GEOTECHNICAL STUDY
PROPOSED NEW ALLIED
HEALTH BUILDING
MERRITT COLLEGE CAMPUS
12500 CAMPUS DRIVE – OAKLAND, CA

Prepared For:

Peralta Community College District
Department of General Services
333 East Eighth Street
Oakland, California 94606

Attention: Atheria Smith
GEOTECHNICAL STUDY
PROPOSED NEW ALLIED HEALTH BUILDING
MERRITT COLLEGE CAMPUS
12500 CAMPUS DRIVE – OAKLAND, CA

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October 26, 2009
Job No. V128AA

Peralta Community College District
Department of General Services
333 East Eighth Street
Oakland, California 94606

Attention: Atheria Smith

Re: Geotechnical Study
Proposed New Allied Health Building
Merritt College Campus
12500 Campus Drive – Oakland, CA

As authorized, we have conducted a study of the soil and rock conditions at the site of the proposed new Allied Health Building at the Merritt College campus in Oakland.

The accompanying report presents our geotechnical recommendations for the project along with the results of the field and laboratory work upon which the recommendations are based.

We are available to review the report with you at your convenience.

Very truly yours,

JENSEN - VAN LIENDEN ASSOCIATES, INC.

Geoffrey Van Lienden
G. E. #853
GEOTECHNICAL STUDY
PROPOSED NEW ALLIED
HEALTH BUILDING
MERRITT COLLEGE CAMPUS
12500 CAMPUS DRIVE – OAKLAND, CA

SCOPE
As authorized, we have conducted a study of the soil and rock conditions at the site of the proposed new Allied Health Building on the Merritt College campus. This report summarizes our geotechnical recommendations for the project and presents the results of the field and laboratory work upon which they were based. Recommendations in the report are given for building foundations, retaining walls, site grading and subgrade preparation beneath slab-on-grade floors, and general recommendations for the project.

PROJECT DESCRIPTION
The project will involve the construction of one or two new buildings on a currently unimproved portion of the school's campus. The buildings will be built near the top of and along the eastern flank of a gradually sloping hillside. The area of the site is located south of Building L. We understand that the new building(s) will be two to three stories in height and it is anticipated that slab-on-grade lower floors would be used. Some grading will be required. Retaining walls may also be necessary.

STUDY METHODS
To study the site, we drilled 10 test borings at the approximate locations shown on the attached Site Plan, Figure 1. The borings were drilled using truck-mounted equipment and extended to depths ranging between 2-1/2 and 17-1/2 feet. All of the borings were terminated due to refusal in dense rhyolite bedrock.

Our principal engineer in the field classified the subsurface conditions encountered in the borings. Boring logs were prepared on the basis of these classifications. The final boring logs presented on Figures 2 through 11 represent the field logs with occasional editing on the basis of laboratory tests and an examination of recovered samples by the engineering staff.
Reasonably undisturbed samples were recovered from the borings and brought to the laboratory. Both a modified California sampler and a standard penetration sampler were used. Tests were performed on the samples to determine the strength, density and moisture content of the various materials. The results of these tests are shown, along with the resistance to penetration of the sampler, at the corresponding sample locations on the logs of borings.

Plasticity tests and hydrometer analyses were performed on selected samples. These tests are used to estimate the expansion potential of the tested soil and are also a guide to other engineering properties. The results of these tests are presented on the Plasticity Charts, Figures 12a and 12b.

As part of our study, we reviewed available geologic publications relating to the site. We also reviewed geotechnical studies, which had been made for previous investigations at the Merritt College campus in the vicinity of this site. All of these reports and references are presented in the attached Bibliography.

A geologic hazards investigation has been conducted concurrently with this study. The geologic hazards investigation has been issued under separate cover. Michael Carey, Certified Engineering Geologist, directed the geologic aspects of the investigation.

