May 18, 2011
Job No. X129AA

GEOTECHNICAL ENGINEERING STUDY
16309 KENT AVENUE
SAN LORENZO, CALIFORNIA

Prepared For:
Resources for Community Development
2220 Oxford Street
Berkeley, California 94705

Attention: Deni Adeniya

Jensen - Van Lienden Associates, Inc.
GEOTECHNICAL ENGINEERING CONSULTANTS

GEOTECHNICAL ENGINEERING STUDY
16309 KENT AVENUE
SAN LORENZO, CALIFORNIA

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Jensen – Van Lienden Associates, Inc.
GEOTECHNICAL ENGINEERING CONSULTANTS

Curtis N. Jensen
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May 18, 2011
Job No. X129AA

Resources for Community Development
2220 Oxford Street
Berkeley, California 94705

Attention: Deni Adeniya

Re: Geotechnical Engineering Study
Ashland Housing Project
San Lorenzo, CA

Gentlemen:

We have completed our study of engineering properties of soils underlying 16309 Kent Avenue in San Lorenzo, California.

The accompanying report presents our study findings and our recommendations for design and construction of foundations and other features of the project proposed for the site relating to geotechnical engineering. The report includes our study data.

We appreciate having been retained to conduct the study, and remain available to discuss with you the report contents, and/or the substance of our study findings.

Very truly yours,

JENSEN - VAN LIENDEN ASSOCIATES, INC.

Curtis N. Jensen
G. E. #438

REGISTERED GEOTECHNICAL ENGINEER
CURTIS N. JENSEN
No. GE438
Exp. 12-31-2011
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STATE OF CALIFORNIA

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GEOTECHNICAL ENGINEERING STUDY
16309 KENT AVENUE
SAN LORENZO, CALIFORNIA

SCOPE

This report presents results of a study of the engineering properties and stratigraphy of soils underlying property at the Kent Avenue Ashland Housing project site in San Lorenzo California. The study site is illustrated on Figure 1.

Residential housing and house trailers currently occupy the site. It is proposed to convert the site from it present use by constructing low-income housing on the site.

The purpose of the study was to characterize the engineering properties and stratigraphy of the soils underlying the site to the extent that we could formulate conclusions concerning the site conditions and recommendations for foundations and for other details of the proposed project relating to geotechnical engineering. To achieve this purpose, the study scope included the following elements.

1. Research
2. Subsurface exploration with test borings and cone penetration tests
3. Soil sampling
4. Laboratory testing
5. Engineering analyses
6. Production of this report

STUDY METHOD

The study was comprised of research for published information about the site geology and seismicity, exploration of the site subsurface conditions, laboratory testing of samples of site subsoils and analyses. Exploration of the site subsurface conditions was conducted with test borings.

Five test borings were drilled on May 10, 2011 with 6-inch diameter, truck-mounted, hollow stem and solid stem auger equipment. Approximate locations of these test borings are displayed on Figure 1.

Our project engineer classified soils brought to the surface by the drilling and sampling tools, and recorded these classifications and related notes onto field logs. The logs were occasionally edited to reflect re-examination of recovered samples and the results of laboratory tests. The edited versions are displayed on Figures 2 through 6.

Samples of encountered soil strata were removed from the test borings. Sampling was generally accomplished with drive samplers, advanced with a 140-pound drop hammer, raised through a height of 30 inches and tripped automatically. The number of hammer blows required to advance the drive samplers the last 12 inches of travel was counted and is recorded on the logs of borings.

We performed several laboratory tests on test boring samples. Moisture content, dry density and unconfined compression strength tests were routinely made (the latter on clayey and silty samples). The unconfined compression strength tests were used to estimate the undrained strength of the tested soil. Measured moisture contents, dry densities and confined compression strengths are given on the logs of borings.

The grain-size distribution and Atterberg Limits of selected samples was also determined. Results are displayed on Figure 7.

Analyses were made of the site foundation load carrying capacity, settlement potential, and liquefaction potential.

SITE DESCRIPTION AND GEOTECHNICAL CONDITIONS

1. Site Description

The site is an irregularly shaped parcel fronting on Kent Avenue, near the intersection of Kent Avenue and East 14th Street. The total area is slightly less than 1 ¼ acre.

