REESE & ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS
134 LYSTRA COURT SANTA ROSA, CA 95403
TELEPHONE (707) 528-3078 FACSIMILE (707) 528-2837

Report
Soil Investigation
NeilMed Warehouse
685 Aviation Boulevard
Santa Rosa, California

Prepared for
NeilMed
c/o Airport Business Center
414 Aviation Boulevard
Santa Rosa, CA 95403

By

REESE & ASSOCIATES
Consulting Geotechnical Engineers

Dan J. Figoni
Project Manager

Jeffrey K. Reese
Civil Engineer No. 47753

REGISTERED PROFESSIONAL ENGINEER
JEFFREY KENT REESE
No. C 47753
Exp. 12-31-19
STATE OF CALIFORNIA

Job No. 1726.1.1
January 18, 2019

INTRODUCTION

This report presents the results of our soil investigation for the proposed NeilMed warehouse to be constructed in Windsor, California. The site address is 685 Aviation Boulevard.

The proposed development will consist of the construction of a tall, two-story, pre-cast, concrete wall structure with approximately 29,530 square feet of lower level concrete slab-on-grade floor space. Preliminary plans indicate that the building will be served by new asphalt- and/or concrete-paved driveway and parking areas and underground utilities. A loading dock and retaining walls are also indicated on the northeast side of the structure.

The object of our investigation, as outlined in our proposal dated October 2, 2018, was to review selected, geologic information in our files, explore subsurface conditions, measure depth to groundwater, if encountered, and determine physical properties of the soils encountered. We then performed engineering analyses to develop conclusions and recommendations concerning:

1. Proximity of the site to active faults.
2. Site preparation and grading.
3. Foundation support and design criteria.
4. Support of concrete slab-on-grade floors.
5. Loading dock and retaining wall design criteria.
6. Preliminary flexible pavement thicknesses based on our experience with similar projects and soils.
7. Soil engineering drainage.
8. Supplemental soil engineering services.

WORK PERFORMED

We reviewed selected, pertinent, published, geologic information and maps in our files including:

1. The "Geology for Planning in Sonoma County" maps, Special Report 120, California Division of Mines and Geology, 1980.
2. Association of Bay Area Governments website (www.abag.ca.gov), Liquefaction Susceptibility Map, USGS Open-File Reports 00-444 and 2006-1037 dated March 2, 2011.
3. Association of Bay Area Governments (ABAG) website (www.abag.ca.gov), 2009, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map.
4. The Healdsburg Quadrangle Sheet of the Alquist-Priolo Earthquake Fault Zone maps, California Division of Mines and Geology, 1983.
5. "Historic Ground Failures in Northern California Associated with Earthquakes," Geological Survey Professional Paper 993, T. L. Youd and S. N. Hoose, US Department of the Interior, 1978, Plate 4.
6. "Bay Area Geologic Maps in Google Earth" Department of the Interior, United States Geological Survey, 2018.
7. Report, "Soil Investigation, Aviation Boulevard Commercial Building, Sonoma County, California" Giblin Associates, Consulting Geotechnical Engineers, dated January 5, 1998.

On November 1, 2018, we observed surface features at the property and explored subsurface conditions to the extent of six test pits at the approximate locations indicated on Plate 1. The test pits were excavated with backhoe equipment to depths ranging from about 4 to 6 feet.

Our representative located the pits, observed the excavations, logged the conditions encountered and obtained samples for visual classification and laboratory testing. In-place strength indicator determinations were conducted in the pit walls with a penetrometer. Logs of the test pits are presented on Plate 2. The soils are classified in accordance with the Unified Soil Classification System explained on Plate 3.

Selected samples were tested in our laboratory to determine moisture content and classification (percent free swell and Atterberg Limits). The laboratory test results and field penetrometer data are summarized on Plate 4. Detailed results of the Atterberg Limits tests are shown on Plate 5.

The pit locations shown on Plate 1 were determined by visually estimating from existing surface features. The locations should be considered no more accurate than implied by the methods used to establish the data. At the completion of the exploration, all the pits were backfilled with the excavated materials, but without compaction.

SURFACE AND SUBSURFACE CONDITIONS

The approximate 1½ acre site is bordered to the north, south, east and west by existing asphalt-paved driveways and/or parking areas that serve adjacent commercial buildings. In general, the parcel is very gently sloping with minor surface irregularities and occasional 8-inch size or smaller concrete fragments noted on the ground surface suggestive of the presence of fill. Past grading has included the construction of a relatively broad southeast/northwest trending drainage swale to divert surface runoff toward the northwest corner of the site. The swale time of our exploration, the ground surface had recently been disked and a relatively low growth of grass and weeds developed. Small trees, bushes and/or hedges were also noted adjacent to the north, south and west boundaries of the site.

