1. RED BROWN SILTY SAND with GRAVEL (SM), loose, moist to wet, fine to coarse sand to occasional coarse subangular gravel and cobbles to 6-inch diameter (Colluvium)

2. YELLOW BROWN & OLIVE BROWN SANDSTONE, closely to very closely fractured, moderately hard, moderately strong clasts with soft plastic matrix, slightly to moderately weathered, randomly oriented open fractures with clayey sand infill (Franciscan Complex)

3. OLIVE AND DARK GRAY MELANGE, intensely sheared, soft, plastic with moderately hard, moderately strong angular clasts in sheared matrix, slightly to moderately weathered (Franciscan Complex)

1. RED BROWN GRAVEL with SILT (GP), loose, wet, medium to coarse angular gravel, occasional cobbles to 6-inch diameter (Colluvium)

2. RED BROWN SILTY SAND with GRAVEL (SM), loose, moist to wet, fine to coarse sand to occasional coarse subangular gravel and cobbles to 6-inch diameter (Colluvium)

3. RED BROWN SAND with CLAY AND GRAVEL (SP-SC), loose, moist, medium to coarse sand, to fine angular gravel to 1/4-inch diameter, caving (Landslide Debris)

4. MOTTLED RED BROWN AND YELLOW BROWN SANDSTONE, very closely fractured, soft, plastic at upper contact, with weak, friable clasts, highly weathered, with depth becomes moderately hard, moderately strong, wide fractures with sandy clay infill (Franciscan Complex)

1. RED BROWN SILTY SAND with GRAVEL (SM), loose, moist to wet, fine to coarse sand to occasional coarse subangular gravel and cobbles to 6-inch diameter (Colluvium)

2. RED BROWN SAND with CLAY AND GRAVEL (SP-SC), closely to very closely fractured, moderately hard, moderately strong clasts locally with soft plastic matrix, slightly to moderately weathered, randomly oriented open fractures with clayey sand infill (Franciscan Complex)

3. YELLOW BROWN & OLIVE BROWN SANDSTONE, intensely sheared, firm, friable, slightly to moderately weathered (Franciscan Complex)

4. OLIVE GRAY and DARK BROWN MELANGE, intensely sheared, firm, friable, slightly to moderately weathered (Franciscan Complex)

Scale: 1" = 5'
1. DARK BROWN SANDY SILT (ML), soft, wet fine to medium sand, abundant organics (Topsoil)

2. RED BROWN CLAYEY SAND with GRAVEL (SC), loose, wet, fine to coarse sand to fine angular gravel to 1-inch diameter (Residual Soil)

3. MOTTLED YELLOW BROWN and OLIVE-GRAY SANDSTONE, very closely fractured, soft, plastic with moderately hard, moderately strong clasts in matrix, moderately to highly weathered, wet on some fracture faces (Franciscan Complex)

4. RED BROWN, DARK GRAY and YELLOW BROWN SANDSTONE, closely to very closely fractured, firm, to moderately hard, friable to moderately strong, slightly to moderately weathered, tight fractures with light gray clayey infill, thin shale lenses, locally wet on some fracture faces (Franciscan Complex)

1. DARK BROWN SANDY SILT (ML), soft, wet fine to medium sand, abundant organics (Topsoil)

2. BROWN SAND with CLAY and GRAVEL (SC-SP) loose, wet, fine to coarse sand to fine subrounded gravel to 3/4-inch diameter (Residual Soil)

3. MOTTLED RED YELLOW, BROWN and OLIVE SANDSTONE, very closely fractured, soft, plastic, with firm, friable clasts locally, highly weathered (Franciscan Complex)

4. GRAY and DARK BROWN SANDSTONE, closely to very closely fractured, moderately hard to hard, moderately strong, slightly weathered, locally randomly oriented gray clayey shears (Franciscan Complex)

1. DARK BROWN SANDY SILT (ML), soft, wet fine to medium sand, abundant organics (Topsoil)

2. BROWN SAND with CLAY and GRAVEL (SC-SP) loose, wet, fine to coarse sand to fine subrounded gravel to 3/4-inch diameter (Residual Soil)

3. RED BROWN SANDSTONE, extremely closely fractured, soft, plastic with firm friable clasts, moderately to highly weathered (Franciscan Complex)