At the time of our study, a few wood frame single-family residences and several residential house trailers occupied the site.

Elevation changes across the site are not large, possibly amounting to 2 feet or so from front to back.

Two separate driveways serve the residences and trailers. Both lead from Kent Avenue and join together near the site center. The driveways are covered with asphalt concrete.

2. Geotechnical Conditions

Our borings indicate that the near surface soil consists of a thin layer of fill, made up of brown very sandy and gravelly sandy clay/clayey sand.

The fill rests on stiff to medium stiff, dark gray silty clay. Our test borings indicate that this layer is continuous throughout the site, and ranges in thickness from about 1 1/2/feet to perhaps as much as 3 feet.

In test borings 1 and 2, the dark gray silty clay rests on stiff brown silty clay, and then, in turn, by stiff olive gray silty clay and stiff mottled, olive gray, orange brown and light gray silty clay.

In test borings 3, 4 and 5 the brown silty clay was absent, and the near surface dark gray silty clay rests on interbedded silty and clayey sands with occasional gravel and some sandy clay (in test boring 3). These sandy soils overlie stiff clays similar to those observed in test borings 1 and 2.

Groundwater migrated into the open test borings as they were being drilled, and the level to which the accumulated groundwater rose in the borings was measured in some borings after they were completed. These measurements are given on the boring logs.

PROJECT DESCRIPTION

We understand that the project will be comprised of several units of two to three story low cost housing, clustered into seven groups through out the site. We anticipate that the units will be framed with wood. Units not built over at grade parking should impose light to moderate in foundation loads. Ground floors in the smaller townhouse and live/work spaces may be concrete slabs on grade.

We expect that a minor to moderate amount of grading will be required to adjust the existing grades to conform with the project grades, to provide for level building areas and drainage, and that parking areas and driveways will be surfaced with asphalt concrete.

Utilities supplying the project are likely to be underground, installed in backfilled trenches.

CONCLUSIONS AND DISCUSSION

1. Foundation Support

We conclude that, aside from the surface dark gray silty clay, the clayey soils underlying the site would be suitable for supporting the project improvements on spread footings.

In contrast the sandy soils observed underlying the dark gray clays in test borings 3, 4 and 5 are believed to be potentially liquefiable and are not considered suited for footing support. However, provided that the potential for liquefaction is mitigated, in our opinion, footings would be satisfactory foundations throughout the entire site. The liquefaction potential and proposed mitigation are discussed in more detail below.

We estimate static total and differential settlements of footings designed in accordance with the recommendations of this report will be 1 inch or less and ¾ inches or less respectively. Possible seismic settlements are discussed below.

2. Liquefaction

Research indicates that the subject site lies within a seismic hazard (liquefaction) zone as determined in accordance with the Seismic Hazard Mapping Act. As noted above, lenses and layers of granular soils, generally silty and clayey sands with occasional gravels underlie the site.

It is known that sandy soils are susceptible to liquefaction under the right conditions. Liquefaction is the transformation of an initially stable soil that possesses substantial strength and bearing capacity to one resembling a viscous fluid having little or no shear strength and bearing capacity. It occurs when ground vibrations associated with strong earthquake ground motions are transmitted through a site containing susceptible soils.

From a practical standpoint, only granular (sandy) soils that are saturated (i.e. lie below the groundwater table) and having a loose consistency are susceptible to liquefaction. Dense, saturated granular soils, cohesive silts and clays and all unsaturated soils (those that lie above the groundwater table) are not liquefiable. The clayey soils that underlie the site will not liquefy.

We evaluated the liquefiability of the sandy layers and lenses that underlie the subject site using the data derived from our study, and the prescriptive procedures given in the References 1 and 4.

These analyses indicate that, by and large, the granular layers that underlie the site could liquefy if the site is subjected to strong seismic ground motions.

Unless the liquefaction potential of the sandy soils is mitigated, foundation and/or ground failures could follow the onset of liquefaction. Shallow foundations (footings) could experience partial or total loss of load carrying capacity. Other ground failures involving site lateral displacements (lateral spreading) or settlements associated with drainage can follow the onset of liquefaction.