The test pits and laboratory tests, correlated with the data obtained from the soil investigation report for the adjacent development to the south, indicate that the site is underlain by discontinuous layers of sandy silts and clays and clayey and silty sands with varying amounts of gravel to the maximum depth explored. Existing fills were encountered in all of the test pits that consist of soft to stiff sandy clays and silts and loose to medium dense very silty and clayey sands that contained varying amounts of gravel and occasional concrete and asphalt fragments. The fill materials, where encountered, extended to depths that vary from about 1/2 to 2½ feet below the existing ground surface. The field and laboratory tests indicate the existing fills generally exhibit a low expansion potential. That is, the soils would tend to undergo low strength and volume changes with seasonal variation in moisture content. The upper natural soils encountered below the fill typically consists of sandy silts and clays and very silty sands of low expansion potential that are relatively weak and porous from prior root growth and decomposition to depths of about 2½ to 3 feet. A layer of slightly plastic, moderately to possibly highly expansive sandy clay was encountered beneath the upper natural soils in Test Pits 1, 2 and 4 that extended to depths that varied from about 2½ to 3½ feet. In general, the materials encountered beneath the expansive clays and upper natural soils in the remaining test pits consist of hard, very sandy silt and dense to very dense clayey and silty sands with varying amounts of coarse sand and fine gravel that would be considered relatively firm and incompressible under the anticipated loading conditions.

Groundwater was not encountered in the test pits during our exploration or in the test borings drilled on the adjacent site. However, we believe that groundwater conditions and seepage levels can vary seasonally, and could rise and fall several feet annually. Determination of the precise depth to groundwater, extent of seasonal water level fluctuations, or the presence of a perched groundwater condition, are beyond the scope of this investigation.

CONCLUSIONS

Based on the results of our field exploration and laboratory tests, we conclude that, from a soil engineering standpoint, the site can be used for the proposed construction. The most significant soil engineering factors that must be considered in design and construction are the presence of existing fills underlain by weak, compressible upper natural soils and underlying moderately to possibly highly expansive clays.

We could find no evidence during our investigation to indicate that the fills encountered were properly placed and compacted under soil engineering observation and testing services. We judge that such fills could be subject to significant amounts of total and/or differential settlement. Also, our experience indicates that weak, porous, upper natural soils can undergo considerable strength loss and settlement when saturated under load. Where evaporation is inhibited by footings, slabs or fill, eventual saturation of the underlying soils can occur. Therefore, we conclude that the existing fills and upper, weak, porous soils are not suitable for new fill, foundation or slab support in their present condition. It will be necessary to remove (overexcavate) the existing fills and upper compressible natural soils for their full depth and replace the materials as properly compacted fill.

Moderately to possibly highly expansive clayey soils were encountered locally during our exploration and also on the adjacent site to the south. Such expansive soils can undergo moderate to possibly high strength and volume changes with seasonal changes in moisture content and can heave and/or distress lightly loaded footings or slabs. Accordingly, moderately to highly expansive soils, if encountered in building areas in close proximity to the ground surface, must be covered with a moisture confining and protecting blanket of approved on-site or imported soils of low expansion potential. Specific recommendations for site preparation and grading are provided in subsequent sections of this report.

The test pits were backfilled with the excavated materials, but the soils were not compacted. Therefore, the test pits constitute local deep zones of highly compressible materials. Where encountered in planned improvement areas, the pit backfills should be removed for their entire depth and the soils replaced as properly compacted fill, or foundation elements deepened accordingly.

Satisfactory foundation support for the structure can be obtained from spread footings bottomed at relatively shallow depths on properly compacted fill. Provided the site is prepared as subsequently recommended, concrete slab-on-grade floors can be used. We judge that, for foundations designed and installed in accordance with our recommendations, total settlements would be on the order of about 1 inch or less. We believe that post-construction settlements should be about one-half this amount.

SEISMIC DESIGN PARAMETERS

The geologic maps reviewed did not indicate the presence of active faults at the site and, therefore, we judge that there is little risk of fault-related ground rupture during earthquakes. In a seismically active region such as Northern California, there is always some possibility for future faulting at any site. However, historical occurrences of surface faulting have generally closely followed the trace of more recently active faults. The closest faults generally considered active are the Rodgers Creek fault zone located about 1.9 miles to the northeast, the Maacama fault zone (southern extension) located about 6.6 miles to the northeast, and the San Andreas fault zone located about 18.7 miles to the southwest.

Strong to very strong ground shaking will occur during earthquakes. The intensity at the site will depend on the distance to the earthquake epicenter, depth and magnitude of the shock, and the response characteristics of the materials beneath the site. Because of the proximity to active fault zones in the region and the potential for strong to very strong ground shaking, it will be necessary to design and construct the project in strict accordance with current standards for earthquake-resistant construction.

We have determined seismic ground motion values in accordance with procedures outlined in Section 1613 of the 2016 California Building Code (CBC). Mapped acceleration parameters (S_S and S_1) were obtained by inputting approximate site coordinates (latitude and longitude) into earthquake ground motion software made available for use by the California Office of Statewide Health Planning and Development (OSHPD) for the determination of CBC ground motion values. Based on our review of available geologic maps and our knowledge of the subsurface conditions, we judge that the site can be classified as Site Class C, as described in Table 20.3-1 of the American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) Standard ASCE/SEI 7-10. Using corresponding values of site coefficients for Site Class C and procedures outlined in the CBC, the mapped acceleration parameters were adjusted to yield the design spectral response acceleration parameters S_{DS} and S_{D1}. The following earthquake design data summarize the results of the procedures outlined above.

