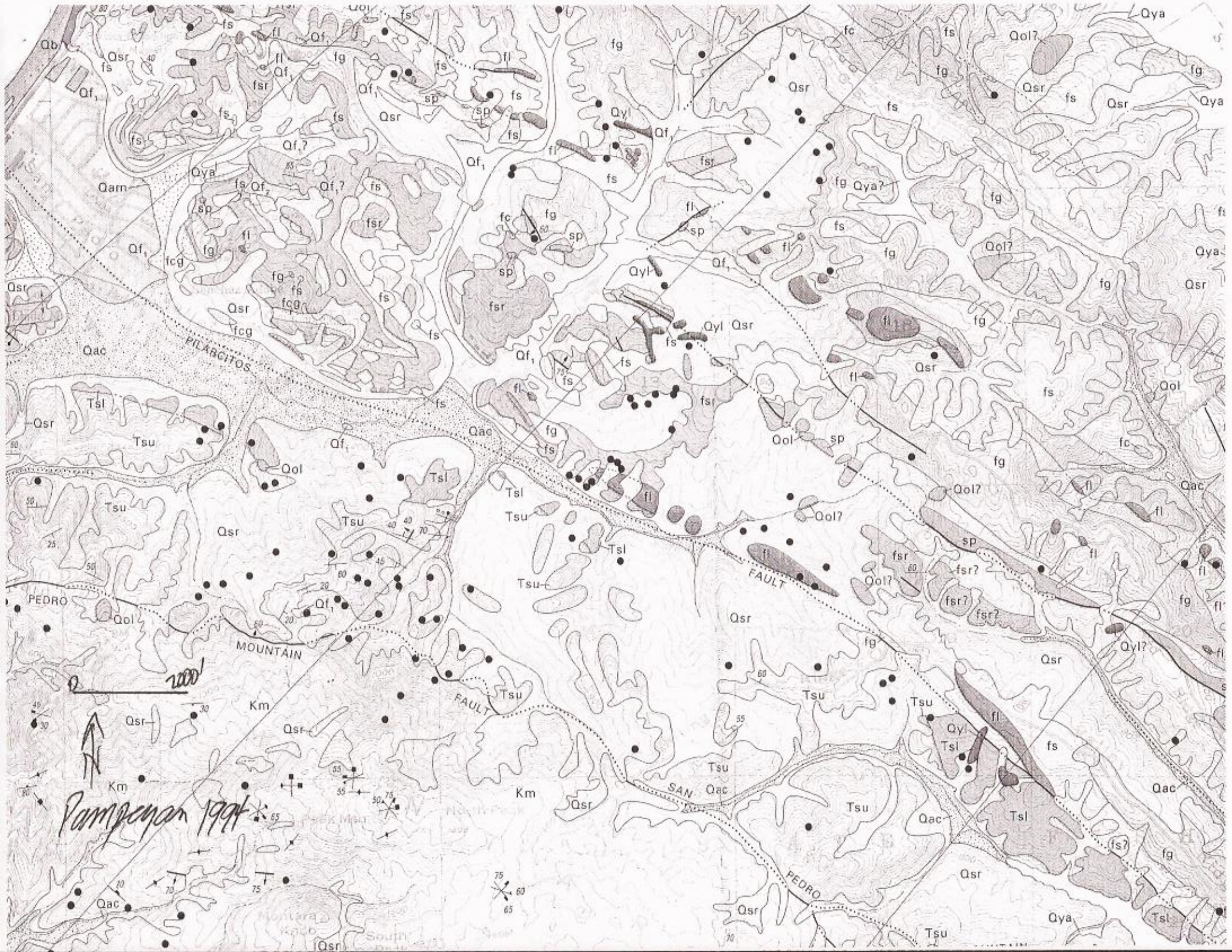
Interior floor slabs should be constructed with a moisture break that consists of 5" of crushed rock, a vapor barrier, and 2" of clean sand. The slab on grade should be 5" thick with reinforcing spaced at no greater than 18" in each direction and adequate control joints to control cracking.