It is our opinion that potential foundation failures associated with liquefaction are possible at the subject site. Judging from our borings the lenses or zones of sandy soils that may liquefy during an extreme seismic event are limited to the center and rear of the site, and between depths of 4 feet and 11 feet.

We judge lateral spreading is unlikely, partly because of the limited extent of the liquefied zones and partly because of the flat topography in the vicinity, and partly because the mitigation recommended below would create a non-liquefiable layer above the liquefied zone that would restrain lateral spreading.

Drainage from the liquefied zones would theoretically decrease the volume of the zone of the liquefied soil below the mitigation level slightly, leading to settlements apparent at the ground surface. Using data derived from our study, we estimate that the post earthquake settlements from this source would amount to about 1 inch or less. Because nearby areas would not liquefy, this estimate of total settlement would also be a reasonable estimate of the differential settlement. These total and differential settlements are judged to be within a range that is tolerable for the structures that are planned for the site.

In summary, while liquefaction of soils underlying the site is possible, it is our view that this liquefaction would not present a hazard for structures supported on spread footings, provided that the mitigation measure recommended below is implemented.

3. CBC Geotechnical Seismic Design Parameters

The site latitude is 37.695 degrees north and longitude is 122.115 degrees west. Judging from our test borings and laboratory data, and assuming that the site liquefaction susceptibility will be mitigated as recommended, we estimate that the Site Class is D.

We estimate that the short period spectral acceleration is 1.959 g and that the one-second period spectral acceleration is 0.758 g.

RECOMMENDATIONS

1. Liquefaction

As discussed above, the results of our study indicate that the sandy soils encountered in test borings 3, 4 and 5 are potentially liquefiable. We recommend mitigating this hazard by densifying the sands before constructing the project improvements.

One method for densification by compacting the sandy soils is described below. The recommended compaction should be sufficient to increase the sandy soil density to a level where it would not be susceptible to liquefaction related strength loss and would therefore be adequate for foundation support.

There are a variety of other densification procedures that have also proven effective, including vibration based methods, construction of stone columns and others. These procedures are commonly carried out by specialty contractors, who would prepare work plans and bids based on the exploration work and laboratory testing described herein (and additional exploration recommended below). If these other procedures are considered, we suggest such contractors be consulted for specific proposals for improvement of the sandy soils.

Our recommended densification method involves subexcavating the upper portion of the sandy soils, temporarily stockpiling them, and backfilling the excavations with engineered fill. Engineered fill is defined in the Site Preparation and Grading section of this report. The excavated soils should be suitable for the backfill, i.e. they do not require removal from the site and replacement with imported fill. This judgment assumes that the excavated dark gray silty clay soils are thoroughly mixed with the other excavated soils.

Based upon our borings, we tentatively estimate the subexcavation and backfilling depth to be to be a minimum of 7 feet below existing grade, or to the surface of the underlying silty clay, whichever is less. For preliminary planning purposes, we suggest that it be assumed that the entire site will warrant subexcavation and backfilling. However, we recommend performing additional subsurface exploration of the site, with borings and/or cone penetration tests to refine the depth and location of required densification (whether densification is done by conversion of the sandy soils to engineered fill or by other methods).

2. Foundations

Provided that the potentially liquefiable soils are densified, we recommend that foundations consist of spread footings. Footings should bear at a depth of 2 feet below lowest adjacent soil grade. Footings should extend to below the dark gray silty clay surface soils that remain as well.

Recommended bearing pressures are 2000 psf for dead loads, 3000 psf for dead and live loads and 4000 psf for the dead, live and transient (seismic or wind) loading condition. These bearing pressures should be suitable for treated and untreated soils.

If the site liquefaction potential is mitigated by compaction, as described herein, we recommend that interior isolated footings be connected with grade beams. Those footings adjacent to continuous perimeter footings should be connected to the perimeter footings as well. The grade beam/footing connection should be designed for a vertical shear and bending moment. The vertical shear should be taken as the sum of one quarter of the dead load and the real portion of the live load. The recommended connection bending moment is the vertical shear times a moment arm of 4 feet.

Grade beams should not be necessary if another method is employed to treat the sandy soils and mitigate their liquefaction potential.

