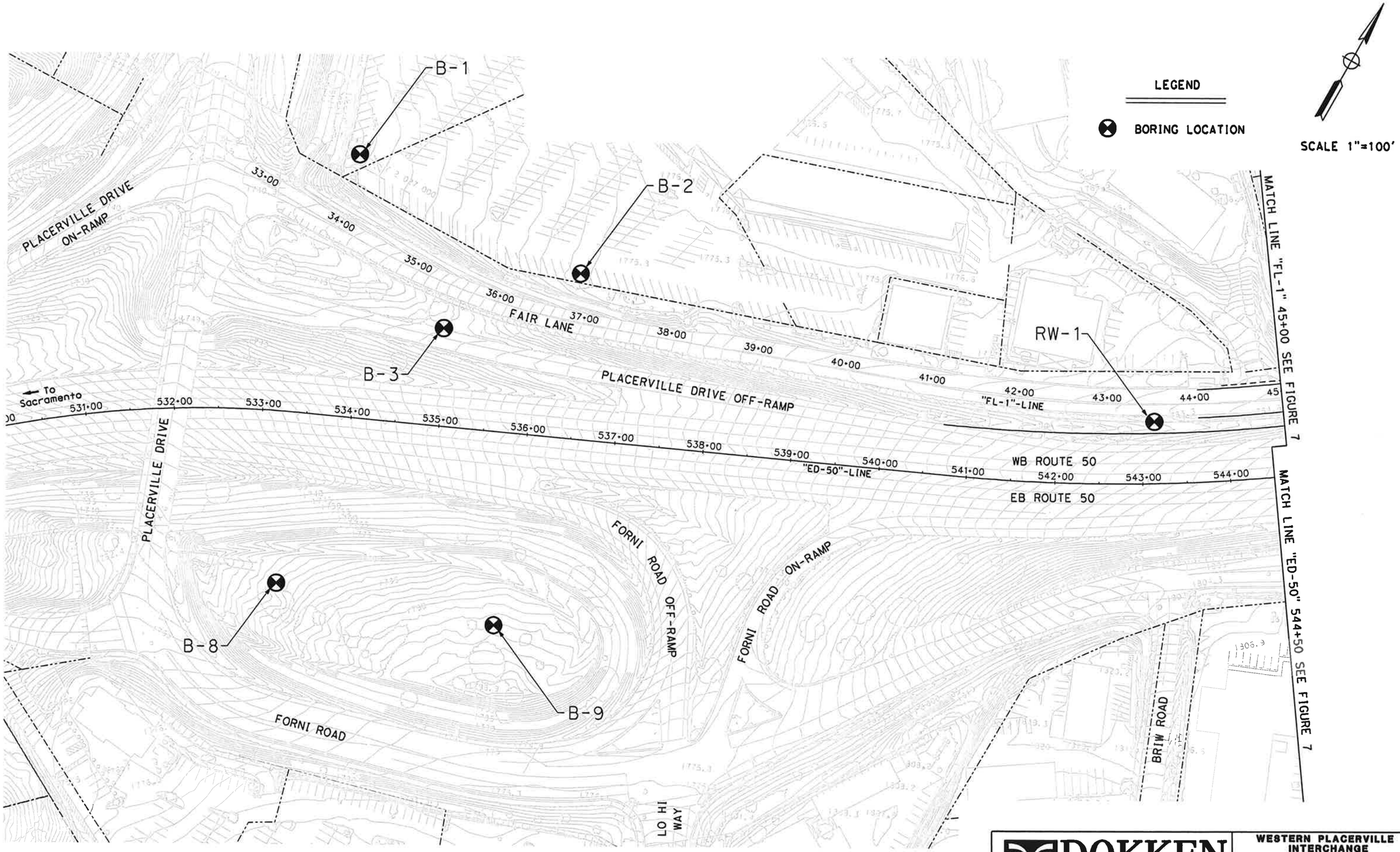


DOKKEN ENGINEERING
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SUITE 200
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(916) 858-0642

**WESTERN PLACERVILLE INTERCHANGE**
**BORING LOCATIONS**
**FIGURE 6**

PREPARED FOR:
THE CITY OF PLACERVILLE

LEGEND

BORING LOCATION

SCALE 1"=100'

B-4

RW-2

RW-3

RW-4

RW-5

B-5

RW-6

RW-7

MATCH LINE "FL-1" 45+00 SEE FIGURE 6

MATCH LINE "ED-50" 544+50 SEE FIGURE 6

MATCH LINE "RL-1" 558+00 SEE FIGURE 8

MATCH LINE "ED-50" 558+00 SEE FIGURE 8

FAIR LANE

"FL-1"-LINE

"RL-1"-LINE

WB ROUTE 50

EB ROUTE 50

RAY LAWYER DRIVE ON-RAMP

FORNI ROAD

45+00 46+00 47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00 58+00

545+00 546+00 547+00 548+00 549+00 550+00 551+00 552+00 553+00 554+00 555+00 556+00 557+00 558+00

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WESTERN PLACERVILLE INTERCHANGE
BORING LOCATIONS
FIGURE 7

PREPARED FOR:
THE CITY OF PLACERVILLE

LEGEND

BORING LOCATION

TEST PIT LOCATION

SCALE 1"=100'

FAIR LANE

MATCH LINE "RL-1" 558+00 SEE FIGURE 7

MATCH LINE "ED-50" 558+00 SEE FIGURE 7

AB-1

RW-9

AB-2

RW-10

TP-1

TP-3

TP-2

B-6

B-7

RAY LAWYER DRIVE ON-RAMP

N28°43'44"E

640.58'

"RL-1"-LINE

"ED-50"-LINE

988.89'

WB ROUTE 50

EB ROUTE 50

S38°29'45"E

390.24'

RAY LAWYER DRIVE

FORNI ROAD

559+00 560+00 561+00 562+00 563+00 564+00 565+00 566+00 567+00 568+00 569+00 570+00 571+00

42+00 43+00 44+00 45+00 46+00 47+00 48+00

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2365 IRON POINT ROAD
SUITE 200
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WESTERN PLACERVILLE INTERCHANGE
BORING LOCATIONS
FIGURE 8

PREPARED FOR:

THE CITY OF PLACERVILLE

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-1

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1765.0 ft MSL | **Date Drilled:** 01/19/09 |
| **Drilling Method:** HSA 6-INCH/NQ ROCK CORE | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = asphalt parking lot (4"). | 0—1765 | | | | | | | | | |
| | | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| Sandy LEAN CLAY (CL), very stiff, yellowish brown to light reddish brown, dry, trace fine gravel, coarse to fine sand, mostly clay, medium plasticity. | 5—1760 | | | 11<br>15<br>17 | | | | | | |
| Same; yellowish brown, medium to fine sand, no gravel. | 10—1755 | | | 7<br>8<br>10 | | | | | | |
| IGNEOUS ROCK (GRANITE), fine grained, massive, light yellowish brown, intensely to moderately weathered, moderately hard; (Sandy LEAN CLAY with Gravel (CL), hard, dry little fine gravel, some coarse to fine sand, mostly clay). | 15—1750 | | | 50 | | | | | | Disturbed Sample |

Boring Terminated At 40.0 ft BGS

Figure No. 2

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-1

DOKKEN ENGINEERING
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| | |
|---|---|
| **Surface Elevation:** 1765.0 ft MSL | **Date Drilled:** 01/19/09 |
| **Drilling Method:** HSA 6-INCH/NQ ROCK CORE | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Same; light yellowish brown to light greenish brown, moderately weathered, hard; (Gravelly SAND with silt (SW), very dense, dry , some coarse to fine gravel, mostly coarse to fine sand, little silt). | 20—1745 | | | 41<br>50/3" | | | | | | |
| IGNEOUS ROCK (GRANITE), fine grained to aphanitic, massive, light gray to light grayish green, slightly weathered to fresh, very hard, very slightly fractured. | | | | | | | | | | Switched to NQ Rock Coring at 23-feet.<br>Run 1:<br>Interval = 23- to 25-feet<br>Recovery = 1.8-feet<br>Run Time = 13-minutes<br>REC = 90%<br>RQD = 0%<br>NOTES: Loss of drilling fluid down bore hole. |
| | 25—1740 | | | | | | | | | |
| Same; fine grained, massive, light gray to yellowish brown, moderately weathered, hard, intensely to moderately fractured. | | | | | | | | | | Run 2:<br>Interval = 25- to 30-feet<br>Recovery = 4-feet<br>Run Time = 35-minutes<br>REC = 80%<br>RQD = 23% |
| | 30—1735 | | | | | | | | | |
| Same. | | | | | | | | | | Run 3:<br>Interval = 30- to 35-feet<br>Recovery = 4.5-feet<br>Run Time = 23-minutes<br>REC = 90%<br>RQD = 74% |
| Same. | 35—1730 | | | | | | | | | Run 4:<br>Interval = 35- to 37-feet<br>Recovery = 1.5-feet<br>Run Time = 15-minutes<br>REC = 75%<br>RQD = 69% |
| Same. | | | | | | | | | | Run 5:<br>Interval = 37- to 40-feet<br>Recovery = 3.0-feet<br>Run Time = 20-minutes<br>REC = 100%<br>RQD = 94% |
| Boring Terminated At 40.0 ft BGS | | | | | | | | | | |

Figure No. 2

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-2

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1770.0 ft MSL | **Date Drilled:** 01/16/09 |
| **Drilling Method:** HSA 6-INCH/NQ ROCK CORE | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = asphalt parking lot (4"). | 0—1770 | | | | | | | | | |
| Sandy LEAN CLAY (CL), yellowish brown, dry, trace fine gravel, coarse to fine sand, mostly clay, medium plasticity. | | | | | | | | | | Bulk Sample from 1- to 5-feet |
| IGNEOUS ROCK (GRANITE), fine grained, massive, light reddish brown, intensely to moderately weathered, soft; (Silty SAND (SM), medium dense, dry, mostly medium to fine sand, some silt). | 5—1765 | | | 9<br>16<br>25 | | | | | | |
| Same; moderately weathered, (very dense, mostly coarse to fine sand, some silt). | 10—1760 | | | 27<br>50/5" | | | | | | Slow drilling conditions; Drill rig experienced dense lithology; slight vibrations; augers heated up |
| Same; light grayish brown to yellowish brown, (trace fine gravel). | 15—1755 | | | 50/5" | | | | | | |

Boring Terminated At 36.5 ft BGS

Figure No. 3

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-2

DOKKEN ENGINEERING
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| | |
|---|---|
| **Surface Elevation:** 1770.0 ft MSL | **Date Drilled:** 01/16/09 |
| **Drilling Method:** HSA 6-INCH/NQ ROCK CORE | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Same; (Well-graded SAND with Gravel and Silt (SW-SM), very dense, light tan to light yellowish brown, dry, some fine gravel, mostly coarse to fine sand, little silt, angular gravel and sand). | 20—1750 | | | 50/2" | | | | | | |
| Same; light gray to light yellowish brown, intensely to moderately weathered; (trace fine gravel). | 25—1745 | | | 50/5" | | | | | | |
| IGNEOUS ROCKS (GRANITE), fine grained to aphanitic, massive, light gray to light grayish green, slightly weathered to fresh, very hard, moderately to slightly fractured. | 30—1740 | | | | | | | | | Switched to NQ Rock Coring at 26.5-feet.<br>Run 1:<br>Interval = 26.5- to 31.5-feet<br>Recovery = 4-feet<br>Run Time = 36-minutes<br>REC = 80%<br>RQD = 38%<br>NOTES: Loss of drilling fluid down bore hole. |
| Same. | 35—1735 | | | | | | | | | Run 2:<br>Interval = 31.5- to 36.5-feet<br>Recovery = 5-feet<br>Run Time = 33-minutes<br>REC = 100%<br>RQD = 63% |

Boring Terminated At 36.5 ft BGS

Figure No. 3

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-3

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1747.0 ft MSL | **Date Drilled:** 01/09/09 |
| **Drilling Method:** HSA 6-INCH | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = loose soil; grass/weeds. | 0.0 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| | 1745.0 | | | | | | | | | |
| Well-graded SAND with Silt and Gravel (SW), very dense, light yellowish brown, moist, trace gravel, mostly medium to fine sand, few silt, moderately cemented. | 2.5 | | | 8<br>24<br>50/1" | | | | | | |
| | 1742.5 | | | | | | | | | |
| Same; tan to light yellowish brown, no gravel. | 5.0 | | | 16<br>50/3" | | | | | | |
| | 1740.0 | | | | | | | | | |
| | 7.5 | | | | | | | | | |
| | 1737.5 | | | | | | | | | |
| | 10.0 | | | | | | | | | |
| | 1735.0 | | | | | | | | | |
| | 12.5 | | | | | | | | | |
| | 1732.5 | | | | | | | | | |