## DRAINAGE DESIGN:

We recommend that the roof downspouts be connected to a tightline and discharged to the existing storm drain system in Rosita Road. The clay content of the soil will prevent infiltration of the runoff into the natural ground.

Sincerely,

Mike O'Connell, P.E.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alluvial deposits. Locally interfingers with or includes slope wash, ravine fill, and colluvium. In many places included with other alluvial deposits because of map-scale limitations

**QTs** **Sedimentary deposits, undivided (Holocene to Pliocene)**— Predominantly fine grained to coarse grained clastic deposits in densely urbanized flatland area adjacent to historic bay margin, where grading and landscaping have obscured geologic relations. As mapped, may locally include older alluvium (Qoa), slope wash, ravine fill, and colluvium (Qsr), Colma Formation (Qc), Merced Formation (Tme), and unnamed Tertiary and Quaternary coarse clastic deposits (Lajoie and others, 1974)

**Qaf** **Fine-grained alluvium (Holocene)**—Unconsolidated, poorly sorted, plastic, organic clay and silty clay in poorly drained interfluvial basins, usually at margins of tidal and marsh lands. Locally contains thin, well-sorted interbeds of sand and fine gravel; contains modern vertebrate and invertebrate fossils. Interfingers with bay mud (Qm) and medium-grained alluvium. Generally less than 10 ft thick

**Qam** **Medium-grained alluvium (Holocene)**—Unconsolidated to moderately consolidated, moderately sorted sand and silty to clayey sand chiefly forming alluvial plains along northeast edge of map area. Locally contains interbeds of well-sorted clay, silt, and gravel; contains modern vertebrate and invertebrate fossils. Interfingers with fine- and coarse-grained alluvium (units Qaf and Qac, respectively). Generally less than 20 ft thick

**Qac** **Coarse-grained alluvium (Holocene)**—Unconsolidated, moderately sorted sand and gravel forming stream levees, fans, and flood plains in and close to upland areas. Grades coarser headward. Locally contains lenticular interlayers of well-sorted silt, sand, and gravel; locally contains modern vertebrate and invertebrate fossils. Interfingers with medium-grained alluvium and colluvial deposits (units Qam and Qsr, respectively). Maximum thickness probably less than 75 ft

**Qsr** **Slope wash, ravine fill, and colluvium (Holocene)**—Unconsolidated to moderately consolidated deposits of sand, silt, clay, and rock fragments accumulated by slow downslope movement of weathered rock debris and soil. Composition dependent upon underlying rocks. Commonly unsorted and unbedded, but locally crudely layered by downslope movements. Mapped where thickness presumed to exceed 5 ft; as thick as 20 ft on north side of San Pedro Valley. Maximum accumulations commonly develop near bases of slopes underlain by sheared rock (fsr) of the Franciscan Complex. Deposits interfinger with alluvial deposits at bases of slopes. Locally includes alluvial deposits and older landslide deposits (Qol) too small to show at this scale. Numerous small shallow landslides (shown by small dots) occur in this unit on southwest flank of Montara Mountain

**Qm** **Bay mud (Holocene)**—Very poorly consolidated to well-consolidated, blue-gray to black silty clay with interspersed layers of sand, gravel, peat, and shell fragments. Bedding ranges from distinct to indistinct. Interfingers with fine-grained alluvium (Qaf). May be as thick as 100 ft near San Francisco International Airport (Hensolt and Brabb, 1990). Soft and plastic when wet; firm when dry. When wet has moderate to high potential for liquefaction under seismic loading conditions

**Qb** **Beach deposits (Holocene)**—Loose clastic deposits composed of sand- to cobble-size fragments in the tidal zone. Moderately well sorted by wave action. Along exposed coast thickness varies with seasons; maximum thickness probably less than 50 ft adjacent to El Granada breakwater in Pillar Point Harbor. Near Little Coyote Point beach deposits are composed mostly of oyster shell fragments; west of Coyote Point deposits are composed mostly of rock debris derived from artificial fill Deposits along Pacific Coast are derived mostly from granitic rock of Montara Mountain (Km)

