Figure 1. Aerial photo, by USGS.

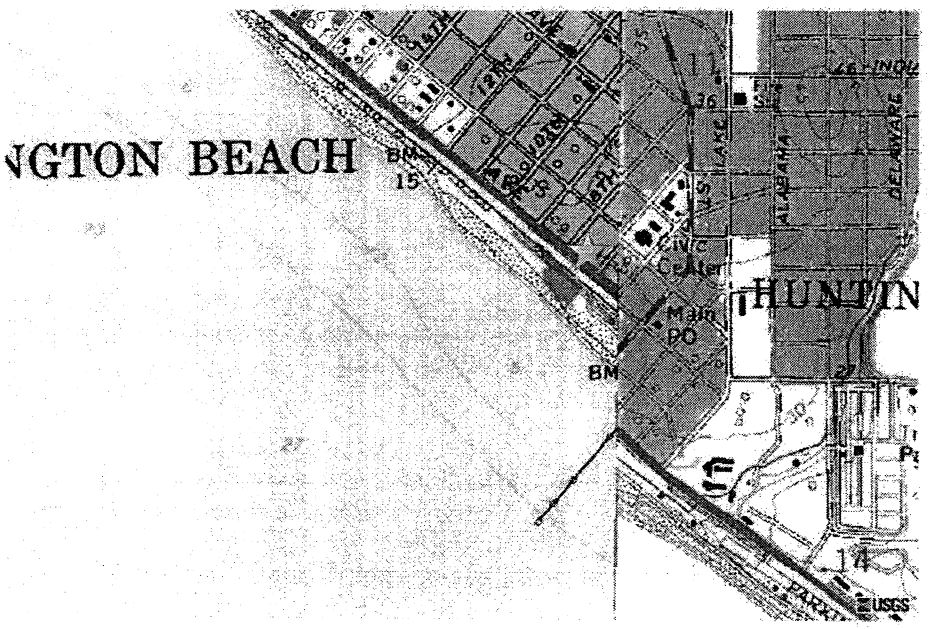

Figure 2. Site topographic map, by USGS

ATTACHMENT NO. 4.6

Section 2.0
Conclusions

The proposed construction is considered feasible from a soils engineering standpoint. All earth work should be performed in accordance with applicable engineering recommendations presented herein or applicable Agency Codes, whichever are the most stringent.

2. 1 Earth Materials

Subsurface materials encountered during the exploration program included light brown, gray to olive, fine to coarse grained silty sand, and coarse grained sand with some silty layers. The top soil/fill mantel appears to have been driven from on-site sources. Topsoil/ fill soils thicknesses vary between 2-3 feet.

2.2 Foundations

Conventional footings founded in an approved fill soils or native competent materials will be used to support the proposed structure.

2.3 Bearing Materials

The surficial soils are disturbed. Such materials are not considered a suitable material from a geotechnical standpoint (shallow soils up to -3 feet). Encountered soils at deeper elevations are considered quite adequate from a soil engineering standpoint.

2.4 Groundwater

During our investigation, ground water was encountered at -15 feet below grade. The depth of ground water may fluctuate depending upon the time and period of the year.

2.5 Chemical Contents

Chemical testing for detection of hydrocarbon or other potential contamination is beyond the scope of this report.

2.6 Liquefaction Study

The computed liquefaction analysis indicated a safety of factor equal to or higher than 1.0 for the site. The differential soil settlement due to seismically induced ground shaking will be in the order of 0.8 inch. The differential settlement can be considered by the project structural engineer in design of the proposed building.

Section subterranean
Recommendations

Based on our exploration, and experience with similar projects, the proposed construction is considered feasible from a soil engineering standpoint providing the following recommendations are made a part of the plans and are implemented during construction.

3.1 Clearing and Site Preparation

Based on review of draft architectural plans, the proposed building is composed of mixed commercial residential building complex with two story of subterranean parking lot . The preliminary plan indicated that the depth of proposed excavation to construct the parking structure will be in the order of 18 feet below existing garde. The perched water is anticipated at 15 feet or shallower, then the following recommendations is necessary to implemented for de-watering of sub-base water.

The sub-slab soils will be removed to a minimum of 24 inches below the slab elevation. The removed soils will be backfilled with 3/4 single size gravel. 4 inches heavy PVC perforated pipes wrapped in geo-fabric will be placed at every 4 feet. The pipes will be connected to a s12 inches solid pipe or set of 6 inches pipes and will be conveyed to a sump having a minimum of 100 gallon per minute capacity. The pumps will have an automatic switch to de-water the sump during the storm tide condition. The sump pump should be maintained by all the time by a qualified person.

The following recommendations may be useful if any grading anticipated.