Boring Terminated At 5.8 ft BGS

Figure No. 4

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-4

DOKKEN ENGINEERING
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| | |
|---|---|
| **Surface Elevation:** 1785.0 ft MSL | **Date Drilled:** 01/09/09 |
| **Drilling Method:** HSA 6-INCH | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| AC= 4-inches.<br>AB = 12-inches. | 0.0—1785.0 | | | | | | | | | |
| Gravelly LEAN CLAY with Sand (CL), (FILL), yellowish brown, moist, some fine gravel, little coarse to fine sand, mostly clay. | 2.5—1782.5 | | | | | | | | | Bulk Sample from 1- to 5-feet.<br>Grab Sample at 0.5- to 1.5-feet. |
| Sandy SILT (ML), hard, light tan, dry, some fine sand, mostly silt. | 5.0—1780.0 | | | 10<br>20<br>25 | | | | 2.3 | | |
| Silty SAND (SM), medium dense, very light yellowish brown, dry, mostly medium to fine sand, some silt. | 7.5—1777.5 | | | 12<br>9<br>12 | | | | | | |
| Well-graded SAND with Silt and Gravel (SW), very dense, very light yellowish brown, dry, little fine gravel, medium to fine sand, little silt, angular, moderate cementation. | 10.0—1775.0 | | | 7<br>50 | | | | | | Refusal of SPT sampler at 11-feet; Recovered rock in sampler shoe. |
| | 12.5—1772.5 | | | | | | | | | |

Boring Terminated At 11.0 ft BGS

Figure No. 5

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-5

DOKKEN ENGINEERING
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| | |
|---|---|
| **Surface Elevation:** 1815.0 ft MSL | **Date Drilled:** 01/09/09 |
| **Drilling Method:** HSA 6-INCH | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| AC= 4.5-inches.<br>AB = 19.5-inches. | 0.0 — 1815.0 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| Silty SAND with Gravel (SM), very dense, yellowish brown, dry, little fine gravel, mostly coarse to fine sand, some silt, angular gravel. | 2.5 — 1812.5 | | | | | | | | | |
| | 5.0 — 1810.0 | | | 22<br>44<br>33 | | | | | | |
| ELASTIC SILT with Sand (MH), hard, reddish brown, dry, little fine sand, mostly silt, medium plasticity. | 7.5 — 1807.5 | | | | | | | | | |
| Well-graded SAND with Silt and Gravel (SW), very dense, very light yellowish brown, dry, little fine gravel, mostly coarse to fine sand, little silt, angular sand and gravel, moderately cemented. | 10.0 — 1805.0 | | | 10<br>40<br>50/5" | | | | | | |
| | 12.5 — 1802.5 | | | | | | | | | |

Boring Terminated At 11.4 ft BGS

Figure No. 6

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-6

DOKKEN ENGINEERING
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| | |
|---|---|
| **Surface Elevation:** 1865.0 ft MSL | **Date Drilled:** 01/13/09 |
| **Drilling Method:** HSA 6-INCH | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = grass/weeds. | 0—1865 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| FAT CLAY with Sand (CH), hard, dark reddish brown, dry to moist, trace fine gravel, little coarse to medium sand, mostly clay, angular gravel and sand, medium plasticity, mottled. | 5—1860 | | | 10<br>28<br>38 | | | | >5 | | |
| LEAN CLAY (CL), hard, reddish brown to tan, dry, medium plasticity, mottled. | 10—1855 | | | 8<br>22<br>36 | | | | >5 | | |
| SILT with Sand (ML), hard, very light yellowish brown to light reddish brown, dry, trace fine gravel, some medium to fine sand, mostly silt. | 15—1850 | | | 25<br>50/3" | | | | | | |
| IGNEOUS ROCK (GRANITE), massive, light gray to light yellowish brown, intensely weathered; (Well-graded SAND with Silt and Gravel (SW), very dense, dry , little fine gravel, mostly coarse to fine sand, little silt). | 20—1845 | | | 30<br>50 | | | | | | |
| Same; (Sandy Lean CLAY (CL), hard, dry, trace fine gravel, some coarse to fine sand, mostly clay). | 25—1840 | | | 25<br>50/4" | | | | | | |

Boring Terminated At 25.9 ft BGS

Figure No. 7

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-7

DOKKEN ENGINEERING
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| | |
|---|---|
| **Surface Elevation:** 1906.0 ft MSL | **Date Drilled:** 01/13/09 |
| **Drilling Method:** HSA 6-INCH/NQ ROCK CORE | **Logged By:** Dan Cloutier |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = grass/weeds. | 0 / 1905 | | | | | | | | | |
| LEAN CLAY with Sand (CL), dark reddish brown, dry to moist, trace fine gravel, little medium to fine sand, mostly clay, angular gravel. | | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| Same; hard, reddish brown, no gravel. | 5 / 1900 | | | 6<br>15<br>32 | | | | | | |
| Sandy SILT (ML), hard, light yellowish brown to light reddish brown, dry to moist, trace gravel, some medium to fine sand, mostly silt, angular gravel and sand. | | | | | | | | | | |
| LEAN CLAY with Sand (CL), very stiff, light yellowish brown to light reddish brown, dry to moist, few medium to fine sand, mostly clay, medium plasticity, medium to low dry strength. | 10 / 1895 | | | 3<br>6<br>19 | | | | | | |
| SILT with Sand (ML), hard, light yellowish brown to light reddish brown, dry to moist, little medium to fine sand, mostly silt, low plasticity. | 15 / 1890 | | | 10<br>50 | | | | | | |
| Same; trace fine gravel. | 20 / 1885 | | | 15<br>50/3" | | | | | | |
| IGNEOUS ROCK (GRANITE), fine grained to aphanitic, very thickly bedded, gray to yellowish brown, intensely to moderately weathered, moderately hard to soft, very intensely to intensely fractured. | 25 / 1880 | | | | | | | | | Switched to NQ Rock Coring at 25-feet.<br>Run 1:<br>Interval = 25- to 30-feet<br>Recovery = 4-feet<br>Run Time = 18-minutes<br>REC = 80%<br>RQD = 14% |

Boring Terminated At 40.0 ft BGS

Figure No. 8

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-7

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1906.0 ft MSL | **Date Drilled:** 01/13/09 |
| **Drilling Method:** HSA 6-INCH/NQ ROCK CORE | **Logged By:** Dan Cloutier |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Same. | 30 1875 | | | | | | | | | NOTES: Loss of drilling fluid down bore hole.<br>Run 2:<br>Interval = 30- to 35-feet<br>Recovery = 3.5-feet<br>Run Time = 23-minutes<br>REC = 70%<br>RQD = 13% |
| Same. | 35 1870 | | | | | | | | | Run 3:<br>Interval = 35- to 40-feet<br>Recovery = 4.5-feet<br>Run Time = 16-minutes<br>REC = 90%<br>RQD = 21% |
| | 40 1865 | | | | | | | | | |
| | 45 1860 | | | | | | | | | |
| | 50 1855 | | | | | | | | | |
| | 55 1850 | | | | | | | | | |