SITE AND SOIL CONDITIONS

Most of the site is unimproved. There are some landscaped areas on the upper part (western side) of the site. The unimproved portions of the site support a sparse growth of wild grass.

Our borings revealed that the site is underlain by very dense red brown to orange brown, weathered, rhyolite bedrock. In some cases, the bedrock has weathered to a consistency similar to a dense sandy gravel. This is typical of rhyolite bedrock in this area.

We encountered what appeared to be up to 3 feet of fill overlying the bedrock in some of the borings. The fill was found on the upper part of the site (Borings 1 and 2). In most borings, the bedrock was encountered at the ground surface.

No groundwater was encountered in any of the borings at the time of drilling. Groundwater levels fluctuate seasonally and annually and are generally higher during the
winter months. Water will probably collect within the near surface soils and flow through fractures in the bedrock during periods of heavy rain or irrigation. All of the borings were filled with cement grout immediately after the drilling had been completed.

Geologic maps indicate that the site is within the Leona Rhyolite Formation. This is consistent with the findings of our test borings. Rhyolite exposures are visible in cut slopes at a number of locations near the site.

The nearest reportedly active earthquake fault to this site is the Hayward Fault. A trace of the Hayward Fault has been mapped approximately 1.3 kilometers to the southwest. The site is not located in an Alquist Priolo Earthquake Rupture Zone. Hazard Zones have been recently established by the California Department of Conservation for landsliding during an earthquake and also for liquefaction potential. This site is not included within any of these hazard zones. We did not observe any landsliding on the site and no landslides have been shown on this site in any of the geologic publications that we reviewed.

CONCLUSIONS

The entire site is underlain by dense, weathered, rhyolite bedrock, with very thin natural soil cover. The rhyolite is non-expansive and will provide good support for building foundations and retaining walls.

We did not encounter groundwater within our borings. All of the borings were terminated because of refusal in dense bedrock. In our opinion, the potential for liquefaction at this site is nil. The site is also not vulnerable to landsliding (under either static or seismic conditions) due to the gradual slopes and the high strength of the underlying bedrock materials.

Specific recommendations are given below:

RECOMMENDATIONS

1. Grading
   All grading should be done under the direct observation of the geotechnical engineer and in accordance with the attached Guide Specifications for Engineered Fills. Prior to commencing the grading, the site should be stripped to remove any organic material such as grass, weeds or landscape vegetation. Existing fills in
structural areas should also be excavated. The stripped materials can be stockpiled for later use in landscape areas but none of the stripped materials should be used in engineered fills.

Excavations can then be made to the planned subgrade elevations. In general, soils from the site should produce a high quality structural fill material.

In areas where fills are to be placed on slopes (5 horizontal to 1 vertical or steeper), excavations should be made to form a key and level benches in the dense bedrock below the fill. In general, the key and benches should extend to a minimum depth of 2 feet below the existing grade. The keyway should be at least 10 feet wide (or the minimum width of the compaction equipment), whichever is wider. In all areas, the exposed surfaces should be scarified to a minimum depth of 6 inches, brought to a moisture content that will permit proper compaction, and compacted to a minimum degree of compaction of 90% (ASTM D1557).

Fills can then be placed on the prepared surfaces in thin layers (6 to 8 inches in uncompacted thickness). The fill should be brought to a moisture content that will permit proper compaction and compacted to a minimum degree of compaction of 90%. In general, on-site, excavated soils should be suitable for use as fill.

Cut and fill slopes can be constructed at inclinations that are no steeper than 2 horizontal to 1 vertical. Where fill slopes are built, the slopes should be overbuilt by a foot or two and then trimmed back to form a hard and well-compacted surface.

The dense bedrock that underlies the site may prove difficult to excavate. The grading contractor should be prepared to use heavy equipment if deep excavations are required. A detailed analysis of the excavatability of the bedrock is beyond our current scope of work.