2016 CBC Ground Motion Parameters

Site Class	C
Mapped Spectral Response Accelerations:	
S_S	1.935g
S_1	0.783g
Design Spectral Response Accelerations:	
S_{DS}	1.29g
S_{D1}	0.678g

RECOMMENDATIONS

Site Preparation and Grading

The site should be cleared of debris and brush, where encountered. Designated trees should be removed and their root systems excavated. Resultant voids should be backfilled with properly compacted soil as subsequently described. Dense growths of grass and vegetation should be removed. The area to be graded then should be stripped of the upper soils containing root growth and organic matter. We anticipate that the depth of stripping needed will average about 3 inches. The strippings should be removed from the site, stockpiled for reuse as topsoil or mixed with at least five parts of soil and used as fill at least 10 feet away from structure, walkways and paved areas.

Wells, septic tanks or other voids encountered or created should be removed, filled with compacted soil or compacted granular material or capped with concrete as determined by the appropriate regulatory agency or the soil engineer.

After stripping, excavation should be performed as necessary. We anticipate that, with the exception of organic matter and rocks or hard fragments larger than 4 inches in diameter, the excavated materials will be suitable for reuse as compacted fill. However, expansive clayey soils, if encountered, should not be used as fill in the upper 30 inches of the building pad, as discussed below.

Within planned building foundation/floor slab and adjacent concrete walkway areas and extending to at least 5 and 3 feet, respectively, beyond the perimeter (building envelope), existing fills and underlying weak, upper natural soils should be excavated for their full depth. We anticipate that the depth of the excavation to remove weak, compressible upper natural soils and/or existing fills will likely vary from about 2½ to 3½ feet below the existing ground surface. Deeper overexcavation may be needed where deeper fills or weak, porous natural soils are encountered. Also, the excavation within the building envelope should be adjusted, as needed, so as to provide space for at least 12 inches of properly compacted, approved, on-site or imported fill of low expansion potential below the bottom of all footings and floor slabs. Where moderately to highly expansive clays are encountered at or near building pad subgrade level, the depth of excavation should be adjusted so to provide space for at least 30 inches of properly compacted, approved, on-site or imported fill of low expansion potential below planned finish pad grade elevation. The actual depth of excavation and need for increased thicknesses of fill of low expansion potential should be determined in the field by the soil engineer based on the materials encountered. We believe that the on-site soils will be suitable for reuse as fill within the upper portion of the building pad. However, as recommended above, expansive clayey soils should not be reused as fill within the upper 30 inches of building or adjacent concrete walkway areas. Because the actual depth of excavations to remove existing fills and weak, upper natural soils and/or expansive materials will vary, we recommend that the contract documents contain provisions to account for such variations.

The surface exposed by stripping or overexcavation should be scarified at least 6 inches deep, moisture conditioned to at least 2 percentage points above optimum (at least 4 percentage points for expansive clayey soils) and compacted to at least 90 percent relative compaction[1]. The

1 Relative compaction refers to the in-place dry density of fill expressed as a percentage of maximum dry density of the same material determined in accordance with the American Society for Testing and Materials (ASTM) Standard ASTM D1557 laboratory compaction test procedure. Optimum moisture content refers to the moisture content at maximum dry density.

moisture conditioning should be sufficient to close any shrinkage cracks for their full depth. Approved, excavated and/or imported fill then should be placed in layers; similarly moisture conditioned and compacted to at least 90 percent.

It is our experience that weak, upper soils, such as those encountered at the site, can tend to trap considerable amounts of water into the late spring or early summer. For grading performed in winter and early spring, there is a risk that the site can become too wet and soft to support construction equipment. Therefore, we believe that site grading early in the construction season could require more than normal effort to satisfactorily excavate and/or compact the materials.

Imported fill material, if needed, should be low in expansion potential and have a Plasticity Index of 15 or less. Imported material should be free of organic matter and rocks or hard fragments larger than 4 inches in diameter. Material proposed for use as imported fill of low expansion potential should be tested and approved by the soil engineer prior to delivery to the site.

Where on-site soils are used in building floor slab areas, the pad surface should be periodically watered so as to be maintained in a moist condition from the completion of the rough grading until concrete slabs are cast, or remoisture conditioned prior to placement of concrete in foundation and slab areas. As an alternative, the upper 12 inches of the building pad could consist of approved imported fill of low expansion potential.

Finished cut and fill slopes should be trimmed to expose dense material and should be no steeper than two horizontal to one vertical (2:1). Slopes over 3 feet high should be planted with deep rooted, fast growing ground cover to help reduce erosion.

Foundation Support

Spread footings can be used for foundation support. Footings should be at least 12 inches wide and should be bottomed at least 12 inches below lowest adjacent pad grade. Provided the site is prepared as recommended above, footings should be underlain by at least 12 inches of properly compacted fill. Spread footings can be designed to impose dead plus code live load and total design load (including wind or seismic forces) bearing pressures of 2,000 and 3,000 pounds per square foot (psf), respectively.