Boring Terminated At 40.0 ft BGS

Figure No. 8

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-8

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1790.0 ft MSL | **Date Drilled:** 01/14/09 |
| **Drilling Method:** HSA 6-INCH | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = grass/weeds. | 0.0—1790.0 | | | | | | | | | |
| | | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| | 2.5—1787.5 | | | | | | | | | |
| Sandy LEAN CLAY (CL), hard, brown, moist, some medium to fine sand, mostly lean clay, medium plasticity. | | | | | | | | | | |
| | 5.0—1785.0 | | | 6<br>30<br>50/5" | | | | | | |
| | 7.5—1782.5 | | | | | | | | | (Drilling Time with HSA from 5- to 10-feet = 10-minutes). |
| IGNEOUS ROCK (GRANITE), fine grained, massive, light gray to light yellowish brown, intensely to moderately weathered, soft; (Well-graded SAND, very dense, dry, trace fine gravel, mostly coarse to fine sand). | | | | | | | | | | |
| | 10.0—1780.0 | | | 50/1" | | | | | | Auger refusal at 10.1-feet |
| | 12.5—1777.5 | | | | | | | | | |

Boring Terminated At 10.1 ft BGS

Figure No. 9

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING B-9

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1780.0 ft MSL | **Date Drilled:** 01/14/09 |
| **Drilling Method:** HSA 6-INCH | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Sandy LEAN CLAY (CL), hard, brown to yellowish brown, moist, some medium to fine sand, mostly clay, medium plasticity. | 0.0—1780.0 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| | 2.5—1777.5 | | | | | | | | | |
| | 5.0—1775.0 | | | 10 | | | | | | (Drilling Time with HSA from 5- to 10-feet = 8-minutes). |
| IGNEOUS ROCK (GRANITE), massive, light gray to light yellowish brown, intensely to moderately weathered, soft; (Well-graded SAND, very dense, dry, trace fine gravel, mostly coarse to fine sand). | | | | 50/4" | | | | | | |
| | 7.5—1772.5 | | | | | | | | | |
| Same; (little fine gravel). | 10.0—1770.0 | | | 50/4" | | | | | | Auger refusal at 10.4-feet |
| | 12.5—1767.5 | | | | | | | | | |

Boring Terminated At 10.4 ft BGS

Figure No. 10

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-1

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1782.0 ft MSL | **Date Drilled:** 07/16/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = asphalt. | 0.0 | | | | | | | | | |
| Sandy SILT (ML), light tan, dry, some fine sand, mostly silt. | 1780.0 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| | 2.5 | | | | | | | | | |
| | 1777.5 | | | | | | | | | |
| | 5.0 | | | 38 | | | | | | |
| IGNEOUS ROCK (GRANITE), massive, tan to yellowish brown, intensely weathered, moderately hard. | | | | 50/3" | | | | | | |
| | 1775.0 | | | | | | | | | Auger Refusal at 7.5-ft. |
| | 7.5 | | | | | | | | | |
| | 1772.5 | | | | | | | | | |
| | 10.0 | | | | | | | | | |
| | 1770.0 | | | | | | | | | |
| | 12.5 | | | | | | | | | |
| | 1767.5 | | | | | | | | | |

Boring Terminated At 7.5 ft BGS

Figure No. 11

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-2

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1788.0 ft MSL | **Date Drilled:** 07/16/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = asphalt. | 0.0 / 1787.5 | | | | | | | | | |
| Sandy SILT (ML), brown, dry, trace coarse to fine gravel, few coarse sand, some medium to fine sand, mostly silt. | | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| | 2.5 / 1785.0 | | | | | | | | | |
| Gravelly LEAN CLAY with Sand (CL), hard, dark reddish brown, dry to moist, little coarse to fine gravel, few coarse to fine sand, mostly lean clay; angular gravel and sand. | 5.0 / 1782.5 | | | 18<br>37<br>50/4" | | | | | | |
| | 7.5 / 1780.0 | | | | | | | | | Auger Refusal at 7.5ft. |
| | 10.0 / 1777.5 | | | | | | | | | |
| | 12.5 / 1775.0 | | | | | | | | | |

Boring Terminated At 7.5 ft BGS

Figure No. 12

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-3

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1793.0 ft MSL | **Date Drilled:** 07/16/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = asphalt. | 0 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| Sandy LEAN CLAY (CL), brown, dry to moist, few medium sand, little fine sand, mostly lean clay, low plasticity. | 1790 | | | | | | | | | |
| IGNEOUS ROCK (GRANITE), fine- to medium-grained, massive, tan to yellowish brown, intensely to moderately weathered, soft, very intensely to intensely fractured. | 5 | | | 15<br>30<br>50/3" | | | | | | |
| | 1785 | | | | | | | | | |
| Same; aphanitic to fine-grained, massive, decomposed, soft. | 10 | | | 9<br>19<br>32 | | | | | | |
| | 1780 | | | | | | | | | |
| Same; very soft. | 15 | | | 23<br>50/5" | | | | | | |
| | 1775 | | | | | | | | | |
| Same; decomposed, very soft. | 20 | | | 38<br>50/3" | | | | | | |
| | 1770 | | | | | | | | | |

Boring Terminated At 20.8 ft BGS

Figure No. 13

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-4

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1803.0 ft MSL | **Date Drilled:** 07/16/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Field Blows | Pocket Pen. (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|
| Sandy SILT (ML), reddish brown, dry, some fine sand, mostly silt. | 0 / 1800 | | | Bulk Sample from 1- to 5-feet. |
| LEAN CLAY (CL), very stiff, reddish brown, dry, trace medium to fine sand, mostly clay, low plasticity. | 5 / 1795 | 5<br>10<br>16 | | |
| IGNEOUS ROCK (GRANITE), fine- to medium-grained, massive, tan to yellowish brown, very intensely weathered to decomposed; (Silty SAND (SM), dense, dry, mostly medium to fine sand, some silt). | 10 / 1790 | 2<br>15<br>25 | >5 | |
| Same; intensely weathered; dense. | 15 / 1785 | 14<br>21<br>23 | | |
| Same; very dense. | 20 / 1780 | 18<br>33<br>50 | | |