1. The areas to receive compacted fill should be stripped of all vegetation, construction debris if there is any, non engineered fill, left in place inadequate and incompetent material up to approved soils. If soft spots are encountered, project soil engineer will evaluate the site conditions and will provide necessary recommendations.

2. The exposed grade should then be overexcavated to approved earth materials (estimated to -3 feet below the existing grade). The excavated area should be scarified to a minimum of 8 inches, adjusted to optimum moisture content, and reworked to achieve a minimum of 90 percent relative compaction.

3. Compacted fill should have a minimum of 1.5 feet depth below proposed footing and extend at least 5 feet beyond all perimeter footings or to a distance equal to the depth of the certified compacted fill, whichever is the greatest.

4. Compacted fill, consisting of on-site soil shall be placed in lifts not exceeding 6 inches in uncompacted thickness. The excavated onsite materials are considered satisfactory for reuse in the fill if the moisture content is near optimum. All organic material and construction debris should be removed and shall be segregated. Any imported fill should be observed, tested, and approved by the soils engineer prior to use as fill. Rocks larger than 6 inches in diameter should not be used in the fill.

5. The fill should be compacted to at least 90 percent of the maximum dry density for the material. The maximum density should be determined by ASTM Test Designation D 1557-00.

6. Field observation, and compaction testing should be performed by a representative of Soil Pacific Inc. during the grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compaction effort should be made with adjustment of the moisture content, as necessary, until a minimum of 90 percent relative compaction is obtained.

3.2 Foundations

The following recommendations may be used in preparation of the design and construction of the foundation system.

3.2.1 Bearing Value

The allowable bearing value for conventional footings, of residential building having a minimum width of 15 inches and a minimum embedment of 24 inches below the lowest adjacent grade in approved compacted engineered fill materials, should not exceed 1800 pounds per square foot. This value may be increased by one-third for short duration (wind or seismic) loading.

3.2.2 Isolated Square Pad Footings

The proposed structure can be adequately supported by shallow spread footing and isolated footings. The minimum embedment for individual pad footings should be 24 inches below the lowest adjacent grade. Allowable bearing value is 1800 psf increased by 200 psf for each additional depth of 12 inches and each additional width of 12 inches to a maximum of 4000 psf. The bearing value may be increased by 1/3 when considering short duration seismic or wind loads.

3.2.3 Foundation Settlement

Based upon anticipated structural loads, the maximum total settlement for the proposed foundation is not expected to exceed 1 inch at design load. Differential settlement between adjacent footings and lateral displacement of lateral resisting elements should not exceed ½ inch.

3.2.4 Concrete Type

Based on experience with similar projects in the area Type V concrete can be used.

3.2.5 Excavation

The excavations are anticipated to be up to 18 feet in vertical height. The excavations are expected to expose the native soils. The existing native soils when are damp or wet , are suitable for vertical excavations up to five feet where not surcharged by adjacent traffic or structures.

All excavations should be stabilized within 30 days of initial excavation. Water should not be allowed to pond on top of the excavation nor to flow towards it. A representative from our office should be present during the process of slot cutting and/or compaction.

3.2.6 Shoring Piles/I beam

For shoring purposes, drilled cast-in-place soldier piles or I beams should be placed at 8 feet on center around all side of the proposed excavation area to construct the subterranean parking . The minimum diameter of the piles is 18 inches. For design purposes, an allowable passive value for the soils below the bottom plane of excavation, may be assumed to be 500 pounds per square foot per foot of depth, up to a maximum of 3,000 pounds per square foot. The corner of the shoring walls will be braced to minimize the deflection of the shoring wall. Maximum allowable deflection of the piles will be .5 inch.

The frictional resistance between the soldier piles and retained soil may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.3, based on uniform contact between the concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. Pile or I beams should have a minimum of 15 feet embedment into the ground below the lowest excavation grade. For temporary shoring design purposes the computed active pressure will be 40 pcf.

3.2.8 Lagging

Lagging between soldier piles could be omitted within the cohesive soils. In the less cohesive soils, such as the sands and gravels, lagging would be necessary. It is recommended that the exposed soils be observed by the soils engineer to verify the cohesive nature of the soils and the area where lagging may be omitted.

Soldier piles and anchors should be designed for the full anticipated pressures. Due to arching in the soils, the pressure on the lagging will be somewhat less. It is recommended that the lagging be designed for the full design pressure but be limited to a maximum of 400 pounds per square foot.

Water should not be allowed to pond on top of the excavation nor to flow towards it. A representative from our office should be present during the process of slot cutting and/or compaction.

Upon drilling and cast in place concrete pour, the proposed excavation can be achieved. The piles can be placed within the property lines at the east and west portions along the cast in place shoring piles. The distance between the shoring devices (piles) and proposed basement walls will be enough to install the backdrain and/or water proofing system.