4. OLIVE BROWN, RED BROWN and DARK BROWN SANDSTONE, closely to extremely closely fractured, firm to moderately hard, friable to moderately strong, slightly to moderately weathered (Franciscan Complex)
1. **DARK BROWN SANDY SILT (ML)**, soft, wet fine to medium sand, abundant organics (Topsoil)

2. **RED BROWN CLAYEY SAND with GRAVEL (SC)**, very loose, wet, fine to coarse sand to fine angular gravel to 1/2-inch diameter (Colluvium)

3. **MOTTLED RED BROWN and OLIVE BROWN SANDY CLAY with GRAVEL (CL-CH)**, soft to stiff, wet, fine to coarse sand to fine angular shale gravel to 3/4-inch diameter, faint relict texture present (Residual Soil)

4. **OLIVE, OLIVE BROWN and DARK GRAY SHALE & SANDY SILTSTONE**, extremely closely fractured, firm, friable, slightly to moderately weathered, randomly oriented fractures and shears present, locally soft, plastic (Franciscan Complex)

---

1. **DARK BROWN SANDY SILT (ML)**, soft, wet fine to medium sand, abundant organics (Topsoil)

2. **MOTTLED RED BROWN and OLIVE BROWN SANDY CLAY with GRAVEL (CL-CH)**, soft to stiff, wet, fine to coarse sand to fine angular shale gravel to 3/4-inch diameter, faint relict texture present (Residual Soil)

3. **OLIVE, OLIVE BROWN and DARK GRAY SHALE & SANDY SILTSTONE**, extremely closely fractured, firm, friable, slightly to moderately weathered, randomly oriented fractures and shears present, locally soft, plastic (Franciscan Complex)

---

1. **DARK BROWN SANDY SILT (ML)**, soft, wet fine to medium sand, abundant organics (Topsoil)

2. **BROWN SILTY SAND with GRAVEL (SM)**, loose, moist, fine to coarse sand to coarse angular gravel to 1-inch diameter (Residual Soil)

3. **RED BROWN and OLIVE BROWN SANDSTONE**, closely to very closely fractured, firm, weak, moderately weathered, randomly oriented fractures (Franciscan Complex)
STP-10
N60°E

1. BROWN SILTY SAND with GRAVEL (SM), loose, moist, fine to coarse sand to coarse angular gravel to 1-inch diameter (Residual Soil)

2. RED BROWN and OLIVE BROWN SANDSTONE, closely to very closely fractured, firm, weak, moderately weathered, randomly oriented fractures (Franciscan Complex)

STP-11
N15°W

1. DARK BROWN SILTY SAND with GRAVEL (SM), very loose, moist, fine to coarse sand to fine angular gravel to 1/2-inch diameter (Colluvium)

2. YELLOW BROWN and OLIVE BROWN SANDSTONE, closely to very closely fractured, moderately hard, moderately strong clasts with soft plastic matrix locally, slightly to moderately weathered (Franciscan Complex)

5 0 5 feet

Scale: 1" = 5'
1. DARK BROWN SANDY CLAY (CL), medium stiff, very moist, porous, with moderate roots (Colluvium)

2. DARK GRAY SANDY SILTY CLAY (CH), medium stiff, wet, sheared texture (Landslide Debris)

3. MOTTLED GRAY, BLUE AND YELLOW BROWN SANDY CLAY (CH), stiff, moist, abundant sandstone fragments (Landslide Debris)

4. GRAY SANDSTONE, very closely spaced fractures, hard, moderately strong, moderately weathered (Franciscan Complex)

---

1. BROWN CLAYEY SAND (SC), medium dense, moist, porous, with abundant roots (Colluvium)

2. MOTTLED BLUE GRAY AND DARK GRAY SANDY CLAY (CH), stiff, moist (Colluvium)

3. DARK GRAY CLAY (CL), very stiff, moist, sheared texture, abundant sandstone and siltstone fragments (Landslide Debris)

4. GRAY SANDSTONE, closely to moderately spaced fractures, hard, moderately strong, slightly weathered (Franciscan Complex)
ROCK SYMBOLS