Our firm should be consulted for further criteria if the lateral load carrying capacity of the foundation soils is a design consideration.

3 Slab on Grade Construction

As noted, because much if not all of the site surface soils will be converted to engineered fill, slabs on grade will be constructed on fill that is compacted to engineered fill requirements. Engineered fill is defined in the Grading section of this report. In the event further exploration defines areas that do not require liquefaction mitigation, the existing surface fill (if, any) and dark gray silty clay should be subexcavated and replaced with engineered fill.

Fill imported to the site to raise site grades and for use beneath concrete slabs-on-grade should generally meet select quality. Select fill is also defined in the Site Grading section.

Because of the presence of groundwater beneath the site, and the potential for a high capillary rise from the groundwater table, we recommend that vapor-retarding systems be installed beneath concrete slabs-on-grade within living and working spaces. The vapor retarder should consist of a capillary break of gravel, at least 4 inches thick, and a sturdy membrane at least 10 mil thick. It is our view that the membrane should be continuous beneath the entire slab. If continuity is not possible, the membrane should be taped or fastened to the sides of the grade beams and footings. Tears and rips in the membrane should be repaired, and openings for plumbing and conduits should also be taped. Other means for reducing the potential for water vapor to work through the slab may also be considered, such as using a low water cement ratio in the slab concrete. We also discouraged using moisture sensitive floor coverings, unless it can be shown that moisture working to the surface of the slab would not be detrimental to the coverings, or that testing demonstrates that the moisture flux through the slabs is less than the floor covering manufacturer's recommendations for their coverings.

We recommend that our slabs on grade be reinforced with reinforcing bars and not welded wire mesh. It has been experienced that mesh if often rendered useless as a reinforcing element during construction.

4. Site Preparation and Grading

After site demolition is completed, the site should be subexcavated and the subexcavations backfilled with engineered fill as described in the Liquefaction section of this report, or the liquefiable sandy soils treated by another method.

Placement and compaction of the select fill should be carried out under the observation of the engineering technician, and field density tests should be made in the compacted fills and backfills to verify that the compaction density is adequate.

Fills placed on the site should be engineered. We define engineered fill as soil and/or soil and rock mixtures with particle sizes not exceeding 6 inches in maximum dimension, placed in relatively thin layers, moisture conditioned as described below, and compacted to a minimum degree of 95%. The subgrade in areas that will receive vehicle traffic should also be compacted to a minimum degree of compaction of 95% at the subgrade level. The degree of compaction should be based upon the ASTM D1557 Standard D1557.

We recommend that the placement moisture content of all fills comprised of clayey soils be at least 1% above the optimum moisture content. The optimum moisture content should also be based upon the ASTM Standard D1557.

With the possible exception of the dark gray surface soils, we generally believe that the on-site fills will be suitable for reuse as engineered fill. If project planning requires fill be imported to the site, we recommend it meet select fill quality. Select fill is soil with a plasticity index of 12 or less, and whose content of clay is less than 25% of the total volume of the imported soil.

We anticipate that the existing asphalt concrete covering the site will be demolished and broken up as part of the site preparation. Provided that the broken asphalt concrete fragments do not exceed 6 inches of maximum dimension, and no more than 15% exceeds 2-1/2 inches of maximum dimension, we believe that it would be reasonable to use the fragments in the site fills, provided they are mixed with the other subexcavated fill. Reuse of the aggregate base that underlies the asphalt concrete would also be suitable as well.

We recommend that the utility trench backfills also be compacted. We note that jetting the backfills probably would not prove satisfactory, and do not recommend jetting as a means for densifying the backfills. The backfill should be compacted to a minimum degree of compaction of 90% to within 3 feet of finished grade and 95% thereafter.

Grading on the site should be carried out in accordance with the attached Guide Specifications for Engineered Fill.

5. Site Drainage

Runoff should be prevented from ponding near the building foundations. It is our opinion that runoff should be collected in downspouts and yard drains and be conveyed in tightline pipes to project storm drains.

6. Construction Observation and Further Services

We recommend that our firm be retained to review building plans for the project in order to assess whether the design criteria presented in this report have been correctly incorporated into the project plans. In this regard, we suggest that the members of the project design team consult with us on an as-needed basis to answer any questions that may arise regarding the design criteria.