Boring Terminated At 21.5 ft BGS

Figure No. 14

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-5

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1798.0 ft MSL | **Date Drilled:** 08/05/09 |
| **Drilling Method:** Hand Auger | **Logged By:** Josh Munn |
| **Drilling Contractor:** Dokken Engineering | **Checked By:** Michael Wilson |
| **Hammer:** 45 lb. Hand Hammer 30-in. drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| LEAN CLAY with Sand (CL), very stiff, reddish brown, dry, little fine sand, mostly clay. | 0.0<br>1797.5 | | | 15<br>23 | | | | | | |
| Same. | 2.5<br>1795.0<br>5.0<br>1792.5 | | | 28<br>43 | | | | | | |
| SILT with Sand (ML), hard, yellowish brown to light reddish brown, little fine sand, mostly silt. | 7.5<br>1790.0 | | | 40<br>50 | | | | | | |
| Same. | 10.0<br>1787.5 | | | 50/2" | | | | | | |
| Same. | 12.5<br>1785.0 | | | 50/4" | | | | | | |

Boring Terminated At 12.8 ft BGS

Figure No. 15

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-6

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1828.0 ft MSL | **Date Drilled:** 07/15/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = asphalt. | 0 | | | | | | | | | |
| | 1825 | | | | | | | | | |
| Well-graded SAND with Clay and Gravel (SW-SC), medium dense, brown to dark brown, dry, some coarse to fine gravel, mostly coarse to fine sand, little lean clay; angular gravel. | 5 | | | 9<br>21<br>24 | | | | | | |
| | 1820 | | | | | | | | | |
| | 10 | | | 10<br>9<br>7 | | | | | | *No Recovery from SPT Sample: 10- to 11.5-ft. |
| Clayey SAND with Gravel (SC), medium dense, brown to grayish brown, dry to moist, little coarse to fine gravel, mostly coarse to fine sand, some lean clay; angular gravel. | | | | 6<br>11<br>14 | | | | | | |
| | 1815 | | | | | | | | | |
| Same. | 15 | | | 9<br>10<br>8 | | | | | | |
| | 1810 | | | | | | | | | |
| Sandy LEAN CLAY with Gravel (CL), stiff, brown, dry to moist, little coarse to fine gravel, little coarse to fine sand, mostly lean clay; angular gravel. | 20 | | | 6<br>6<br>5 | | | | | | |
| | 1805 | | | | | | | | | |

Boring Terminated At 21.5 ft BGS

Figure No. 16

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-7

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1843.0 ft MSL | **Date Drilled:** 07/15/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Field Blows | Pocket Pen. (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|
| Surface = Silty SAND with Gravel (SM). | 0 / 1840 | | | Bulk Sample from 1- to 5-feet. |
| Gravelly LEAN CLAY (CL), very stiff, light yellowish brown to brown, dry, little coarse to fine gravel, trace coarse to fine sand, mostly lean clay, low plasticity. | 5 / 1835 | 20<br>16<br>18 | >5 | |
| LEAN CLAY (CL), very stiff, light reddish brown, dry, trace fine gravel, trace coarse to fine sand, mostly lean clay, low plasticity. | 10 / 1830 | 9<br>14<br>20 | >5 | |
| Same; hard. | 15 / 1825 | 14<br>27<br>50/5" | >5 | |
| IGNEOUS ROCK (GRANITE), aphanitic to medium-grained, massive, decomposed, soft; (Lean CLAY with Gravel, hard, light yellowish brown, dry, little coarse to fine gravel, mostly lean clay). | | | | |
| Same; no clay. | 20 / 1820 | 33<br>50/3" | | |

Boring Terminated At 20.8 ft BGS

Figure No. 17

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-9

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1869.0 ft MSL | **Date Drilled:** 07/20/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Dan Cloutier |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Field Blows | Remarks and Other Lab Tests |
|---|---|---|---|
| Surface = Dry grass/ weeds/ silty sand. | 0 | | Bulk Sample from 1- to 5-feet. |
| SEDIMENTARY ROCK (ARGILLITE), massive, reddish brown, very intensely weathered to decomposed, soft, very intensely fractured; (LEAN CLAY with Sand (CL), hard, dry to moist, mostly lean clay, trace to few medium to fine sand, low to medium plasticity). | | 8<br>33<br>38 | |
| | 1860 | | |
| Same; reddish brown to grayish brown. | 10 | 21<br>28<br>30 | |
| Same; light brown. | | 16<br>37<br>47 | |
| | 1850 | | |
| Same; grayish brown, intensely to very intensely weathered. | 20 | 27<br>45<br>50 | |
| Same; very intensely weathered, moderately hard, very intensely fractured; (Lean CLAY with Sand (CL), hard, dry to moist, mostly clay, trace medium to fine sand, low to medium plasticity. | | 31<br>50/2" | *Drilling Note: Drilling chatter at 27-ft bgs. Increase Gravel in auger cuttings. |
| | 1840 | | |
| Same. | 30 | 30<br>42<br>50/2" | |
| Same; moderately weathered to intensely weathered. | | 38<br>50/2" | *Drilling Note: Extreme drilling chatter; difficult, slow drilling. Cuttings were mostly Gravel from 27- to 38-ft. Auger Refusal at 38-ft bgs. |
| | 1830 | | |

Boring Terminated At 38.0 ft BGS

Figure No. 18

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING RW-10

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1873.0 ft MSL | **Date Drilled:** 07/17/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Dan Cloutier |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Field Blows | Remarks and Other Lab Tests |
|---|---|---|---|
| Surface = dry grass/ weeds/ Silty SAND. | 0 / 1870 | 11 21 29 | Bulk Sample from 1- to 5-feet. |
| SEDIMENTARY ROCK (ARGILLITE), massive, reddish brown, very intensely weathered to decomposed, soft, very intensely fractured; (Lean CLAY with Sand (CL), hard, dry to moist, mostly clay, trace to few medium to fine sand, low to medium plasticity. Same. | 10 / 1860 | 17 25 30 | |
| Same; reddish brown to grayish brown. | | 30 45 41 | |
| Same; very stiff, reddish brown to light yellowish brown. | 20 / 1850 | 9 9 17 | |
| Same. | | 8 14 21 | |
| Same; hard. | 30 / 1840 | 16 32 43 | |
| Same; reddish brown to grayish brown, very intensely weathered. | | 11 50/5" | |
| Same; grayish brown, trace coarse to fine gravel. | 40 / 1830 | 28 50/4/4" | *Drilling Notes: Gravels in cuttings at 39-ft. |
| Same; light grayish to reddish brown, moderately to intensely weathered, moderately hard, very intensely fractured. | | 50/2" | *Drilling Notes: No sample taken at 50-ft; cuttings indicate same material as above. |
| | 50 / 1820 | | |