AGGLOMERATE  CONGLOMERATE  BASALT / ANDESITE
SHEARED ROCKS  SERPENTINITE  PYROCLASTIC
SILTSTONE  SANDSTONE  CLAYSTONE  MUDSTONE
SHALE  BEDROCK  TUFF  ASPHALT

LAYERING

MASSIVE  Greater than 6 feet
THICKLY BEDDED  2 to 6 feet
MEDIUM BEDDED  8 to 24 inches
THINLY BEDDED  2¼ to 8 inches
VERY THINLY BEDDED  ¼ to 2¼ inches
CLOSELY LAMINATED  ¼ to ¾ inches
VERY CLOSELY LAMINATED  Less than ¼ inch

JOINT, FRACTURE, OR SHEAR SPACING

VERY WIDELY SPACED  Greater than 6 feet
WIDELY SPACED  2 to 6 feet
MODERATELY SPACED  8 to 24 inches
CLOSELY SPACED  2¼ to 8 inches
VERY CLOSELY SPACED  ¼ to 2¼ inches
EXTREMELY CLOSELY SPACED  Less than ¼ inch

HARDNESS

Soft - pliable; can be dug by hand
Firm - can be gouged deeply or carved with a pocket knife
Moderately Hard - can be readily scratched by a knife blade; scratch leaves heavy trace of dust and is readily visible
after the powder has been blown away
Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible
Very Hard - cannot be scratched with pocket knife, leaves a metallic streak

STRENGTH

Plastic - capable of being molded by hand
Friable - crumbles by rubbing with fingers
Weak - an unfractured specimen of such material will crumble under light hammer blows
Moderately Strong - specimen will withstand a few heavy hammer blows before breaking
Strong - specimen will withstand a few heavy ringing hammer blows and usually yields large fragments
Very Strong - rock will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments

DEGREE OF WEATHERING

Highly Weathered - abundant fractures coated with oxides, carbonates, sulphates, mud, etc., thorough discoloration, rock disintegration, mineral decomposition
Moderately Weathered - some fracture coating, moderate or localized discoloration, little to no effect on cementation, slight mineral decomposition
Slightly Weathered - a few stained fractures, slight discoloration, little or no effect on cementation, no mineral composition
Fresh - unaffected by weathering agents; no appreciable change with depth

ENGINEERING GEOLOGY ROCK TERMS

RGH CONSULTANTS
Cornell Winery
245 Wappo Road
Santa Rosa, California

PLATE

Job No: 2096.05.05.1  Date: June 2010
Dashed line indicates the approximate upper limit boundary for natural soils.

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Clayey Sand W/Gravel (SC)</td>
<td>39</td>
<td>16</td>
<td>23</td>
<td>31.1</td>
<td></td>
<td>SC</td>
</tr>
<tr>
<td>Light Brown Silty Clayey Sand W/Gravel (SC-SM)</td>
<td>21</td>
<td>15</td>
<td>6</td>
<td>10.4</td>
<td></td>
<td>SC-SM</td>
</tr>
</tbody>
</table>

**Remarks:**
- Expansion Index= 45 (Low)
- Expansion Index= 18 (Very Low)

**Project No.** 2096.05.05.1  **Client:** RGH Consultants

**Project:** Cornell Winery-Supplemental Study, Santa Rosa

**Source of Sample:** SCB-1  **Depth:** 8.5'

**Source of Sample:** SCB-1  **Depth:** 16.0'

---

RGH CONSULTANTS, INC.

CLASSIFICATION TEST DATA
Cornell Winery
245 Wappo Road
Santa Rosa, California

Job No: 2096.05.05.1  Date: June 2010
Dashed line indicates the approximate upper limit boundary for natural soils.

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;40</th>
<th>%&lt;200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Silty Clayey Sand W/Gravel (SC-SM)</td>
<td>25</td>
<td>21</td>
<td>4</td>
<td>20.5</td>
<td>SC-SM</td>
<td></td>
</tr>
<tr>
<td>Dark Grey Sandy Lean Clay (CL)</td>
<td>47</td>
<td>16</td>
<td>31</td>
<td>66.6</td>
<td>CL</td>
<td></td>
</tr>
<tr>
<td>Grey Clayey Sand W/Gravel (SC)</td>
<td>35</td>
<td>12</td>
<td>23</td>
<td>36.1</td>
<td>SC</td>
<td></td>
</tr>
</tbody>
</table>

Project No. 2096.05.05.1  Client: RGH Consultants
Project: Cornell Winery-Supplemental Study, Santa Rosa

Remarks:
- Source of Sample: SCB-3  Depth: 2.0-3.5'
- Source of Sample: SCB-3  Depth: 34.0'
- Source of Sample: SCB-3  Depth: 41.0'

RGH CONSULTANTS, INC.
LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils.

MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS
--- | --- | --- | --- | --- | --- | ---
• Light Brown Clayey Sand W/Gravel (SC) | 33 | 16 | 17 | 17.6 | SC
■ Grey Clayey Gravel W/Sand (GC) | 30 | 14 | 16 | 12.1 | GC
▲ Grey Clayey Sand (SC) | 40 | 13 | 27 | 49.7 | SC
★ Light Brown Clayey Sand W/Gravel (SC) | 43 | 19 | 24 | 41.6 | SC

Project No. 2096.05.05.1  Client: RGH Consultants
Project: Cornell Winery-Supplemental Study, Santa Rosa

Remarks:
- Source of Sample: SCB-4  Depth: 27.0'
- Source of Sample: SCB-4  Depth: 41.0'
- Source of Sample: SCB-4  Depth: 55.0'
- Source of Sample: SCB-4  Depth: 8.5'

RGH CONSULTANTS, INC.
LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils.

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Brown Silty Clayey Sand W/Gravel (SC-SM)</td>
<td>25</td>
<td>19</td>
<td>6</td>
<td>13.7</td>
<td></td>
<td>SC-SM</td>
</tr>
<tr>
<td>Mottled Red Brown Clayey Sand W/Gravel (SC)</td>
<td>39</td>
<td>18</td>
<td>21</td>
<td>28.9</td>
<td></td>
<td>SC</td>
</tr>
<tr>
<td>Brown Clayey Sand W/Gravel (SC)</td>
<td>45</td>
<td>19</td>
<td>26</td>
<td>25.7</td>
<td></td>
<td>SC</td>
</tr>
</tbody>
</table>

Project No. 2096.05.05.1  Client: RGH Consultants
Project: Cornell Winery-Supplemental Study, Santa Rosa

- Source of Sample: SCB-7  Depth: 14.5-15.0'
- Source of Sample: STP-7  Depth: 1.0-4.5'
- Source of Sample: STP-8  Depth: 0.5-4.5'

RGH CONSULTANTS, INC.

CLASSIFICATION TEST DATA
Cornell Winery
245 Wappo Road
Santa Rosa, California

Job No: 2096.05.05.1  Date: June 2010
**Type of Test:**
CU with Pore Pressures

**Sample Type:** Undisturbed

**Description:** Grey Clayey Sand W/Gravel (SC)

**LL =** 35  
**PL =** 12  
**PI =** 23

**Assumed Specific Gravity =** 2.70

**Remarks:**

---

**Sample No.**  
1. Water Content, %  
2. Dry Density,pcf  
3. Saturation, %  
4. Void Ratio  
5. Diameter, in.  
6. Height, in.  

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Water Content, %</th>
<th>Dry Density,pcf</th>
<th>Saturation, %</th>
<th>Void Ratio</th>
<th>Diameter, in.</th>
<th>Height, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.0</td>
<td>129.9</td>
<td>99.5</td>
<td>0.2976</td>
<td>2.310</td>
<td>6.000</td>
</tr>
<tr>
<td>2</td>
<td>11.0</td>
<td>129.9</td>
<td>99.5</td>
<td>0.2976</td>
<td>2.310</td>
<td>6.000</td>
</tr>
<tr>
<td>3</td>
<td>11.0</td>
<td>129.9</td>
<td>99.5</td>
<td>0.2976</td>
<td>2.310</td>
<td>6.000</td>
</tr>
</tbody>
</table>