Resistance to lateral loads can be obtained by passive earth pressure and soil friction. We recommend the following criteria for design:

Passive Earth Pressure	=	300 pounds per cubic foot (pcf) equivalent fluid, neglect the upper 1 foot unless confined by pavements or slabs
Soil Friction Factor	=	0.30

Slab-on-Grade

Provided the site is prepared as recommended above, slab-on-grade floor areas should be underlain by a minimum of 12 inches of properly compacted fill. In addition, slabs should be underlain by a capillary moisture break and cushion layer consisting of at least 4 inches of free-draining, crushed rock or gravel (slab rock) at least 1/4-inch and no larger than 3/4-inch in size. Crushed rock should be used where the slabs would be subjected to wheel loads such as forklifts or trucks.

Moisture vapor will condense on the underside of slabs. Where migration of moisture vapor through slabs is detrimental, a minimum 10-mil moisture vapor retarder should be provided between the supporting base material and the slabs. Two inches of moist, clean sand could be placed on top of the membrane to aid in curing and to provide puncture protection. However, the actual use of sand should be determined by the architect or design engineer. The use of a less permeable and stronger membrane should be considered if sand is not to be placed for puncture protection, or where the flooring manufacturer requires a vapor barrier. Concrete design and curing specifications should recognize the potential adverse affects associated with placement of concrete directly on the membrane.

Slabs should be at least 4 inches thick and be reinforced to reduce cracking and help keep closed those cracks that do appear. Where subjected to heavy wheel or storage loads, the slabs should be thickened and reinforced to accommodate the increased loading. Actual slab thickness and reinforcing should be determined by the design engineer or architect based on anticipated use and performance. Prior to placing the reinforcing or slab rock, the subgrade soils should be thoroughly moisture conditioned and be smooth, firm and uniform.

Where underlain by at least 12 inches of properly compacted fill consisting of approved on-site soil or imported fill material of low expansion potential, slabs could be tied to foundations. Frequent joints should be provided in the slabs to permit movements to occur and reduce the potential for slab distress. To reduce possible slab cracking resulting from minor settlement, closure pours could be considered adjacent to continuous and column footings.

Retaining and Loading Dock Walls

Prior to construction of retaining walls, the wall footing area and the area behind the wall that will have a concrete slab-on-grade should be prepared as recommended above for those areas.

Where the walls can tilt slightly, active pressures can be developed, and the walls should be designed for an equivalent fluid pressure of 40 pcf. If the tops of the walls are constrained from tilting, the pressures are higher, and 60 pcf should be used.

Wall footings can be designed in accordance with the criteria above for building foundations. Where the wall backfills are subjected to heavy storage and/or vehicular loads, the walls should be designed for a surcharge pressure equal to 2½ feet of additional backfill.

Retaining walls should be fully backdrained. The backdrains should consist of 4-inch-diameter perforated, rigid plastic pipe sloped to drain to outlets by gravity and free-draining crushed rock or gravel. The crushed rock or gravel should extend to within 1 foot of the surface. The drainrock should conform to the quality requirements for Class 2 Permeable Materials per Caltrans Standard Specifications. As an alternative, any clean, washed durable rock product containing less than 1 percent soil fines, by weight, could be used if the rock is separated from the soil bank and covered with a nonwoven geotextile fabric (such as Mirafi

140N or equivalent) weighing at least 4 ounces per square yard. The upper 12 inches should be backfilled with compacted soil to inhibit surface water infiltration unless capped with a concrete slab. The ground surface behind retaining walls should be sloped to drain. Where migration of moisture through retaining walls would be detrimental, the walls should be waterproofed.

Pavement Thicknesses

For planning purposes, based on our experience with similar projects and soils, we recommend the following minimum pavement sections for driveways and parking areas:

Material	Parking Areas	Driveway Areas
Class II Aggregate Base	6"	8"
Asphalt Concrete	2.5"	2.5"

Such pavements should be suitable for auto and light pickup truck traffic. Where heavier delivery truck loadings are anticipated, the pavement thickness should be increased to at least 3 inches of asphalt and about 12 to 16 inches of aggregate base, depending on anticipated loading. We can provide specific recommendations, if desired. Because of concentrated heavy wheel loads at dumpster lift points, reinforced concrete slabs should be used at those locations.

Loose or poorly compacted fills encountered within planned asphalt- and concrete-paved areas should be removed for their full depth and replaced as properly compacted fill. The actual need for and extent of overexcavations of such fills should be determined in the field by the soil engineer. Prior to subgrade preparation, all underground utilities in the paved areas should be installed and properly backfilled. Pavement subgrades should be prepared by scarifying to a depth of at least 6 inches, moisture conditioning to slightly above optimum (at least 2 percentage points above optimum for on-site clayey soils, if encountered) and compacting to at least 95 percent relative compaction. Finished subgrade should be smooth, firm, uniform and nonyielding. Aggregate base materials should be spread in layers, moisture conditioned and compacted to at least 95 percent relative compaction. The aggregate base should also be firm and nonyielding.

The materials and methods used should conform to the requirements of the current edition of the State of California Caltrans Standard Specifications and the requirements of the County of Sonoma and/or the Town of Windsor.

Geotechnical Drainage

Ponding water will soften site soils and could be detrimental to foundations. It is important that the area adjacent to the building be sloped to drain away from foundations. Good, positive surface drainage away from the building consisting of at least 1/4-inch per foot extending at least 4 feet out should be provided and maintained.