Our firm should be retained to be on site when excavations are being made. The purpose of our site observations would be to verify that exposed materials are consistent with our expectations, and are the supporting materials as defined in the soil report. Being on site will also enable us to provide recommendations for changes to the project if conditions different from those anticipated are encountered during construction.

We recommend that our firm be retained to provide construction observation and testing services in connection with the placement and compaction of engineered fills. A technician should be on site while the fills are being placed and being compacted, and both field and laboratory tests should be made to verify that recommended minimum degrees of compaction are being achieved in the field.

7. Pavements

We anticipate project pavements will be comprised of asphalt concrete.

In areas traversed only by automobile and pickup truck traffic, we judge that a section comprised of 3 inches of asphalt concrete over 8 inches of aggregate base should be adequate.

The pavement section for truck traffic should be designed for the size of the trucks, the amount of truck traffic and the "R" value of the pavement subgrade. We suggest that the "R" value be determined from test(s) performed on the subgrade soils after site demolition and grading have been completed. The pavement section for truck traffic could then be determined.

Aggregate base should comply with Section 26 of the CALTRANS Standard Specifications. It should be compacted to a minimum degree of compaction of 95%.

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

Idriss, I.M., Boulanger, R.W., Soil Liquefaction During Earthquakes, Earthquake Engineering Research Institute, 2008.

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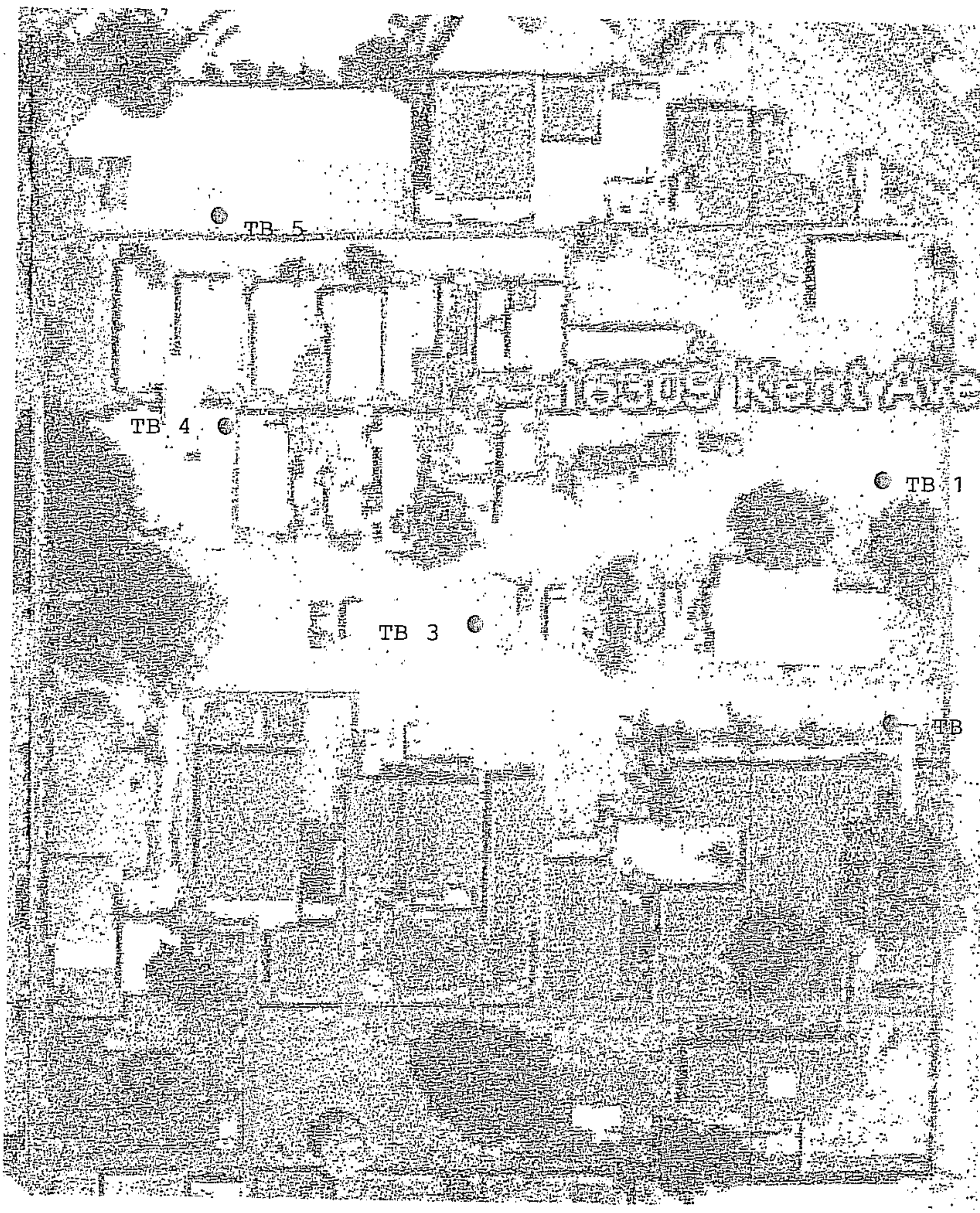