**Initial**

**A-T Test**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Water Content, %</th>
<th>Dry Density,pcf</th>
<th>Saturation, %</th>
<th>Void Ratio</th>
<th>Diameter, in.</th>
<th>Height, in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13.8</td>
<td>122.9</td>
<td>100.0</td>
<td>0.3720</td>
<td>2.397</td>
<td>5.890</td>
</tr>
<tr>
<td>2</td>
<td>12.8</td>
<td>125.3</td>
<td>100.0</td>
<td>0.3449</td>
<td>2.440</td>
<td>5.573</td>
</tr>
<tr>
<td>3</td>
<td>11.8</td>
<td>127.8</td>
<td>100.0</td>
<td>0.3191</td>
<td>2.493</td>
<td>5.236</td>
</tr>
</tbody>
</table>

**Strain rate, in./min:**  
0.004  
0.004  
0.004

**Eff. Cell Pressure, psf:**  
999.4  
2000.2  
4000.3

**Fail. Stress, psf:**  
1977.8  
2966.3  
4773.8

**Total Pore Pr., psf:**  
7948.8  
8337.6  
9216.0

**Strain, %:**  
2.5  
3.1  
2.9

**Ult. Stress, psf:**  
5417.9

**Total Pore Pr., psf:**  
8712.0

**Strain, %:**  
16.2

**$\sigma^f$ Failure, psf:**  
2516.4  
4116.9  
7046.1

**$\sigma^g$ Failure, psf:**  
538.6  
1150.6  
2272.3

---

**Client:** RGH Consultants

**Project:** Cornell Winery-Supplemental Study, Santa Rosa

**Source of Sample:** SCB-3  
Depth: 41.0'

**Date Sampled:** 4-22-10

---

**RGH CONSULTANTS**

TRIAXIAL STRENGTH TEST DATA
Cornell Winery  
245 Wappo Road  
Santa Rosa, California

**Job No:** 2096.05.05.1  
**Date:** June 2010

---

**PLATE:** 22

---
Type of Test: CU with Pore Pressures
Sample Type: Undisturbed
Description: Light Brown Clayey Sand W/Gravel (SC)

LL = 43, PL = 19, PI = 24
Assumed Specific Gravity = 2.70
Remarks:

Sample No. | 1 | 2 | 3
--- | --- | --- | ---
Water Content, % | 13.6 | 13.6 | 13.6
Dry Density,pcf | 117.8 | 117.8 | 117.8
Saturation, % | 85.4 | 85.4 | 85.4
Void Ratio | 0.4304 | 0.4304 | 0.4304
Diameter, in. | 2.210 | 2.210 | 2.210
Height, in. | 6.000 | 6.000 | 6.000

AI Test
Water Content, % | 15.4 | 14.4 | 12.6
Dry Density, pcf | 119.1 | 121.3 | 125.8
Saturation, % | 100.0 | 100.0 | 100.0
Void Ratio | 0.4154 | 0.3900 | 0.3395
Diameter, in. | 2.208 | 2.239 | 2.241
Height, in. | 5.950 | 5.681 | 5.465

Strain rate, in./min. | 0.004 | 0.004 | 0.004
Eff. Cell Pressure, psf | 999.4 | 2000.2 | 4000.3
Fail. Stress, psf | 1878.7 | 3140.4 | 5573.1
Total Pore Pr., psf | 7848.0 | 8222.4 | 8553.6
Strain, % | 2.3 | 1.8 | 4.2
Ult. Stress, psf | 5790.9
Total Pore Pr., psf | 8395.2
Strain, % | 9.8
 Failure, psf | 2518.0 | 4406.1 | 8507.9
 Failure, psf | 639.4 | 1265.8 | 2934.7

Client: RGH Consultants
Project: Cornell Winery-Supplemental Study, Santa Rosa
Source of Sample: SCB-4 Depth: 8.5'

Date Sampled: 4-22-10

RGH CONSULTANTS, INC.
Symbols:
- Contact: solid line where well located, long dash where approximately located, short dash where inferred (gradational in the Calistoga 15 minute quadrangle), dotted where concealed; query indicates additional uncertainty.
- Fault: solid line where well located, long dash where approximately located, short dash where inferred, dotted where concealed; query indicates additional uncertainty. Arrow and number indicate direction and amount of dip in degrees. Whether or not the fault is active or poses any hazard to man is generally unknown. Only crosscutting faults are shown within KJfs, although most contacts therein probably are faults.
- Strike and dip of bedding: inclined
- Thrust fault: dashed where approximately located, queried where doubtful. Sawteeth on upper plate.