2. Foundations

a. Spread Footings

The building and other improvements can be supported on spread footing type foundations. The footings should extend to a minimum depth of 18
inches below the lowest adjacent finished grade. Where footings are constructed near slopes, they should be deepened in accordance to the criteria presented on Figure 13.

Footings can be supported within cuts and/or well-compacted fills. The footings can be designed for an allowable soil pressure of 2000 psf for dead load, 3000 psf for combined dead plus live load, and 4000 for all loads including wind or seismic. These pressures are based on the assumption that the footings will be built within fills and are conservative for footings in bedrock.

There is some risk of differential settlement of the building foundations if the building transitions between excavations hard rock and thick fills. A common approach to address this problem is to overexcavate the bedrock areas to a depth of approximately 5 feet below the bottoms of the footings (possibly even deeper if very thick fills are planned) and then backfilling the entire area with engineered fill. This will create a situation in which all of the footings bear in fill.

Footings constructed in accordance with the criteria given in this section should experience future settlements of less than ½ inch. If more than 5 feet of fill is placed beneath the footings, the settlement can be estimated to be approximately 1% of the fill thickness at that location. Most of the settlement would occur within the first 5 years.

b. Drilled Piers
It may be necessary to use drilled pier foundations to resist uplift loads. Piers should be at least 18 inches in diameter and can be designed to resist uplift loads using a skin friction value of 500 psf. This is a value that assumes that the pier will be primarily supported in fill. The friction can be used below a depth of 3 feet below the finished ground surface. This is a conservative value and can be increased if the piers extend several feet into the bedrock. The value given above is for dead plus live loads. It can be increased by 33% to account for all loads including wind or seismic. A minimum pier length of 10 feet should be maintained.
3. Retaining walls
Retaining walls supporting level backslopes can be designed for an equivalent fluid pressure of 40 pcf. If the backslope extends upward at an inclination of 2 horizontal to 1 vertical, the pressure should be increased to 60 pcf. If the walls are tied back, or restrained from movement at the top, the pressures should be increased by another 25%.

The retaining walls should be designed to account for the additional horizontal loads that might be associated with an earthquake. For this site, it is recommended that the seismic increment be computed as a uniform pressure equal to 8H in psf (where H is equal to the height of the wall in feet at that location).

The retaining walls can be supported on spread footings designed in accordance with the criteria given above. For lateral resistance, a coefficient of friction of 0.35 can be used between the bottom of the footing and the underlying soil or rock. Passive pressure can be computed by assuming an equivalent fluid weighing 350 pcf. The upper 18 inches of soil should be discounted in the passive pressure calculation.

4. Slab-on-grade Construction and Pavements
As mentioned above, the soil and rock at this site are composed of non-expansive materials. No special subgrade preparation treatment is necessary (beyond the grading procedures recommended in Section 1) for slabs-on-grade.

If slabs are to be constructed in areas where moisture migration and the resulting dampness in the slab would be undesirable, a moisture vapor retarder system should be used beneath the slab. A variety of treatments are available on the market today varying considerably in effectiveness and expense. A commonly used treatment consists of a few inches of open graded gravel (capillary rock) a moisture vapor proof membrane, and 1 or 2 inches of sand over the membrane. The use of the sand is a matter of debate among structural engineers.

Preliminarily, it is suggested that asphalt pavements be designed using the assumption that the subgrade R-value will be 25. This should be verified by further testing.
5. CBC Geotechnical Seismic Design Parameters

a. Mapped Values

The site longitude and latitude are 37.7888 degrees west and 122.1654 degrees north, respectively (NAD 83).
The site class is C.
The estimated site short period spectral acceleration $S_s$ is 1.97g.
The estimated site 1-second spectral acceleration $S_1$ is 0.77g.
$F_s = 1.0$
$F_v = 1.3$

b. Site Specific Values

A site-specific ground motion analysis has been conducted for this project. Based on our site-specific analyses, the ground motion values are as follows.