The roof should be provided with gutters or roof drain inlets, and the downspouts should discharge onto paved areas or splash blocks draining at least 30 inches away from foundations or be connected to nonperforated rigid-plastic pipelines that discharge by gravity to planned or existing drainage facilities.

Where irrigated landscape areas abut the building excess water can be introduced into soil layers along the edge of the building tending to soften soils around the footings and increase the risk of potential heave of the floor slab in expansive soils areas and/or migration of moisture beneath floor slabs. We believe that the installation of the recommended compacted fill pad that extends to at least 5 feet beyond the building perimeter should provide an effective barrier to the infiltration of excess water from landscape areas. However, as an added precaution, such landscape planters abutting the building could be lined with a plastic membrane (6-mil visqueen or equivalent) and be provided with a subdrain that outlets into planned site drainage systems (gutters, storm drains, etc.). Also any cold joints in the perimeter foundations below grade should be hot-mopped or water-proofed on the exterior side in some manner.

Depending on the location and extent of planned landscape elements, surface and subsurface drainage features may need to be incorporated into the plans. We can provide specific recommendations during final design, if requested.

Supplemental Services

We should review grading and foundation plans for conformance with the intent of our recommendations. During site grading and foundation excavation operations, the soil engineer should be notified to provide intermittent observation and testing. We should observe the conditions encountered, confirm needed overexcavation depths and modify our recommendations, if warranted. Field and laboratory tests should be performed to ascertain that the specified moisture content and degree of compaction are being attained.

Concrete placement and reinforcing should be checked as stipulated on the project plans or as required by the Building Department. It is our understanding that approval from the Building Department must be obtained prior to the placement of concrete in foundation elements.

LIMITATIONS

We have performed the investigation and prepared this report in accordance with generally accepted standards of the soil engineering profession. No warranty, either express or implied, is given. It should be understood that the scope of our work is limited to evaluating the physical properties of earth materials considered typical of geotechnical engineering practice and does not include other concerns such as soil chemistry, corrosion potential, mold, and soil and/or groundwater contamination.

Subsurface conditions are complex and may differ from those indicated by surface features or encountered at test pit locations. Therefore, variations in subsurface conditions not indicated on the logs could be encountered. If the project is revised, or if conditions different from those described in this report are encountered during construction, we should be notified immediately so that we can take timely action to modify our recommendations, if warranted.

Supplemental services as recommended herein are in addition to this investigation and are charged for on an hourly basis in accordance with our Standard Schedule of Charges. Such supplemental services are performed on an as-requested basis, and we can accept no responsibility for items we are not notified to check, or for use or interpretation by others of the information contained herein.

Site conditions and standards of practice change. Therefore, we should be notified to update this report if construction is not performed within 24 months.

LIST OF PLATES

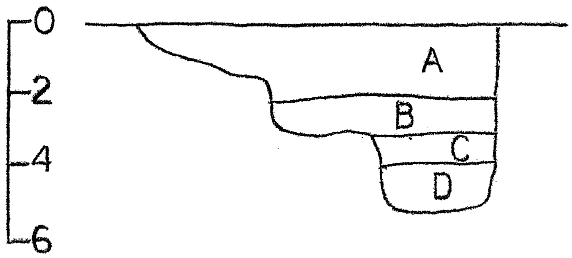
DISTRIBUTION

Copies Submitted: 5

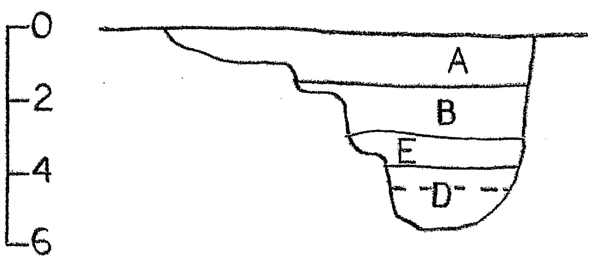
NeilMed
c/o Airport Business Center
414 Aviation Boulevard
Santa Rosa, CA 95403
Attention: Patrick Imbimbo

DF/JKR:nay/ra/Job No. 1726.1.1

LOG OF TEST PIT #1



LOG OF TEST PIT #2



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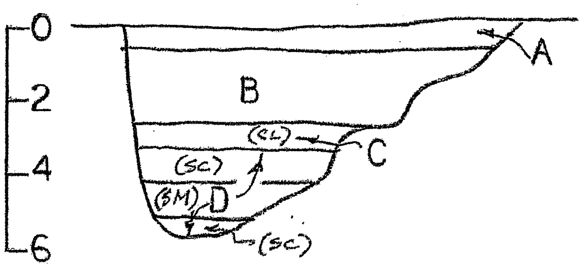

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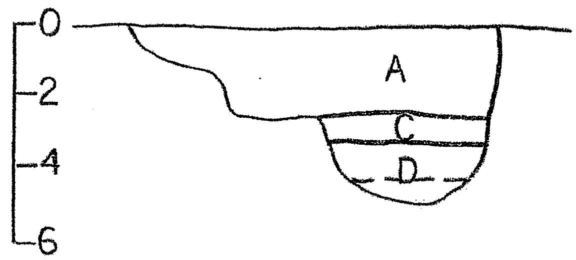