Note: Boring Locations are Approximate

Scale 1"= 50'

Jensen – Van Lienden Associates, Inc.

Boring Location Plan
16309 Kent Ave.
San Lorenzo, CA

Date	Figure	Job No.
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Jensen – Van Lienden Associates, Inc.
GEOTECHNICAL CONSULTANTS

Log of Boring Number 1

Ashland Housing
16309 Kent Avenue
San Lorenzo, California

SUPERVISOR: CNJ
DATE DRILLED: May 10, 2011
DRILLING METHOD: 6 solid stem auger
SAMPLING METHOD: Drive with 140# hammer
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: 7 1/2' on May 10, 2011

Sample Number	Diameter (in.)	Blows/Foot	Dry Density (pcf)	Moisture Content (%)	Unconfined Compressive Strength (psf)	Depth (feet)	Description
1	2.4	19	99	22	6900	0–2	Medium dense brown sand and gravel over stiff dark gray silty clay
			103	20	3400	2–8.5	Stiff brown and olive brown silty clay
2	2.4	8	96	24	-		Grading to very clayey sand to sandy clay
3	2.4	8	83	38	1200	8.5–13	Medium stiff to stiff dark gray brown silty clay grades to dark gray
4	2.4	19	-	30	-	13–25	Stiff olive brown silty clay
5	2.4	23	100	26	4300		grades to olive green gray mottled with orange brown below 20'
						25	BOTTOM OF BORING

Job Number X129AA

Figure 2

Jensen – Van Lienden Associates, Inc.
GEOTECHNICAL CONSULTANTS

Log of Boring Number 2

Ashland Housing
16309 Kent Avenue
San Lorenzo, California

SUPERVISOR: CNJ
DATE DRILLED: May 10, 2011
DRILLING METHOD: 6 solid stem auger
SAMPLING METHOD: Drive with 140# hammer
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: 8' on May 10, 2011

Sample Number	Diameter (in.)	Blows/Foot	Dry Density (pcf)	Moisture Content (%)	Unconfined Compressive Strength (psf)
1	2.4	10	97	26	-
2	2.4	10	81	39	2000
3	2.4	29	107	21	-

Depth (feet)	Description
0	Stiff brown very sandy clay with gravel (probable fill)
	Stiff dark gray silty clay
5	Stiff medium dark brown silty clay grades very sandy and silty with depth
10	Medium stiff to stiff dark olive gray silty clay
15	Very stiff olive brown mottled with dark gray and white silty clay
20	BOTTOM OF BORING
25	
30	

Job Number X129AA

Figure 3

Jensen – Van Lienden
Associates, Inc.
GEOTECHNICAL CONSULTANTS

Log of Boring Number 3

Ashland Housing
16309 Kent Avenue
San Lorenzo, California

SUPERVISOR: CNJ
DATE DRILLED: May 10, 2011
DRILLING METHOD: 6" Hollow Stem Auger
SAMPLING METHOD: Drive with 140# hammer
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: Not Measured