Boring Terminated At 50.0 ft BGS

Figure No. 19

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING AB-1

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1866.0 ft MSL | **Date Drilled:** 07/21/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Dan Cloutier |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface = dry grass/ weeds/ Silty SAND. | 0 | | | | | | | | | Bulk Sample from 1- to 5-feet. |
| LEAN CLAY with Sand (CL), very stiff, reddish brown to brown, dry to moist, few to little medium to fine sand, mostly clay, low to medium plasticity. | 1860 | | | 3<br>8<br>9 | | | | | | |
| SEDIMENTARY ROCK (ARGILLITE), massive, reddish brown to grayish brown, very intensely weathered to decomposed, soft, intensely fractured; (Lean CLAY with Sand (CL), hard, dry, mostly clay, few medium to fine sand size fragments, low to medium plasticity). | 10 | | | 8<br>28<br>50/5" | | | | | | |
| Same. | 1850 | | | 15<br>20<br>36 | | | | | | |
| Same; very stiff. | 20 | | | 5<br>5<br>25 | | | | | | *Drilling Note: Drilling chatter from 18- to 20-ft bgs. |
| Same; intensely to very intensely weathered; hard. | 1840 | | | 21<br>27<br>50/3" | | | | | | |
| Same; moderately to intensely weather, moderately hard, very intensely fractured; (Lean CLAY with Gravel (CL), hard, dry, little coarse to fine gravel size fragments, mostly clay; angular). | 30 | | | 1<br>2<br>45 | | | | | | *Drilling Note: Drilling chatter at 27-ft bgs. |
| | 1830 | | | 50/5" | | | | | | |
| Same; no recovery. | 40 | | | 50/1" | | | | | | Auger refusal at 40-ft bgs. |

Boring Terminated At 40.1 ft BGS

Figure No. 20

NEW DE LOG OF BORING 1773 W. PLACERVILLE.GPJ DOKKEN TEMPLATE.GDT 9/9/09

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING AB-2

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1874.0 ft MSL | **Date Drilled:** 07/16/09 |
| **Drilling Method:** HSA 8-inch | **Logged By:** Josh Munn |
| **Drilling Contractor:** PC Exploration | **Checked By:** Michael Wilson |
| **Hammer:** 140 lbs. Auto-Hammer, 30-inch Drop | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| SEDIMENTARY ROCK (ARGILLITE), massive, reddish brown to grayish brown, very intensely weathered to decomposed, very intensely fractured. | 0 1870 5 1865 10 1860 15 1855 20 1850 | | | | | | | | | *Boring drilled for Bedrock depth detemination only.<br>*Drilling Note: Increase in drilling chatter and difficulty. Drilling stopped at 22-ft bgs; Bedrock not encountered. |

Boring Terminated At 22.0 ft BGS

Figure No. 21

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING TP-1

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1870.0 ft MSL | **Date Drilled:** 04/02/09 |
| **Drilling Method:** JD 310D Backhoe | **Logged By:** Michael Wilson |
| **Drilling Contractor:** PC Exploration | **Checked By:** Rob Lawrence |
| **Hammer:** 24" Bucket | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface grass and +/-2" of Topsoil.<br>Sandy Silty CLAY (ML), reddish brown, moist. | 0.0 — 1870.0 | | | | | | | | | |
| SEDIMENTARY ROCK (ARGILLITE), highly weathered, thinly laminated, crumbles by hand, excavated in 4-6" pieces (Silty SAND with Gravel (SM), reddish brown, moist).. | 2.5 — 1867.5 | | | | | | | | | |
| | 5.0 — 1865.0 | | | | | | | | | Trench side slopes remained vertical at completion. No visible raveling, however numerous voids on trench side walls. |
| Same; (LEAN CLAY (CL), tan-gray, moist, medium plasticity, blocky).<br>Same; moderately weathered (easily broken by rock hammer), reddish brown where exposed, dark gray where fresh, thinly laminated, excavated into 4-6" pieces, becoming more moist with depth. | 7.5 — 1862.5 | | | | | | | | | |
| | 10.0 — 1860.0 | | | | | | | | | Test pit terminated at maximum reach of backhoe and backfilled at completion. |
| | 12.5 — 1857.5 | | | | | | | | | |

Boring Terminated At 11.3 ft BGS

Figure No. 22

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING TP-2

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1875.0 ft MSL | **Date Drilled:** 04/02/09 |
| **Drilling Method:** JD 310D | **Logged By:** Michael Wilson |
| **Drilling Contractor:** PC Exploration | **Checked By:** Rob Lawrence |
| **Hammer:** 24" Bucket | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface grass and +/-2" of Topsoil.<br>Silty CLAY (CL-ML), reddish brown, moist. | 0.0 — 1875.0 | | | | | | | | | |
| | 2.5 — 1872.5 | | | | | | | | | |
| Sandy LEAN CLAY (CL), gray mottled with tan, moist, blocky. | 5.0 — 1870.0 | | | | | | | | | Trench side slopes remained vertical at completion. No visible raveling. Test pit remained open for ~1.5 hour prior to backfilling with no visible caving or tension cracks at surface. |
| | 7.5 — 1867.5 | | | | | | | | | |
| | 10.0 — 1865.0 | | | | | | | | | |
| SEDIMENTARY ROCK (ARGILLITE), moderately weathered (easily broken by rock hammer), reddish brown where exposed, dark gray where fresh, thinly. | | | | | | | | | | Test pit terminated at maximum reach of backhoe. |
| | 12.5 — 1862.5 | | | | | | | | | |