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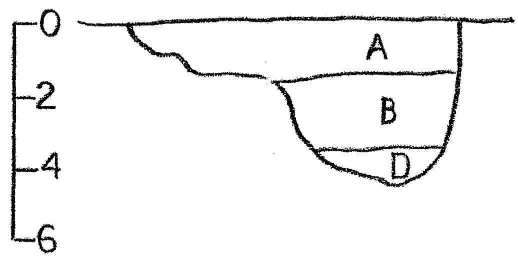
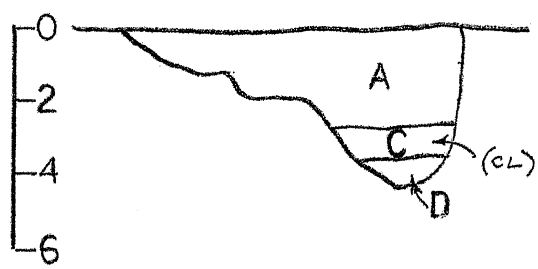


LOG OF TEST PIT #6



SOIL DESCRIPTION

A: DARK BROWN SANDY SILT/SILTY AND/OR CLAYEY SAND (ML/SM/SC), medium stiff/loose, dry, with moderate amounts of fine root fibers, 2-inch size subangular gravel and occasional asphalt and concrete fragments (fill)

B: BROWN SANDY SILT/SANDY CLAY (ML/CL), medium stiff, dry, porous (topsoil), with occasional fine roots

C: DARK BROWN SANDY CLAY (CL/CH), stiff to very stiff, moist

D: LIGHT BROWN/YELLOW-BROWN VERY SANDY SILT/VERY SILTY/CLAYEY SAND (ML/SM/SC), hard/dense, dry to moist, increase in sand content with depth

E: OLIVE-BROWN SANDY CLAY (CH), very stiff, wet

REESE & ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS	Job No: 1726.1.1 Date: 01/14/19 Appr: DF	**LOG OF TEST PITS 1 THROUGH 6** NEILMED WAREHOUSE 685 AVIATION BOULEVARD SANTA ROSA, CALIFORNIA	PLATE **2**

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			TYPICAL NAMES	
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN No. 200 SIEVE	**GRAVEL** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVEL WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SAND MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SAND WITH LESS THAN 5% FINES	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		SAND WITH OVER 12% FINES	SM	SILTY SAND, GRAVEL-SAND-SILT MIXTURE
			SC	CLAYEY SAND, GRAVEL-SAND-CLAY MIXTURE
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN No. 200 SIEVE	**SILT AND CLAY** LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILT, ROCK FLOUR, SANDY OR CLAYEY SILT WITH LOW PLASTICITY
			CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAY (LEAN)
			OL	ORGANIC CLAY AND ORGANIC SILTY CLAY OF LOW PLASTICITY
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOIL, ELASTIC SILT
			CH	INORGANIC CLAY OF HIGH PLASTICITY, GRAVELLY, SANDY OR SILTY CLAY (FAT)
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

						Shear Strength, psf	Confining Pressure, psf
EI	–	Expansion Index	TxUU	–	Unconsolidated Undrained Triaxial	320	(2600)
Consol	–	Consolidation	TxCU	–	Consolidated Undrained Triaxial	320	(2600)
LL	–	Liquid Limit (in %)	DSCD	–	Consolidated Drained Direct Shear	2750	(2000)
PL	–	Plastic Limit (in %)	FVS	–	Field Vane Shear	470	
PI	–	Plasticity Index	LVS	–	Laboratory Vane Shear	700	
SA	–	Sieve Analysis	UC	–	Unconfined Compression	2000	*
G_s	–	Specific Gravity	UC(P)	–	Laboratory Penetrometer	700	*
■		"Undisturbed" Sample					
□		Bulk Sample					

Notes: (1) All strength tests on 2.8" or 2.4" diameter samples unless otherwise indicated.

* Compressive Strength

REESE & ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS	Job No: 1726.1.1 Date: 1-14-19 Appr: [signature]	SOIL CLASSIFICATION CHART AND KEY TO TEST DATA NEILMED WAREHOUSE SANTA ROSA, CALIFORNIA	PLATE **3**

PIT NUMBER	DEPTH	TEST TYPE*	TEST RESULTS
1	1.0	UC(P)	<500
	1.0	FS	45
	2.5	UC(P)	1000
	2.5	M	9.4
	2.5	FS	30
	3.5	UC(P)	2500
	3.5	FS	70
	4.5	UC(P)	4500+
	4.5	M	15.5
2	0.8	UC(P)	750
	1.0	FS	30
	2.0	UC(P)	1000
	3.2	UC(P)	2000
	3.3	FS	90
	4.3	UC(P)	3500
	5.5	UC(P)	4500+
3	1.5	UC(P)	1000
	1.5	FS	25
	2.7	M	10.7
	2.7	FS	15
	3.0	UC(P)	2000
	4.5	UC(P)	4500+
	4.5	M	9.3

*Test Type

M	Moisture Content (percent of dry weight)
MD	Moisture Content (percent of dry weight)/dry density (pounds per cubic foot)
UC(P)	Penetrometer - strength indicator (pounds per square foot)
UC	Unconfined Compression (pounds per square foot)
-200	Percent Passing No. 200 sieve by weight
FS	Percent Free Swell