$s_{DS} = 1.87g$
$s_{MS} = 2.80g$
$s_{M1} = 0.80g$
$s_{M1} = 1.20g$

The procedures used to develop these values are described in the Geologic Hazards Report.

6. Site Drainage

Good drainage should be developed on the property. Water should be prevented from ponding near the building foundations or near the tops of slopes. Water should not be allowed to flow over the slopes in concentrated streams or channels. Water collected in downspouts and yard drains should be conveyed in tight line pipes to approved discharge facilities.
7. **Construction Observations and Review of Plans**

We recommend that the final building plans be submitted to our office for review. This will enable us to evaluate specifics of the construction and to make supplemental recommendations if necessary.

Structural grading and excavating for foundations should also be done under the direct observation of the soil engineer. These observations would be made to verify that the soil and rock conditions are those that were anticipated for the development of the design criteria, to determine that the foundations extend for the minimum recommended depth into supporting soil or rock, and to verify that fills are being compacted to meet the project specifications.
LIMITATIONS

The conclusions and opinions in this report are based on visual examinations of the property and on the subsurface exploration described in this report. While, in our opinion, this investigation adequately discloses the soil conditions across the site, the possibility exists that there are anomalies or changes in the soil conditions that were not discovered by this investigation. Should such items be discovered during construction, our office should be notified immediately so that any necessary supplemental recommendations can be made.

This study was not intended to disclose the locations of any existing utilities, septic tanks, leaching fields, or other buried structures. The contractor or other people working on this project should locate these items, if any.

This report was prepared to provide engineering opinions and recommendations only. It should not be construed to be any type of guarantee or insurance.
REFERENCES

ASCE STANDARD 7-05


California Division of Mines and Geology, 1982, Special Studies Zones, Oakland East Quadrangle, map at 1:24,000 scale.

California Geological Survey (formerly California Division of Mines and Geology). 1996, California fault parameters; available on CGS Internet Site.


California Division Of Mines And Geology., 2003; Seismic Hazard Zone Report 080 For The Oakland East and Part of Las Trampas Ridge Quadrangles.

California Division of Mines and Geology, 1982, Special Studies Zone, Oakland East Quadrangle, map at 1:24,000 scale.

Crane, R.C. 1995; Geology Of Mount Diablo Region And East Bay Hills. in: Recent Geologic Studies of the San Francisco Bay Area, SEPM, Pacific Section, Vol. 76, p87-114


Lienkaemper, James J., 1992. "Map of Recently Active Traces of the Hayward Fault, Alameda and Contra Costa Counties, California" 1:24,000 MAP MF-2196

Nilsen, T.H., "Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Oakland East 7 1/2' Quadrangle, Contra Costa and Alameda Counties, California", USGS Open File Map 75-277-41


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Pradel, D., 1998, Procedure to evaluate earthquake-induced settlements to dry sandy soils: ASCE Journal of Geotechnical and Geoenvironmental Engineering. V. 124, p. 4. p3 364-368. [Note: This publication contains methods to simplify the procedures of Tokimatsu and Seed (1987)].

Seed, R.B. and Idriss, I.M., 1982, Ground motions and soil liquefaction during earthquakes, Earthquake Engineering research Institute, Oakland, California, 134 p.

State of California, 2/14/03, Seismic Hazard Zones, Oakland East and Part of Las Trampas Ridge Quadrangles

State of California, 2/14/03, Seismic Hazard Zones, Oakland West Quadrangle.