Sample Number	Diameter (in.)	Blows/Foot	Dry Density (pcf)	Moisture Content (%)	Unconfined Compressive Strength (psf)
1	2.4	19	96 23	100 21	- -
2	2.4	8	104	18	-
3	2.4	7	80	38	1800
4	2.4	14	91	31	2900
5	2.4	17	93	30	1600
6	2.4	12	93	30	-
7	2.4	11	97	27	1600
8	2.4	21	100	26	-
9	2.4	24	101	25	1700

Depth (feet): 10, 20, 30, 40, 50, 60

Graphic Log

Description

Medium stiff brown gravelly sandy clay over stiff black silty clay

Stiff gray brown sandy clay

Loose brown silty sand with seams of coarse sand

Medium stiff to stiff dark gray brown silty clay
grades to olive gray brown

Stiff dark gray silty clay

Medium stiff to stiff mottled olive green/gray silty clay

Medium stiff mottled brown and light gray sandy clay

grades to silty clay and olive brown

BOTTOM OF BORING

Job Number X129AA

Figure 4

Jensen – Van Lienden Associates, Inc.
GEOTECHNICAL CONSULTANTS

Log of Boring Number 4

Ashland Housing
16309 Kent Avenue
San Lorenzo, California

SUPERVISOR: CNJ
DATE DRILLED: May 10, 2011
DRILLING METHOD: 6 solid stem auger
SAMPLING METHOD: Drive with 140# hammer
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: Approx. 7 ' on May 10, 2011

Sample Number	Diameter (in.)	Blows/Foot	Dry Density (pcf)	Moisture Content (%)	Unconfined Compressive Strength (psf)
1	1.4	5	–	23	–
2	2.4	11	-	36	-
3	2.4	14	93	31	-
4	2.4	33	96	27	1200
5	2.4	18	95	29	1600

Depth (feet)	Description
0 – 2	Stiff black silty clay beneath 2" AC and 3 of brown gravelly sand
2 – 7	Loose dark brown very clayey sand grades to silty sand
7 – 16	Medium stiff live brown silty clay grades to olive green gray very silty at 15'
16 – 20.5	Stiff dark gray silty clay
20.5 – 26.5	Medium stiff to stiff mottled olive green, gray and brown silty clay
26.5	BOTTOM OF BORING

Job Number X129AA

Figure 5

Jensen – Van Lienden Associates, Inc.
GEOTECHNICAL CONSULTANTS

Log of Boring Number 5

Ashland Housing
16309 Kent Avenue
San Lorenzo, California

SUPERVISOR: CNJ
DATE DRILLED: May 10, 2011
DRILLING METHOD: 6 solid stem auger

SAMPLING METHOD: Drive with 140# hammer
SURFACE ELEVATION: Not Measured
GROUNDWATER DEPTH: Approx. 5 ' on May 10, 2011

Sample Number	Diameter (in.)	Blows/Foot	Dry Density (pcf)	Moisture Content (%)	Unconfined Compressive Strength (psf)
1	2.4	18	--	20	--
2	2.4	6	103	19	--
			100	22	5400
3	2.4	13	96	28	2500
4	2.4	18	103	23	4200
5		8	94	29	--
6	2.4	16	105	22	1700