**Qd** **Dune sand (Holocene)**—Loose, fine- to medium-grained, well-sorted, eolian sand. Present along Pacific Coast northeast of Shelter Cove and northeast of Mori Point. Unit may be as thick as 30 ft

**Qyl** **Younger landslide deposits (Holocene)**—Unconsolidated to moderately consolidated deposits whose composition and structure depend upon bedrock geologic unit involved and type of landslide. Considered to be active and (or) unstable. More younger landslide deposits may be present than are shown on this map

**Artificial fill (Holocene)**—Divided into:

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of San Andreas
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minerals

**fc** **Chert**—Massive t
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United States
Department of
Agriculture

Soil
Conservation
Service

1991

In cooperation with
the Regents of the
University of California
(Agricultural Experiment
Station)

# Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California

Use soil 111 or 112 for native



**110—Candlestick-Kron-Buriburi complex, 30 to 75 percent slopes.** This map unit is on coastal uplands. Slope is 30 to 75 percent. The native vegetation is mainly annual grasses, coastal brush, and forbs. Elevation is 200 to 1,350 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 54 to 56 degrees F, and the average frost-free period is 300 to 350 days.

This unit is 40 percent Candlestick fine sandy loam, 25 percent Kron sandy loam, and 20 percent Buriburi gravelly loam. The Candlestick soil is on the lower side slopes and toe slopes, and the Kron and Buriburi soils are on the upper and middle side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Candlestick soil is moderately deep and well drained. It formed in material weathered from hard, fractured sandstone. Typically, the surface layer is 14 inches thick. The upper part is brown fine sandy loam, and the lower part is brown loam. The subsoil is pale brown sandy clay loam about 10 inches thick. Hard, fractured sandstone is at a depth of 24 inches. The depth to bedrock ranges from 20 to 40 inches.

The Kron soil is shallow and well drained. It formed in material derived from hard, fractured sandstone. Typically, the surface layer is brown sandy loam about 3 inches thick. The underlying material to a depth of 14 inches is brown loam. Hard, fractured sandstone is at a depth of 14 inches. The depth to bedrock ranges from 10 to 20 inches.

The Buriburi soil is moderately deep and well drained. It formed in material derived dominantly from hard, fractured sandstone. Typically, the surface is covered with a mat of decomposed and undecomposed leaves and twigs about 2 inches thick. The surface layer is dark grayish brown gravelly loam about 3 inches thick. The underlying material to a depth of 30 inches is grayish brown gravelly loam. Hard, fractured sandstone is at a depth of 30 inches. In some areas the surface layer is loam. The depth to bedrock ranges from 20 to 40 inches.

Included in this unit are small areas of Barnabe soils; Orthents, cut and fill; and Rock outcrop. Also included are small areas of soils that have slopes of less than 30 percent or more than 75 percent, soils that are similar to the Candlestick soil but are more than 40 inches deep to bedrock, soils that are similar to the Buriburi soil but are loam throughout, and Typic Argiustolls. Included areas make up about 15 percent of the total acreage.

Permeability is moderately slow in the Candlestick soil and moderate in the Kron and Buriburi soils. The available water capacity is low or moderate in the Candlestick soil, very low in the Kron soil, and low in the Buriburi soil. Effective rooting depth is 20 to 40 inches in the Candlestick and Buriburi soils and 10 to 20 inches in the Kron soil. Runoff is rapid or very rapid on all three soils, and the hazard of water erosion is high or very high. The Candlestick soil is highly susceptible to slippage when it is wet, especially in the steeper areas.

This unit is used for recreational development or as wildlife habitat or watershed. Some areas are used for homesite development.

If this unit is used for recreational development, the main limitations are the slope, the susceptibility of the Candlestick soil to slippage, and the shallowness of the Kron soil. The slope limits the use of areas of the unit mainly to a few paths and trails, which should extend across the slope. Runoff should be diverted to prevent erosion of paths and trails. The plant cover can be maintained by limiting traffic. Cuts and fills should be seeded or mulched.