Approx Location of Test Boring

Approx Scale 1" = 100'


Site Plan
Boring Locations

<table>
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<th>Date</th>
<th>Figure</th>
<th>Job No.</th>
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<td>10/09</td>
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<td>V128AA</td>
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Medium dense red brown clayey sand
(Possible Fill)

Very dense red brown to orange brown weathered rhyolite

BOTTOM OF BORING
(Refusal)
Log of Boring Number 1a

Allied Health Building
Merritt College Campus
12500 Campus Drive, Oakland

Supervisor: GVL
Date Drilled: August 14, 2009
Drilling Method: 4.5" Solid Auger
Sampling Method: 140 lbs/30-inch drop
Surface Elevation: Not Measured
Groundwater Depth: Dry - ATD

Sample Number | Diameter (in.) | Blows/Feet | Dry Density (pcf) | Moisture Content (%) | Unconfined Compressive Strength (psf) | Description |
--- | --- | --- | --- | --- | --- | --- |
1 | 1.4 | 20 | - | - | - | Medium dense red brown clayey sand (Possible Fill) |
2 | 1.4 | 68/ | - | - | - | Very dense red brown to orange brown weathered rhyolite |

Graphic Log

Job Number V128AA

Figure 2a
<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Diameter (in)</th>
<th>Blow-Count</th>
<th>Dry Density (pcf)</th>
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<td>13</td>
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<tr>
<td>2</td>
<td>1.4</td>
<td>SPT 50/1</td>
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</table>

Job Number: V128AA  
Figure: 3
### Log of Boring Number 3

**Allied Health Building**  
Merritt College Campus  
12500 Campus Drive, Oakland

**SUPERVISOR:** GVL  
**DATE DRILLED:** August 14, 2009  
**DRILLING METHOD:** 4.5" Solid Auger  
**SAMPLING METHOD:** 140lbs/30-inch drop  
**SURFACE ELEVATION:** Not Measured  
**GROUNDWATER DEPTH:** Dry - ATD

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<th>Sample Number</th>
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<th>Undrained Compressive Strength (psf)</th>
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<td>108</td>
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<td>6</td>
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<td>SPT</td>
<td>50/1</td>
<td>-</td>
<td>-</td>
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<td>Dense red brown to orange brown weathered rhyolite</td>
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**Graphic Log**

**BOTTOM OF BORING (Refusal)**

**Job Number:** V128AA  
**Figure:** 4
### Log of Boring Number 4

**Allied Health Building**  
**Merritt College Campus**  
**12500 Campus Drive, Oakland**

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<th>GVL</th>
<th>SAMPLING METHOD:</th>
<th>140lbs/30-inch drop</th>
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<table>
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<tr>
<th>Sample Number</th>
<th>Diameter (in.)</th>
<th>Blows/Foot</th>
<th>Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Unconfined Compressive Strength (psf)</th>
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**BOTTOM OF BORING**  
(Refusal)
SUPERVISOR: GVL
DATE DRILLED: August 14, 2009
DRILLING METHOD: 4.5' Solid Auger

SAMPLEING METHOD: 140lbs/30-inch drop
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: Dry - ATD

Sample Number
Diameter (in.)
Blows/foot
Dry Density (pcf)
Moisture Content (%)
Uncentered Compressive Strength (psf)

Depth (feet)

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<th>Depth</th>
<th>Description</th>
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<td>0</td>
<td>Medium dense brown clayey sand</td>
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<tr>
<td></td>
<td>Dense red brown to orange brown weathered rhyolite</td>
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</tbody>
</table>

BOTTOM OF BORING (Refusal)
Description
Medium dense brown silty sand and gravel
Dense red brown to orange brown weathered rhyolite

BOTTOM OF BORING
(Refusal)
Log of Boring Number 8

Allied Health Building
Merritt College Campus
12500 Campus Drive, Oakland

SUPervisor: GVL
Date Drilled: August 14, 2009
Drilling Method: 4.5" Solid Auger
Sampling Method: 140lbs/30-inch drop
Surface Elevation: Not Measured
Groundwater Depth: Dry - ATD

---

Sample Number | Diameter (in.) | Blow Count | Foot | Density (pcf) | Moisture Content (%) | Unconfined Compressive Strength (psf) | Depth (feet) | Graphic Log
--- | --- | --- | --- | --- | --- | --- | --- | ---
1 | 1.4 | 50/ | | | | | | |