Boring Terminated At 11.3 ft BGS

Figure No. 23

**Project: Western Placerville Interchange**
**Location:** Placerville, CA
**Project No.:** 1773

# LOG OF BORING TP-3

DOKKEN ENGINEERING
www.dokkenengineering.com

| | |
|---|---|
| **Surface Elevation:** 1865.0 ft MSL | **Date Drilled:** 04/02/09 |
| **Drilling Method:** JD 310D | **Logged By:** Michael Wilson |
| **Drilling Contractor:** PC Exploration | **Checked By:** Rob Lawrence |
| **Hammer:** 24" Bucket | **Depth to Groundwater:** Not Encountered |

| Material Description and Classification | Depth (feet) Elevation | Soil Type | Sample Type | Field Blows | Dry Density (pcf) | Moisture Content (%) | Unc. Comp. (Strength ksf) | Pocket Pen. (ksf) | Torvane (ksf) | Remarks and Other Lab Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| Surface grass and +/-2" of Topsoil.<br>Silty CLAY (ML), reddish brown, moist. | 0.0 — 1865.0 | | | | | | | | | |
| SEDIMENTARY ROCK (ARGILLITE), highly weathered, thinly laminated, crumbles by hand, excavated into 4-6" pieces which were soil-coated (Silty SAND with Gravel (SM), reddish brown, moist). | 2.5 — 1862.5 | | | | | | | | | |
| Same; grading from highly to moderately weathered (crumbles by hand to easily broken by rock hammer), reddish brown where exposed, dark gray where fresh, thinly laminated, excavated into 4-6" pieces and occasionally up to 12". | 5.0 — 1860.0 | | | | | | | | | Trench side slopes remained vertical at completion. No visible raveling, however numerous voids on trench side walls. |
| | 7.5 — 1857.5 | | | | | | | | | |
| | 10.0 — 1855.0 | | | | | | | | | Test pit terminated at 10' and backfilled at competion. |
| | 12.5 — 1852.5 | | | | | | | | | |

Boring Terminated At 10.0 ft BGS

Figure No. 24

**Project: Western Placerville Interchange**
**Location: Placerville, CA**
**Project No: 1773**

# BORING LEGEND

DOKKEN ENGINEERING
www.dokkenengineering.com

## UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

| MATERIAL TYPES | CRITERIA FOR ASSIGNING SOIL GROUP NAMES | | | GROUP SYMBOL | SOIL GROUP NAMES & LEGEND |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE | GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE | CLEAN GRAVELS <5% FINES | Cu>4 AND 1<Cc<3 | GW | WELL-GRADED GRAVEL |
| | | | Cu>4 AND 1>Cc>3 | GP | POORLY-GRADED GRAVEL |
| | | GRAVELS WITH FINES >12% FINES | FINES CLASSIFY AS ML OR MH | GM | SILTY GRAVEL |
| | | | FINES CLASSIFY AS CL OR CH | GC | CLAYEY GRAVEL |
| | SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE | CLEAN SANDS <5% FINES | Cu>6 AND 1<Cc<3 | SW | WELL-GRADED SAND |
| | | | Cu>6 AND 1>Cc>3 | SP | POORLY-GRADED SAND |
| | | SANDS AND FINES >12% FINES | FINES CLASSIFY AS ML OR MH | SM | SILTY SAND |
| | | | FINES CLASSIFY AS CL OR CH | SC | CLAYEY SAND |
| FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT<50 | INORGANIC | PI>7 AND PLOTS>"A" LINE | CL | LEAN CLAY |
| | | | PI>4 AND PLOTS<"A" LINE | ML | SILT |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OL | ORGANIC CLAY OR SILT |
| | SILTS AND CLAYS LIQUID LIMIT>50 | INORGANIC | PI PLOTS >"A" LINE | CH | FAT CLAY |
| | | | PI PLOTS <"A" LINE | MH | ELASTIC SILT |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OH | ORGANIC CLAY OR SILT |
| HIGHLY ORGANIC SOILS | | PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR | | PT | PEAT |

### OTHER MATERIAL SYMBOLS

- Poorly Graded Sand with Clay
- Clayey Sand
- Sandy Silt
- Low to High Plasticity Clay
- Poorly Graded Gravelly Sand
- Topsoil
- Well Graded Gravel with Clay
- Well Graded Gravel with Silt
- Sand
- Silt
- Well Graded Gravelly Sand
- Gravelly Silt
- Asphalt
- Boulders and Cobble

### SYMBOLS

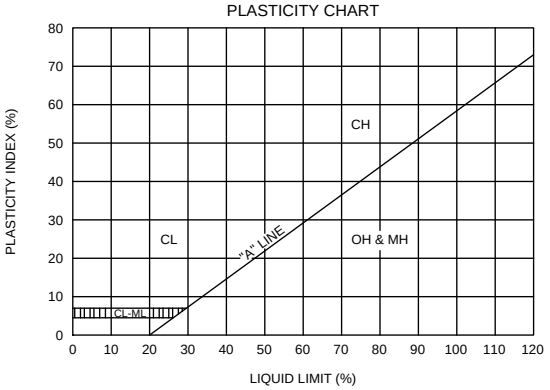
- Standard Penetration Sample (1-3/8" ID)
- Modified California Sample (2.5" ID)
- Shelby Tube Sample
- Bulk Sample
- Water Level During Drilling
- Stabilized Groundwater Level

### Notes:

| | | |
|---|---|---|
| CA | - | CHEMICAL ANALYSIS (CORROSIVITY) |
| CD | - | CONSOLIDATED DRAINED TRIAXIAL |
| CN | - | CONSOLIDATION |
| CU | - | CONSOLIDATED UNDRAINED TRIAXIAL |
| DS | - | DIRECT SHEAR |
| PP | - | POCKET PENETROMETER (TSF) |
| RV | - | R-VALUE |
| SA | - | SIEVE ANALYSIS |
| LL | - | LIMIT LIQUID |
| PI | - | PLASTICITY INDEX |
| MDD | - | MAXIMUM DRY DENSITY (pcf) |

| | | |
|---|---|---|
| tsf | - | TONS PER SQUARE FOOT |
| psf | - | POUNDS PER SQUARE FOOT |
| pcf | - | POUNDS PER CUBIC FOOT |
| OWC | - | OPTIMUM WATER CONTENT (%) |
| #200 | - | (% PASSING NO. 200 SIEVE |
| SW | - | SWELL TEST |
| TC | - | CYCLIC TRIAXIAL |
| TV | - | TORVANE SHEAR |
| UC | - | UNCONFINED COMPRESSION |
| UU | - | UNCONSOLIDATED UNDRAINED TRIAXIAL |

PLASTICITY CHART




PENETRATION RESISTANCE
(RECORDED AS BLOWS / FT)

| SAND & GRAVEL | | SILT & CLAY | | |
|---|---|---|---|---|
| RELATIVE DENSITY | BLOWS/FOOT* | CONSISTENCY | BLOWS/FOOT* | COMPRESSIVE STRENGTH (TSF) |
| VERY LOOSE | 0 - 4 | VERY SOFT | 0 - 1 | 0 - 0.25 |
| LOOSE | 5 - 10 | SOFT | 2 - 4 | 0.25 - 0.50 |
| MEDIUM DENSE | 11 - 30 | FIRM | 5 - 8 | 0.50 - 1.0 |
| DENSE | 31 - 50 | STIFF | 9 - 15 | 1.0 - 2.0 |
| VERY DENSE | OVER 50 | VERY STIFF | 16 - 30 | 2.0 - 4.0 |
| | | HARD | OVER 31 | OVER 4.0 |