3.3 Utility Trench Backfill

Utility trenches backfill should be placed in accordance with Appendix D. It is the owners and contractors responsibility to inform subcontractors of these requirements and to notify Soil Pacific when backfill placement is to begin.

3.4 Seismic Design and Construction

Construction should be in conformance with seismic design parameters of the latest edition of Uniform Building Code (U.B.C.). Based on our review of the general geology map of the project site the project soil profile type is defined as Sd. Please refer to the Appendix C for closest faults and other related seismic design parameters.

3.5 Surface and Sub-surface Drainage Provisions

Proper surface drainage gradients are helpful in conveying water away from foundations and other improvements. Subsurface drainage provisions are considered essential in order to reduce pore- pressure build-up behind retaining structures. Ponding of water enhances infiltration of water into the local soils, and should not be allowed anywhere on the pad.

Ground water is shallow at the vicinity of the subject project. Proposed subterranean parking structure excavation may expose the ground water during the high tide. Adequate sump pump is necessary shall be designed by the civil engineer of the project to accommodate the subterranean parking lot excessive water infiltration, if the elevation of the slab-on-grade is expected below 13 feet from existing grade. The

structural engineer will consider the buoyancy pressure, in case the proposed two-story subterranean parking exposes the groundwater level.

3.7 Conventional Retaining Wall

For preliminary design, the following guidelines are presented for structural wall design consideration.

1) Where a free standing structure is proposed, a minimum equivalent fluid pressure, for lateral soil loads, of 65 pounds per cubic foot may be used for design for onsite non expansive granular soils conditions and level backfill (10:1 or less). If the wall is restrained against free movement (= +/- 1 % of wall height) then the wall should be designed for lateral soil loads approaching the at-rest condition. Thus, for restrained conditions, the above value should be increased by 30 pounds per cubic foot. In addition, all retaining structures should include the appropriate allowances for any anticipated surcharge loads.

2) An allowable soil bearing pressure of 1800 lbs. per square foot may be used in design for footings imbedded a minimum of 24 inches below the lowest adjacent competent grade.

3) A friction coefficient of 0.30 between concrete and natural or compacted soil and a passive bearing value of 400 lbs. per square foot per foot of depth may be employed to resist lateral loads.

Free-draining material consisting of at least 1 cubic foot of 3/4-inch crushed rock/ gravel should be utilized around pipe drains. If an open space greater than 1 foot exists between the back of the wall and the soil face, gravel backfill should be compacted by vibration. An impervious soil cap should be provided at the top of the wall backfill to prevent infiltration of surface waters into the backdrain system. The cap may be a combination of concrete and/or compacted fine grained soils. The compacted backfill soil cap should be at least 1 foot thick when used in conjunction with a concrete slab type cap and at least 2 feet thick when used exclusively.

3.8 Utility Trench Backfill

Utility trenches backfill should be placed in accordance with Appendix D. It is the owners and contractors responsibility to inform subcontractors of these requirements and to notify Soil Pacific when backfill placement is to begin.

3.9 Concrete Slab

Slab areas that are to be carpeted or tiled, or where the intrusion of moisture is objectionable, should be underlain by a moisture barrier consisting of 20 -mil Visqueen, properly protected from the puncture by two inches of sand to and below. In order to control the buoyancy pressure, it is recommended that subterranean parking slab to be designed with a minimum of 6 inches thick and reinforced with No.3 rebar at 18 inches on-center, placed at mid heigh. **Structural slab shall design the structure against the buoyancy pressure.**

3.10 Drainage Control

Patio or driveway subgrade soil should be compacted to a minimum of 90 percent to a depth of 18 inches. All run-off should be gathered in gutters and conducted, off site in a non-erosive manner. Planters located adjacent to footings should be sealed, and leach water intercepted.

3.11 Observation and Testing

It is recommended that **Soil Pacific Inc.** be present to observe and test during the following stages of construction:

☐ Site grading to confirm proper removal of unsuitable materials and to observe and test the placement of fill.

☐ Inspection of all foundation excavations prior to placement of steel or concrete.

☐ During the placement of retaining wall subdrain and backfill materials.

☐ Inspection of all slab-on-grade areas prior to placement of sand, Visqueen.

☐ After trenches have been properly backfilled and compacted.

☐ When any unusual conditions are encountered../.