Explanation:
- Sonoma Volcanics Group (not necessarily in stratigraphic sequence.)
  - Tsa: Andesitic to basaltic lava flows
  - Tst: Pumiceous ash-flow tuff, locally welded or partly welded with intercalated bedded agglomeritic tuff, andesitic or basaltic lava flows, tuff breccia, bedded tuff, and pumiceous tuff
  - Tsu: Sedimentary deposits; unconsolidated interbedded and interfingering tufaceous sand, silt, volcanic gravel; bedded tuff, clay, diatomite

- Franciscan Assemblage (not necessarily in correct time sequence.)
  - KJfs: Sheared shale and sandstone that contains generally resistant masses of chert, "high grade" metamorphic rock, variable shattered sandstone and greenstone, metagreenstone, and generally less resistant serpentine; masses range in length from less than one foot to greater than 5 miles, and constitute a variable, generally unknown proportion of the unit. Potassium feldspar generally absent. Parts of unit correspond to melange unit described by Hsu (1989).
  - sp: Serpentinite, including relatively fresh ultramafic masses. Occurs as lenses, sheets, and irregularly shaped masses, largely within and along boundaries of KJfs.
  - gs: Greenstone, including pillow lava, tuff, minor intrusive varieties, and minor fossiliferous limestone, and metagreenstone ranging from rock containing incipient blueschist minerals to completely reconstituted blueschist. Masses range to longer than 5 miles.

Approximate Winery Location

Reference: Huffman and Armstrong, 1980

Scale: 1:62,500

CGS GEOLOGIC MAP
Cornell Winery
245 Wappo Road
Santa Rosa, California

PLATE 24
Terrace deposits (Holocene)
Alluvial fan deposits (Holocene)
Sonoma Volcanics - Andesite to basalt lava flows
Sonoma Volcanics - Pumiceous ash-flow tuff
Sonoma Volcanics - Volcanic sand and gravel
Franciscan Complex - Melange
Franciscan Complex - Serpentinite
Franciscan Complex - Graywacke and melange
Franciscan Complex - Greenstone

Reference: Graymer et al, 2007

Scale: 1" = 5,000'

RGH CONSULTANTS
Cornell Winery
245 Wappo Road
Santa Rosa, California

USGS GEOLOGIC MAP

Job No: 2006.05.01.1 Date: June 2010

PLATE 25
EXPLANATION

Relative Slope Stability Categories

Landslides

C
Areas of lowest relative slope stability. Failure and downslope movement of rock and soil has occurred, or may have occurred ("possible" landslides).

\[ \text{C} \]
Areas of relatively unstable rock and soil units, on slopes greater than 15%, containing abundant landslides.

\[ \text{Bf} \]
Locally level areas within hilly terrain; may be underlain or bounded by unstable or potentially unstable rock materials.

Note: Geologic conditions in areas labeled Bf, B, C, and landslides mandate that engineering geology reports must be required prior to tentative tract approval for land use planning and land development.

Note: Categories are interpretive and apply generally to large areas. Within each area conditions may range in detail through all four stability categories. Hence, an A area may locally contain unmapped landslides, and a landslide area may contain stable slopes of slight inclination.

Landslide Symbols

\[ \text{Contact between landslide deposits; landslide and more stable ground; or areas of differing slope stability. Dashed line indicates an approximate location.} \]

\[ \text{General direction of landslide movement} \]

\[ \text{Query indicates possible landslide} \]

\[ \text{Landslide or severe soil creep area too small to be outlines at the map scale. Question mark adjacent to arrow indicates landslide is uncertain, or "possible."} \]

Approximate Winery Location

Reference: Huffman and Armstrong, 1980

Scale: 1:62,500

RGH CONSULTANTS
CGS LANDSLIDE MAP
Cornell Winery
245 Wappo Road
Santa Rosa, California

Job No: 2096.05.05.1 Date: June 2010

PLATE 26
Symbols Used

LANDSLIDE ZONE:
Slide area consisting of numerous coalesced and superposed landslides of various sizes, types of movement, and degrees of activity. Because of spatial complexity, it is generally not feasible to delineate individual slides composing these zones. Meaning of symbols: D, P, and A are the same as of LARGE LANDSLIDE DEPOSITS (see below). The following symbols are used only for the LANDSLIDE ZONES: D-DA, landslide zone consist of primarily DEFINITE TO DEFINITE and ACTIVE landslide deposits; P-?, landslide zone consists of primarily PROBABLE to QUESTIONABLE landslide deposits.