If this unit is used for homesite development, the main limitations are the slope, the susceptibility of the Candlestick soil to slippage, and the shallowness of the Kron soil. Cuts needed to provide essentially level building sites can expose bedrock. Excavation for roads and buildings increases the risk of erosion. Only the part of the site that is used for construction should be disturbed. Structures to divert runoff are needed if buildings and roads are constructed. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion.

This map unit is in capability subclass VIIe (15), nonirrigated.

**111—Candlestick Variant loam, 2 to 15 percent slopes.** This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from various kinds of rock. Slope is 2 to 15 percent. The native vegetation is mainly annual grasses and forbs. Elevation is 25 to 400 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 54 to 56 degrees F, and the average frost-free period is 300 to 350 days.

Typically, the surface layer is dark brown and brown loam about 21 inches thick. The subsoil to a depth of 60 inches or more is yellowish brown clay loam.

Included in this unit are small areas of soils that are similar to the Candlestick Variant soil but have more clay in the subsoil or are loamy throughout. Also included are small areas of soils that are less than 60

inches deep to bedrock or have slopes of more than 15 percent. Included soils make up about 10 percent of the total acreage.

Permeability is moderately slow in the Candlestick Variant soil. The available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow or medium, and the hazard of water erosion is slight or moderate.

This unit is used mainly for recreational development or as wildlife habitat or watershed. Some areas are used for homesite development.

If this unit is used for recreational development, the main limitation is the slope. The slope limits the use of areas of the unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining an adequate plant cover. The plant cover can be maintained by limiting traffic. Cuts and fills should be seeded or mulched.

If this unit is used for homesite development, the main limitations are the slope and the moderate shrink-swell potential. The risk of erosion is greater in the steeper areas. Only the part of the site that is used for construction should be disturbed. Structures to divert runoff are needed if buildings and roads are constructed. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. Mulch, fertilizer, and irrigation are needed to establish lawn grasses and other small-seeded plants.

Buildings and roads should be designed to offset the effects of shrinking and swelling. Shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has a low shrink-swell potential.

This map unit is in capability unit IVe-1 (15), nonirrigated.

**112—Candlestick Variant loam, 15 to 30 percent slopes.** This very deep, well drained soil is on alluvial fans. It formed in alluvium derived from various kinds of rock. Slope is 15 to 30 percent. The native vegetation is mainly annual grasses and forbs. Elevation is 25 to 400 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 54 to 56 degrees F, and the average frost-free period is 300 to 350 days.

Typically, the surface layer is dark brown and brown loam about 21 inches thick. The subsoil to a depth of 60 inches or more is yellowish brown clay loam.

Included in this unit are small areas of soils that are similar to the Candlestick Variant soil but have more clay in the subsoil or are loamy throughout. Also included are small areas of soils that are less than 60 inches deep to bedrock or have slopes of less than 15 percent or more than 30 percent and small areas of soils that are in drainageways and are shallow and stony. Included soils make up about 10 percent of the total acreage.

Permeability is moderately slow in the Candlestick Variant soil. The available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for recreational development or as wildlife habitat or watershed. Some areas are used for homesite development.

If this unit is used for recreational development, the main limitation is the slope. The slope limits the use of areas of the unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining an adequate plant cover. The plant cover can be maintained by limiting traffic. Cuts and fills should be seeded or mulched.