REESE & ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS	Job No: 1726.1.1 Date: 01-18-19 Appr: [signature]	**LABORATORY TEST DATA** **NEILMED WAREHOUSE** **685 AVIATION BOULEVARD** **SANTA ROSA, CALIFORNIA**	**PLATE** **4a**

PIT NUMBER	DEPTH	TEST TYPE*	TEST RESULTS
4	1.0	UC(P)	1000
	1.5	FS	40
	2.0	UC(P)	1200
	3.0	UC(P)	2000
	3.5	M	11.3
	3.5	FS	30
	4.0	UC(P)	3000
	5.0	UC(P)	4500+
5	1.0	UC(P)	750
	1.0	FS	40
	2.5	M	8.0
	2.5	FS	30
	3.0	UC(P)	1000
	4.0	UC(P)	4500+
6	0.5	FS	45
	1.0	UC(P)	1000
	1.5	M	9.6
	1.5	FS	50
	2.0	UC(P)	1250
	3.0	UC(P)	3000
	3.5	UC(P)	4000
	3.8	M	11.7

*Test Type

M	Moisture Content (percent of dry weight)
MD	Moisture Content (percent of dry weight)/dry density (pounds per cubic foot)
UC(P)	Penetrometer - strength indicator (pounds per square foot)
UC	Unconfined Compression (pounds per square foot)
-200	Percent Passing No. 200 sieve by weight
FS	Percent Free Swell

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Job No: 1726.1.1

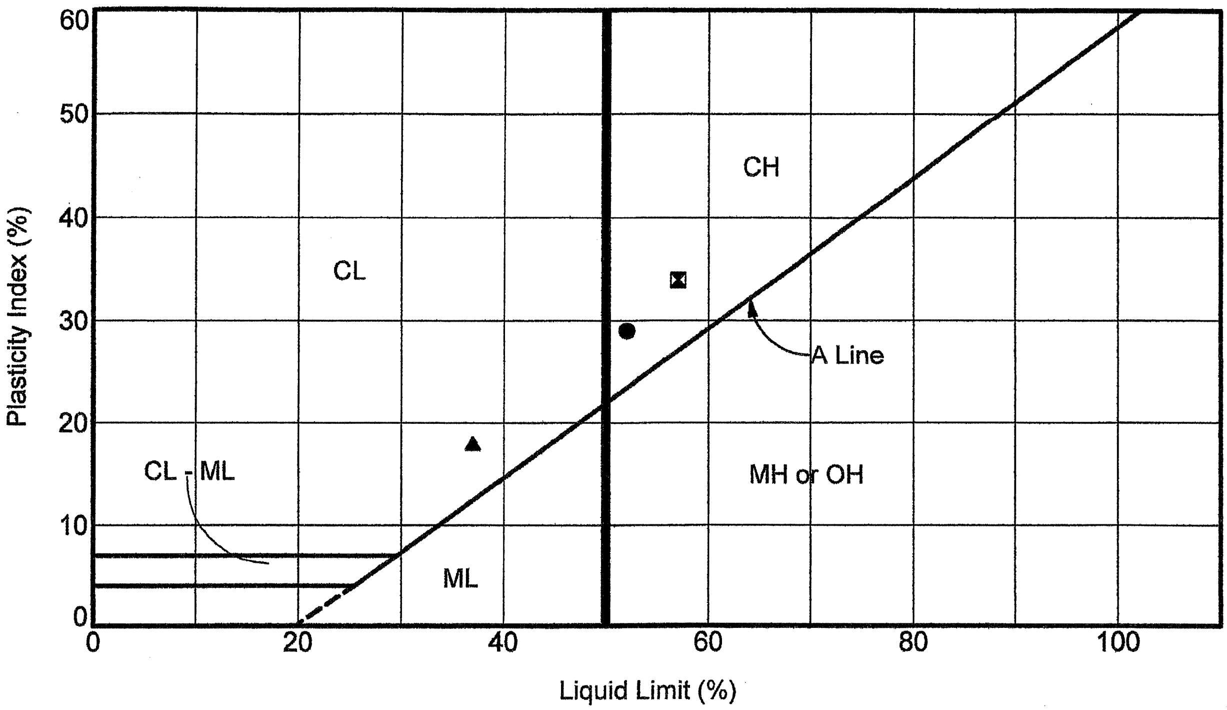
Date: 01-18-19

Appr: [signature]

LABORATORY TEST DATA

NEILMED WAREHOUSE
685 AVIATION BOULEVARD
SANTA ROSA, CALIFORNIA

PLATE **4b**



ASTM D 4318-98

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**DARK BROWN GRAVELLY CLAYEY SAND (SC)** **Test Pit 1 at 1.0 feet**	**52**	**23**	**29**	**45**
⊠	**OLIVE-BROWN SANDY CLAY (CH)** **Test Pit 2 at 3.3 feet**	**57**	**23**	**34**	**90**
▲	**DARK BROWN SILTY SAND (SM)** **Test Pit 4 at 1.5 feet**	**37**	**19**	**18**	**40**