LARGE LANDSLIDE DEPOSITS:
Landslide which is 50 feet or more in maximum dimension. Arrows indicate general direction of downslope movement (omitted for lack of space on some landslides and on all questionable landslides). Single barbed arrows indicate primarily flow movement. Capital letters shown on each landslide have the following designations: D, DEFINITE landslide deposits; P, PROBABLE landslide deposits. Hachured lines show the approximate position of inferred landslide scarps. Topographic features whose outlines are subdued by weathering and/or largely obscured by vegetation but whose overall form is suggestive of landslide origin are called questionable landslides (? On map).

SMALL LANDSLIDE DEPOSITS:
100 to 500 feet in maximum dimension. Arrows indicate general direction of downslope movement and are centered over the location of deposits. Meaning of symbols: arrows, D, P, ? are the same as for LARGE LANDSLIDE DEPOSITS (see above).

Reference: Dwyer, 1976

USGS LANDSLIDE MAP
Cornell Winery
245 Wappo Road
Santa Rosa, California

RGH CONSULTANTS

Job No: 2096.05.05.1 Date: June 2010

Scale: 1:24,000
PLATE 27
Note: Keyway excavation and subdrain installation should be observed by Geotechnical Engineer / Engineering Geologist.

1 min. graded Berm or Interceptor Ditch

Roadway

Structure

15 min. to toe of slope unless cutslope is retained

cutslope

Fill of even thickness

Compacted soil (12" thick, min)

HILLSIDE GRADING ILLUSTRATION
(Not To Scale)

Imaginary 1:1 Plane

Existing Ground Surface

2 min. into bedrock as approved by Geotechnical Engineer / Engineering Geologist

Horizontally bench continuously into bedrock as recommended

Keyway Subdrain (see detail below)

10 min.

2 (max)

HILLSIDE GRADING ILLUSTRATION
(Not To Scale)

1'

bench

Class 2 Permeable Material

Slope keyway and bench slopes to 1\frac{1}{4}:1 or as recommended by the Geotechnical Engineer / Engineering Geologist

4" Perforated Pipe (perforations down), sloped to drain to gravity outlet

4' min.

2' min.

KEYWAY SUBDRAIN
(Not To Scale)
Notes:

1. Drain rock should meet the requirements for Class 2 Permeable Material, Section 68, State of California "Caltrans" Standard Specification, latest edition. Drain rock should be placed to approximately three-quarters the height of the retaining wall.

2. Pipe should conform to the requirements of Section 68 of State of California "Caltrans" Standards, perforations placed down, sloped at 1% for gravity flow to outlet or sump with automatic pump. The pipe invert should be located at least 8 inches below the lowest adjacent finished surface.

3. During construction the contractor should use appropriate methods such as temporary bracing and/or light compaction equipment to avoid overstressing the walls. Non-expansive soils to be used as backfill.

4. Slope excavation back at a 1:1 gradient from the back of footing where expansive materials are exposed.
TYPICAL UNDERSLAB DRAIN PLAN

Solid Outlet Pipe to Approved Outlet

Perforated Underslab Drain Pipe

Lateral @ 15-foot intervals (both ways) and to drain all isolated underslab areas

SLAB UNDERDRAIN

5" (min)

4" min. Perforated Plastic Pipe

6" (min)

SDR 35 or better
APPENDIX B - REFERENCES


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RGH Consultants, September 21, 2009, Response to BZA comments

Seed, H.B. and Idriss, I.M., 1982, Ground Motion and Soil Liquefaction During Earthquakes: Earthquake Engineering Research Institute, Berkeley, California.


Todd Engineers, 2006, Supplemental Groundwater availability study, Cornell Farms LLC, August.


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APPENDIX C - DISTRIBUTION

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(2,1) (5,1)

EGC:GWR:JJP:Iw

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Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. And no one— not even you — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client’s goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it’s changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,

- composition of the design team, or

- project ownership.