Description:

Dense red brown to orange brown weathered rhyolite

---

Bottom of Boring (Refusal)
Log of Boring Number 9

Allied Health Building
Merritt College Campus
12500 Campus Drive, Oakland

SUPERVISOR: QVL
DATE DRILLED: August 14, 2009
DRILLING METHOD: 4.5" Seld Auger

SAMPLING METHOD: 140lbs/30-inch drop
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: Dry - ATD

---

Sample Number | Diameter (in) | Blows/Foot | Density (pcf) | Moisture Content (%) | Unconfined Compressive Strength (psf) | Depth (feet) | Graphic Log | Description
--- | --- | --- | --- | --- | --- | --- | --- | ---
1 | 1.4 | SPT | 20 | - | 8 | - | - | Dense range sity to clayey sand and gravel from weathered rhyolite
2 | 2.0 | 19 | 112 | 7 | | | | Dense red brown to orange brown weathered rhyolite
3 | 1.4 | 50/1 | 108 | 8 | | | | BOTTOM OF BORING (Refusal)

---

Job Number V128AA

Figure 10
Sample Number | Diameter (in.) | Blow/Density (pdr) | Moisture Content (%) | Unconfined Compressive Strength (psf) | Description
--- | --- | --- | --- | --- | ---
1 | 1.4 | 41 | 14 | 30 | Dense red brown to orange brown weathered rhyolite
2 | 1.4 | 30 | 14 | 50 | BOTTOM OF BORING (Refusal)
3 | 1.4 | 2" | 50 | 2" |
PLASTICITY CHART

INDEX TEST RESULTS

<table>
<thead>
<tr>
<th>Sample Identification</th>
<th>Atterberg Limits (%)</th>
<th>Grain Sizes (% Dry Weight)</th>
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<td>Plasticity Index</td>
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<td>64</td>
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<td>3-5-3</td>
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<td>4-1-4</td>
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PLASTICITY CHART

INDEX TEST RESULTS

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<th>Grain Sizes (% Dry Weight)</th>
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<td>9-2-3</td>
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</table>
SPREAD FOOTING FOUNDATIONS

PIER FOUNDATIONS

REQUIRED DEPTH of FOUNDATIONS
CONSTRUCTED NEAR SLOPE

D = Depth to bottom of foundation (for spread footings)
D = Depth to top of supporting material (for piers)
(see soil report)
A. GENERAL

1. Definition of Terms

FILL...is all soil or soil/rock materials placed to raise the grade of the site or to backfill excavations.

ON-SITE MATERIAL...is that which is obtained from the required excavations on the site.

IMPORT MATERIAL...is that hauled in from off-site areas.

SELECT MATERIAL...is a soil material meeting the requirements set forth in "C(2)" below.

ENGINEERED FILL...is a fill upon which the Soil Engineer has made sufficient tests and placement and compaction observations to enable him to issue a written statement that in his opinion the fill has been placed and compacted in accordance with the Soil Engineer's recommendations and/or the specification requirements.

ASTM SPECIFICATIONS...are the Annual Book of ASTM Standards (Part 19), American Society for Testing and Materials, latest revision.

MAXIMUM DRY DENSITY...is the maximum density for a given fill material that can be produced in the laboratory by the Standard procedure ASTM D1557, "Moisture-Density Relations of Soils Using a 10 Pound (4.5 kg) Rammer and an 18 inch (457 mm) Drop".

OPTIMUM MOISTURE CONTENT...is the moisture content at which the maximum laboratory density is achieved using the standard compaction procedure ASTM Test Designation D1557.

DEGREE OF COMPACTION...is the ratio, expressed as a percentage, of the dry density of the fill material as compacted in the field to the maximum dry density for the same material.