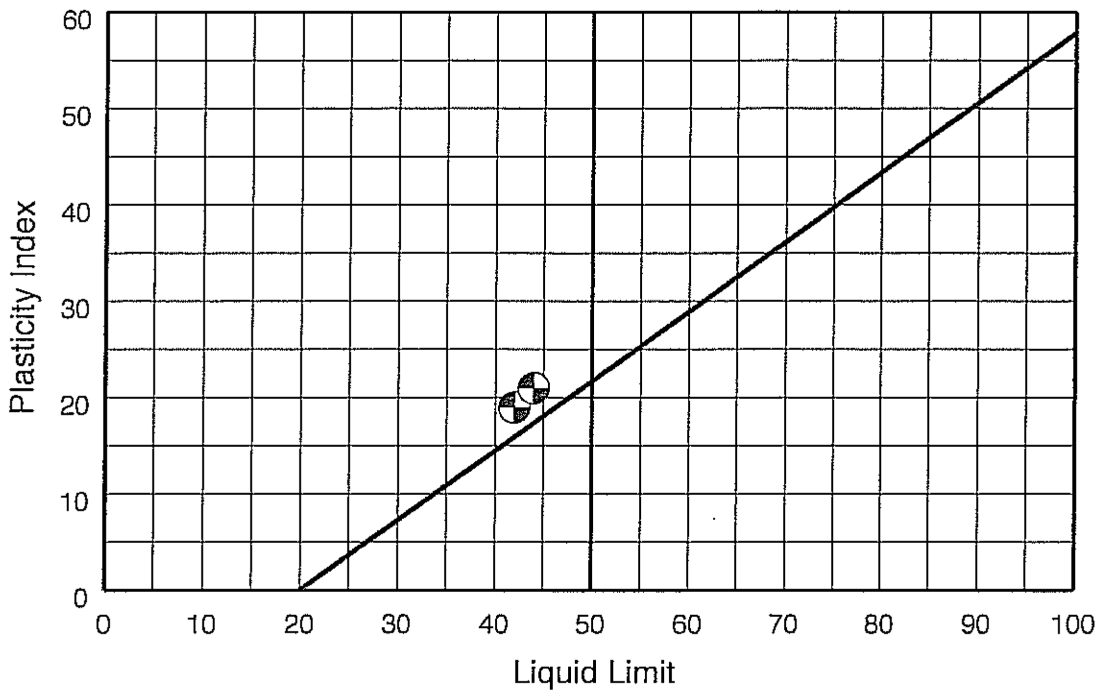
Depth (feet)	Description
0 – ~1.5	Stiff black silty clay
~1.5 – ~8	Stiff dark olive brown very sandy clay Grades to silty and clayey sand at 5.5 feet
~8 – ~13.5	Stiff dark grey brown to olive brown silty clay
~13.5 – ~20	Stiff dark grey silty clay
~20 – ~26.5	Medium stiff to stiff mottled brown, olive brown and orange brown very silty clay
~26.5	BOTTOM OF BORING

Depth (feet): 5, 10, 15, 20, 25, 30

Job Number X129AA

Figure 6

PLASTICITY CHART



INDEX TEST RESULTS

Sample Identification		Atterberg Limits (%)		Grain Sizes (% Dry Weight)		
Sample No.	Description	Liquid Limit	Plasticity Index	Sand	Silt	Clay
5-1	Black silty clay	44	21	25	41	34
3-1	Dark gray silty clay	42	19	-	-	-
1-2	Brown very sandy clay	-	-	48	29	23
4-1	Brown clayey sand	-	-	71	17	12

Jensen – Van Lienden Associates, Inc.		
16309 Kent Avenue San Lorenzo, California		
Date 5/2011	Figure 7	Job No. X129AA

GUIDE SPECIFICATIONS
FOR ENGINEERED FILL
Job No. X129AA

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 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

3. Soil Conditions

Jensen-Van Lienden Associates, Inc. has performed a soil investigation for the site and a report has been issued by them dated May 18, 2011 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 in areas to be covered with structures or to be filled with engineered fill, as defined below, 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 re-use later as topsoil, but none of this stripped material nor any of the building debris may be used in engineered fills.

Trees that are removed shall have their root systems grubbed out and the resulting excavations backfilled with engineered fill.

2. Preparation for Filling

After stripping existing fill and removing demolition debris, areas to be filled shall be overexcavated as recommended in the Soil Report. The overexcavation depth shall be 7 feet below existing grade or 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, provided that dark gray/black near surface clays are thoroughly mixed with the other excavated soils.

After stripping the surface vegetation and overexcavating to 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.

C. MATERIAL USED FOR FILL

1. Requirements for General Engineered Fill

The Soil Engineer must approve all fill material. 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 strippings, shall be suitable for use as fill.

2. Requirements for Select Fill Material

In addition to the requirements "C (1)" above, select material, when called for on the plans, must conform to the following minimum requirements:

Maximum Plasticity Index 12
Maximum % Finer than .002 mm 25

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 95%.

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 aerating 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. Natural clayey soils shall be placed and compacted at a moisture content that is 1% or more above the optimum moisture content.

Any fill where the Soil Engineer does not approve the site preparation, type of material, or compaction shall be removed and/or recompacted by the contractor until the requirements are satisfied.

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.

G. 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.