As a general rule, always inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by:

- the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Relying on the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report’s Recommendations Are Not Final

Do not over rely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual
subsurface conditions revealed during construction. The geotechnical
engineer who developed your report cannot assume responsibility or
liability for the report's recommendations if that engineer does not perform
construction observation.

A Geotechnical Engineering Report Is Subject to
Misinterpretation
Other design team members' misinterpretation of geotechnical engineering
reports has resulted in costly problems. Lower that risk by having your geo-
technical engineer confer with appropriate members of the design team after
submitting the report. Also retain your geotechnical engineer to review per-
Nent elements of the design team's plans and specifications. Contractors can
also misinterpret a geotechnical engineering report. Reduce that risk by
having your geotechnical engineer participate in prebid and preconstruction
conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs
Geotechnical engineers prepare final boring and testing logs based upon
their interpretation of field logs and laboratory data. To prevent errors or
omissions, the logs included in a geotechnical engineering report should
never be redrawn for inclusion in architectural or other design drawings.
Only photographic or electronic reproduction is acceptable, but recognize
that separating logs from the report can elevate risk.

Give Contractors a Complete Report and
Guidance
Some owners and design professionals mistakenly believe they can make
contractors liable for unanticipated subsurface conditions by limiting what
they provide for bid preparation. To help prevent costly problems, give con-
tractors the complete geotechnical engineering report, but precede it with a
clearly written letter of transmittal. In that letter, advise contractors that the
report was not prepared for purposes of bid development and that the
report's accuracy is limited; encourage them to confer with the geotechnical
engineer who prepared the report (a modest fee may be required) and/or to
conduct additional study to obtain the specific types of information they
need or prefer. A prebid conference can also be valuable. Be sure contrac-
tors have sufficient time to perform additional study. Only then might you
be in a position to give contractors the best information available to you,
while requiring them to at least share some of the financial responsibilities
stemming from unanticipated conditions.

Read Responsibility Provisions Closely
Some clients, design professionals, and contractors do not recognize that
geotechnical engineering is far less exact than other engineering disci-
plines. This lack of understanding has created unrealistic expectations that
have led to disappointments, claims, and disputes. To help reduce the risk
of such outcomes, geotechnical engineers commonly include a variety of
explanatory provisions in their reports. Sometimes labeled "limitations"
many of these provisions indicate where geotechnical engineers' responsibil-
ities begin and end, to help others recognize their own responsibilities
and risks. Read these provisions closely. Ask questions. Your geotechnical
engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered
The equipment, techniques, and personnel used to perform a geoen-
vironmental study differ significantly from those used to perform a geotechnical
study. For that reason, a geotechnical engineering report does not usually
relate any geoenvironmental findings, conclusions, or recommendations;
E.g., about the likelihood of encountering underground storage tanks or
regulated contaminants. Unanticipated environmental problems have led to
numerous project failures. If you have not yet obtained your own geoen-
environmental information, ask your geotechnical consultant for risk man-
agement guidance. Do not rely on an environmental report prepared for
someone else.

Obtain Professional Assistance To Deal with Mold
Diverse strategies can be applied during building design, construction,
operation, and maintenance to prevent significant amounts of mold from
growing on indoor surfaces. To be effective, all such strategies should be
devised for the express purpose of mold prevention, integrated into a com-
prehensive plan, and executed with diligent oversight by a professional
mold prevention consultant. Because just a small amount of water or
moisture can lead to the development of severe mold infections, a num-
ber of mold prevention strategies focus on keeping building surfaces dry.
While groundwater, water infiltration, and similar issues may have been
addressed as part of the geotechnical engineering study whose findings
are conveyed in this report, the geotechnical engineer in charge of this
project is not a mold prevention consultant; none of the services per-
formed in connection with the geotechnical engineer's study
were designed or conducted for the purpose of mold preven-
tion. Proper implementation of the recommendations conveyed
in this report will not of itself be sufficient to prevent mold from
growing in or on the structure involved.

Rely, on Your ASFE-Member Geotechnical
Engineer for Additional Assistance
Membership in ASFE/The Best People on Earth expresses geotechnical
engineers' a wide array of risk management techniques that can be of
genuine benefit for everyone involved with a construction project. Confer
with you ASFE-member geotechnical engineer for more information.

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