2. Responsibility of the Soil Engineer

The Soil Engineer shall be the Owner's representative to observe the grading operations, both during preparation of the site and compaction of any engineered fill. He shall make enough visits to the site to familiarize
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himself generally with the progress and quality of the work. He shall make a sufficient number of field observations and tests to enable him to form an opinion regarding the adequacy of the site preparation, the acceptability of the fill material, and the extent to which the degree of compaction meets the specification requirements. Any fill where the site preparation, type of material, or compaction is not approved by the Soil Engineer shall be removed and/or recompacted by the contractor until the requirements are satisfied.

3. Soil Conditions

A soil investigation has been performed for the site by Jensen-Van Lienden Associates, Inc. and a report has been issued by them dated September 24, 2009 covering that investigation. The contractor shall familiarize himself with the soil conditions at the site, whether covered in that report or not, and shall thoroughly understand all recommendations associated with the grading.

B. SITE PREPARATION

1. Stripping

Prior to any cutting or filling, the site shall be stripped and grubbed to a sufficient depth to remove all grass, weeds, roots, and other vegetation. The minimum stripping depth shall be 2 inches. The site shall be stripped to such greater depth as the Soil Engineer in the field may consider necessary to remove materials that in his opinion are unsatisfactory. The stripped material shall either be removed from the site or stockpiled for reuse later as topsoil, but none of this stripped material nor any of the building debris may be used in engineered fills.

2. Preparation for Filling

After stripping, existing fill as called for on the plans and recommended in the Soil Report in areas to be filled shall be overexcavated to the minimum depth called for on the plans or that is required by the Soil Engineer in the field. The overexcavated soils that are clean and free from organic material can be used later as general engineered fill.

After stripping the surface vegetation and overexcavating the weak soils to the required depths, the exposed surface shall be scarified to a minimum depth of 6 inches, watered or aerated as necessary to bring the soil to a moisture content that will permit compaction, and recompacted to the requirements of engineered fill as specified in "D" below. Prior to placing
fill, the Contractor shall obtain the Soil Engineer's approval of the site preparation in the area to be filled. The requirements of this section may be omitted only when approved in writing by the Soil Engineer.

All fills within 30 feet of a fill slope or where fills are placed on natural slopes inclined at 5 horizontal to 1 vertical or steeper shall be founded on strong soils below the natural surface soils. An excavation shall be made at the toe of the fill slope to form a key having a minimum width as recommended in the soil report and shown on the grading plans. The key shall be excavated into the underlying undisturbed rock or strong soil if approved by the Soil Engineer. Excavations shall then be made into the strong natural soils to form level benches upon which to place the fill.

C. MATERIAL USED FOR FILL

All fill material must be approved by the Soil Engineer. The material shall be a soil or soil/rock mixture that is free of organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension, and not more than 15% by dry weight shall be larger than 2 1/2 inches in greatest dimension. The soils from the site, except the surface stripings, shall be suitable for use as fill.

D. PLACING AND COMPACTING FILL MATERIAL

All fill material shall be compacted as specified below, or by other methods if approved by the Soil Engineer, so as to produce a minimum degree of compaction of 90%. Higher degrees of compaction shall be as described in the Soil Report.

Fill material shall be spread in uniform lifts not exceeding 8 inches in uncompacted thickness. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either aeraing the material if it is too wet or spraying the material with water if it is too dry. Each lift shall be thoroughly mixed before compaction to ensure a uniform distribution of water content.

E. EXCAVATION

All excavations shall be carefully made true to the grades and elevations shown on the plans. The excavated surfaces shall be properly graded to provide good drainage during construction and to prevent ponding of water.
F. TREATMENT AFTER COMPLETION OF GRADING

After grading is completed and the Soil Engineer has finished his observation of the work, no further excavation or filling shall be done except with the approval of and under the observation of the Soil Engineer.

It shall be the responsibility of the Grading Contractor to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.