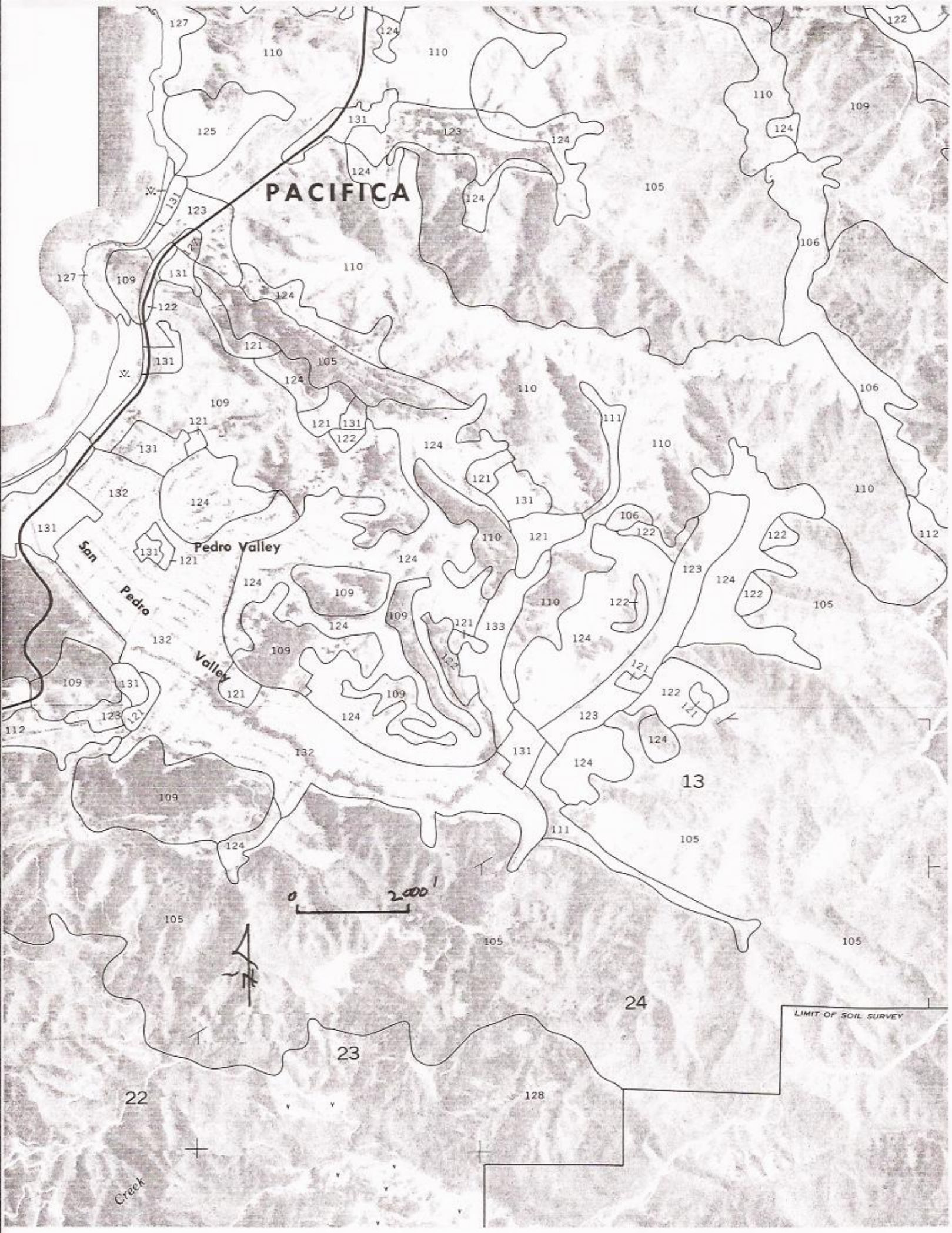
If this unit is used for homesite development, the main limitations are the slope and the moderate shrink-swell potential. Only the part of the site that is used for construction should be disturbed. Structures to divert runoff are needed if buildings and roads are constructed. Revegetating disturbed areas around construction sites as soon as possible helps to control erosion. Mulch, fertilizer, and irrigation are needed to establish lawn grasses and other small-seeded plants.

Buildings and roads should be designed to offset the effects of shrinking and swelling. Shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has a low shrink-swell potential.

This map unit is in capability subclass VIe (15), nonirrigated.

**113—Fagan loam, 15 to 50 percent slopes.** This deep, well drained soil is on uplands. It formed in material weathered from soft sandstone and shale. Slope is 15 to 50 percent. The native vegetation is mainly annual grasses, forbs, and some brush. Elevation is 200 to 2,000 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 56 to 58 degrees F, and the average frost-free period is 275 to 330 days.

Typically, the surface layer is brown loam over grayish brown clay loam about 19 inches thick. The upper 7 inches of the subsoil is yellowish brown clay loam, and the lower 17 inches is yellowish brown clay. Soft sandstone and shale are at a depth of 43 inches.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