APPENDIX A

Field Exploration

ATTACHMENT NO. 4.13

Log of Sub-surface Exploration

Std. Pen	Drive Wt: Drop:	USCS Letter	Equipment Type: CME		Boring # B-1
Bulk/Bag		Graphic	Diameter: 8"	Logged by: Y.K.	Date:7-26-04
Ring	SP	Laboratory	Depth: 55 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	N	Moisture	Dry Reading		Description of Earth Materials
				SM	Light brown, silty sand/sandy silt with some organic materials and construction debris, damp, top soils..
5	11/11/12			SM	Light brown, silty sand/sandy silt fine grained, damp. Native.
10	4/7/16			SM	Gray sandy silt/silty sand fine grained damp, Moderatly dense, native.
15	16/19/26			SG	Gray, fine grained, silty sand with , saturated, moderatly dense.
20	15/19/27			SP	Light brown, silty sand, fine grained, moist and dense.
25	16/23/25			SP	Light brown, fine to medium grained silty sand, moist, dense.
30	16/25/30			SG	Light gray, light brown medium to coarse grained sand with some silt, moist, dense.
35	15/17/24			SG	Light brown, olive, medium grained sand with some silt, moist, dense.
40	10/16/25			SM	Gray coarse grained sand with trace of silt, saturated, dense.

Log depicts conditions at the time and location drilled.

Soil Pacific Inc. Geotechnical and Environmental Services	Project Name:612-620 Pacific Coast Hwy, Huntington Beach	
	Project Number: A-2743-04	
	Report Date:	Figure:

ATTACHMENT NO. 4.14

Log of Sub-surface Exploration

Std. Pen	Drive Wt: Drop:	USCS Letter	Equipment Type: CME 55	Boring # B-1
Bulk/Bag		Graphic	Diameter: 8" / Logged by: Y.K.	Date:7-23-04
Ring		Laboratory	Depth: 55 feet / G.water: - feet	Backfilled:Y

Elev. (feet)	N	Moisture	Dry Reading			Description of Earth Materials
	17/17/22				SP	
						Light brown coarse grained sand with traceof silt, saturated.
50	10/15/29				SP	
						brown, gray medium garined sand, saturated.
55	16/18/22				SP	
						End of sub-surface exploration 55 feet. Groundwater observed. at 15 feet below grade.

Log depicts conditions at the time and location drilled.

Soil Pacific Inc.	Project Name: 612-620 Pacific Coast Hwy, Huntington Beach	
Geotechnical and Environmental Services	Project Number: A-2743-04	
	Report Date:7-26-04	Figure:

ATTACHMENT NO. 4.15

Log of Sub-surface Exploration

B-2

Std. Pen	Drive Wt: Drop:	USCS Letter	Equipment Type: CME		Boring # B-2
Bulk/Bag		Graphic	Diameter: 8"	Logged by: Y.K.	Date:7-26-04
Ring	SP	Laboratory	Depth: 20 feet	G.water: - feet	Backfilled:Y

Elev. (feet)	N	Moisture	Dry Reading		Description of Earth Materials
				SM	Light brown, silty sand/sandy silt with some organic materials and construction debris, damp, top soils..
	16/16/24			SM	Light brown, silty sand/sandy silt fine grained, damp. Native.
5					
	10/16/20			SM	Gray sandy silt/silty sand fine grained damp, moderatly dense, native.
10					
	19/21/22				
15				SG	Gray, fine grained, silty sand with , saturated, moderatly dense.
	10/10/20			SP	
20					Light brown, silty sand, fine grained, moist and dense.
25					End of sub-surface exploration 20 feet. Groundwater was observed at -15 feet.
30					
35					
40					

Log depicts conditions at the time and location drilled.

Soil Pacific Inc. Geotechnical and Environmental Services	Project Name:612-620 Pacific Coast Hwy, Huntington Beach	
	Project Number: A-2743-04	
	Report Date:	Figure:

ATTACHMENT NO. 4.16

Log of Sub-surface Exploration

B-3

Std. Pen	Drive Wt: Drop:	USCS Letter	Equipment Type: CME		Boring # B-3
Bulk/Bag		Graphic	Diameter: 8"	Logged by: Y.K.	Date:7-26-04
Ring	SP	Laboratory	Depth: 20 feet	G.water: - feet	Backfilled:Y
Elev. (feet)	N	Moisture / Dry Reading	Description of Earth Materials		

Elev. (feet)	Sample	USCS	Description of Earth Materials
		SM	Light brown, silty sand/sandy silt with some organic materials and construction debris, damp, top soils..
5	19/20/29	SM	Light brown, silty sand/sandy silt fine grained, damp. Native.
	10/12/13		
10		SM	Gray sandy silt/silty sand fine grained damp, moderatly dense, native.
	11/13/15		
15		SG	Gray, fine grained, silty sand with , saturated, moderatly dense.
		SP	
20	26/50		Light brown, silty sand, fine grained, moist and dense.
25			End of sub-surface exploration 20 feet. Groundwater was observed at -15 feet.
30			
35			
40			

Log depicts conditions at the time and location drilled.

Soil Pacific Inc. Geotechnical and Environmental Services	Project Name:612-620 Pacific Coast Hwy, Huntington Beach	
	Project Number: A-2743-04	
	Report Date:	Figure:

ATTACHMENT NO. 4.17