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Job No: 1726.1.1

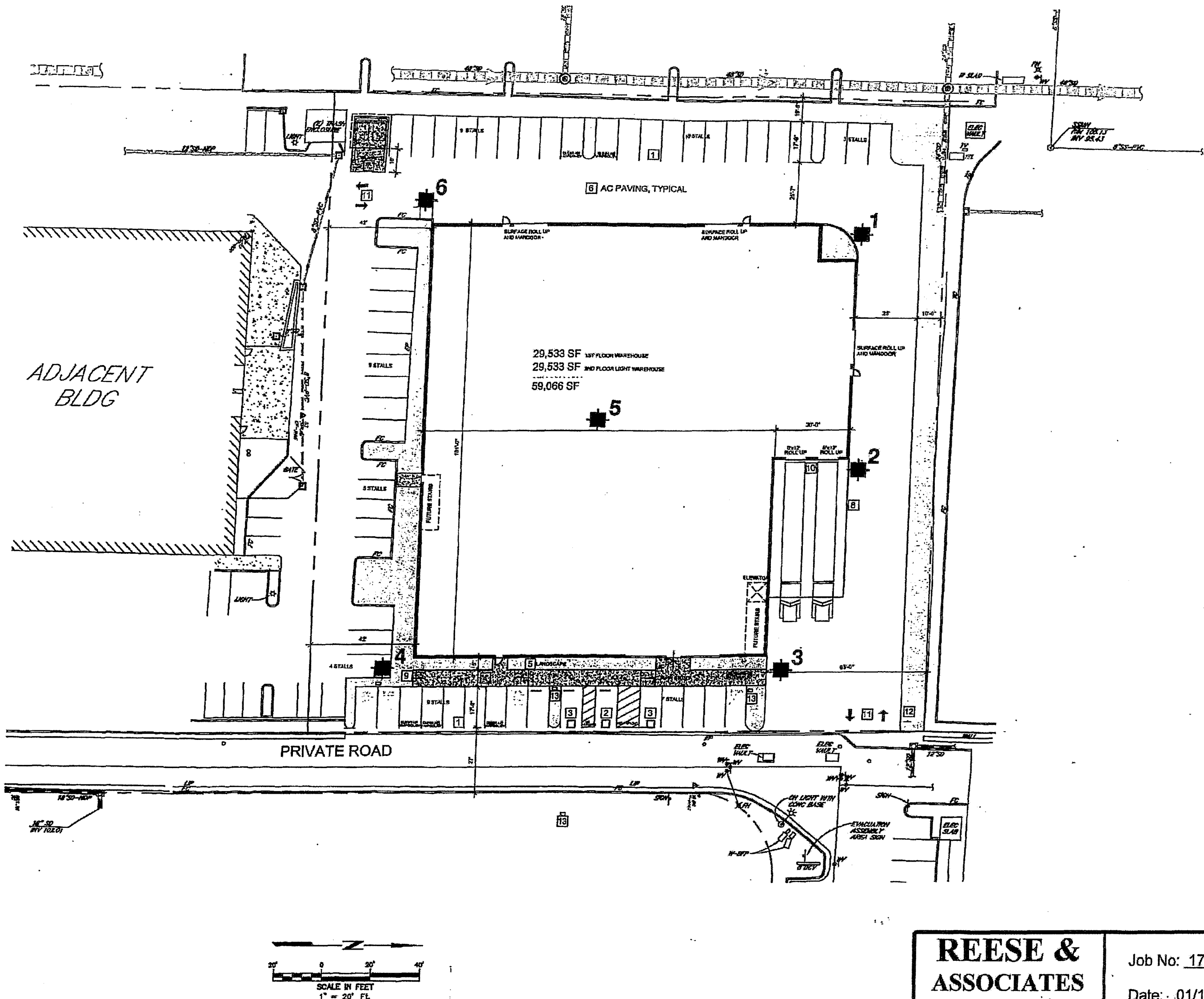
Date: 1-14-19

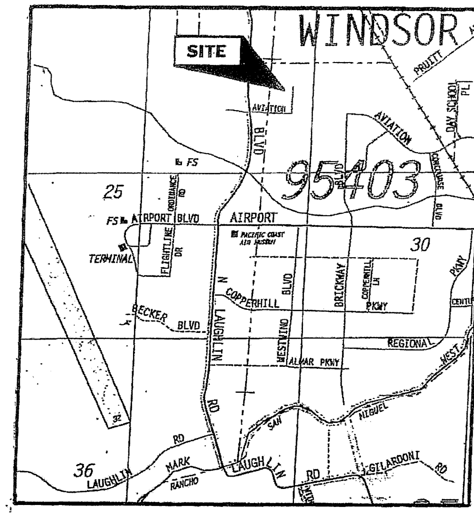
Appr: DS

ATTERBERG LIMITS TEST RESULTS

NEILMED WAREHOUSE
SANTA ROSA, CALIFORNIA

PLATE
5





■ Approximate Test Pit Location

REESE & ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS	Job No: 1726.1.1 Date: 01/14/19 Appr: [signature]	TEST PIT LOCATION PLAN AND SITE VICINITY MAP NEILMED WAREHOUSE 685 AVIATION BOULEVARD SANTA ROSA, CALIFORNIA	PLATE 1