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

Figure No. 25

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 03 | ED | 50 | | | |

REGISTERED CIVIL ENGINEER — X — DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — R. LAWRENCE — No. 63076 — Exp. 6-30-10 — CIVIL — STATE OF CALIFORNIA

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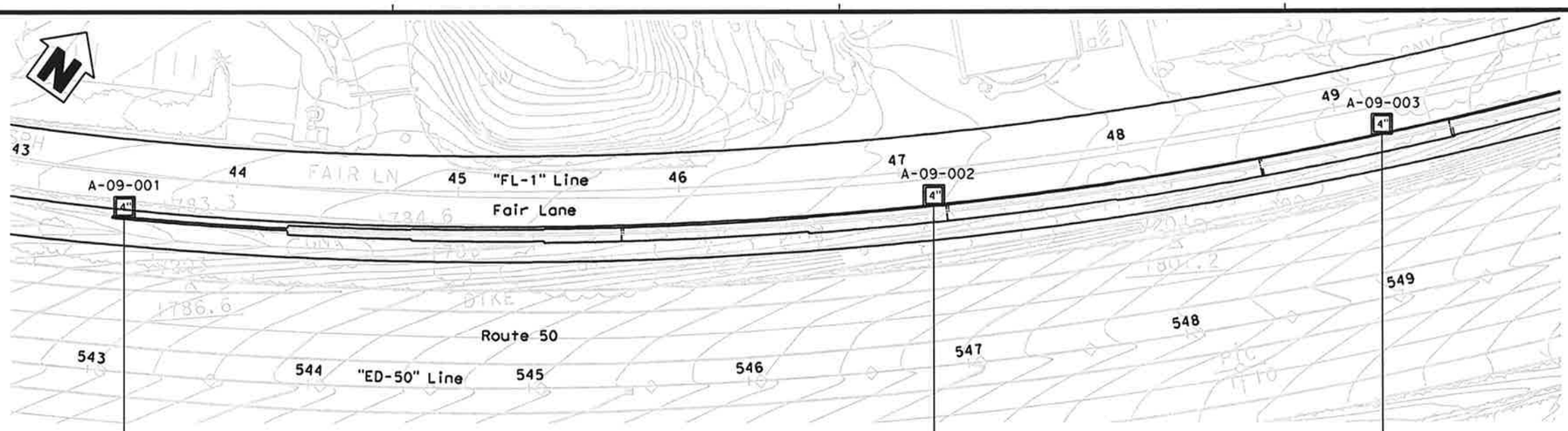
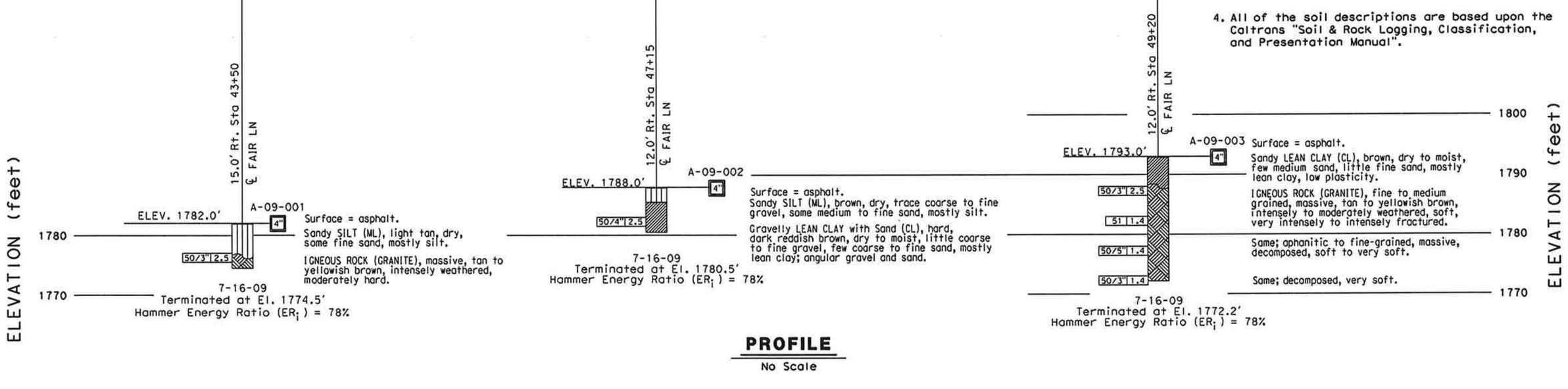



## PLAN

1" = 30'

## NOTES:

1. All of the borings were drilled using 4.25" ID hollow-stem augers with a drilling plug.
2. The 1.4" ID split barrel sampler was driven with a 140-lb. hammer falling 30" in accordance with conducting the Standard Penetration Test (ASTM D 1586). The blows for the second and third 6" drive lengths (12" total) were recorded as the Blow Count and appears on the Log of Test Borings. These are actual raw field blow counts and were not corrected for energy, overburden, or any other standard corrections.
3. The strength/relative density descriptors are from Sections 1.3 and 1.4 of the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual". These descriptors are based upon the Standard Penetration Test (ASTM D 1586)but have been modified sufficiently as not to relate to the Standard Penetration strength/relative density correlations.
4. All of the soil descriptions are based upon the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual".




## PROFILE

No Scale

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| X DESIGN OVERSIGHT | | DESIGN | BY R. Burns | CHECKED X | PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | J. Bishop PROJECT ENGINEER | BRIDGE NO. X |
| X SIGN OFF DATE | | DETAILS | BY C. Houghton | CHECKED X | | | POST MILE X |
| | | QUANTITIES | BY X | CHECKED X | | | |

RETAINING WALL NO. 1

LOG OF TEST BORINGS NO. 1

DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU X EA X

FILE => $REQUEST

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY): 8-6-09

SHEET X OF X

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 03 | ED | 50 | | | |

REGISTERED CIVIL ENGINEER — X — DATE

REGISTERED PROFESSIONAL ENGINEER — R. LAWRENCE — No. 63076 — Exp. 6-30-10 — CIVIL — STATE OF CALIFORNIA

PLANS APPROVAL DATE

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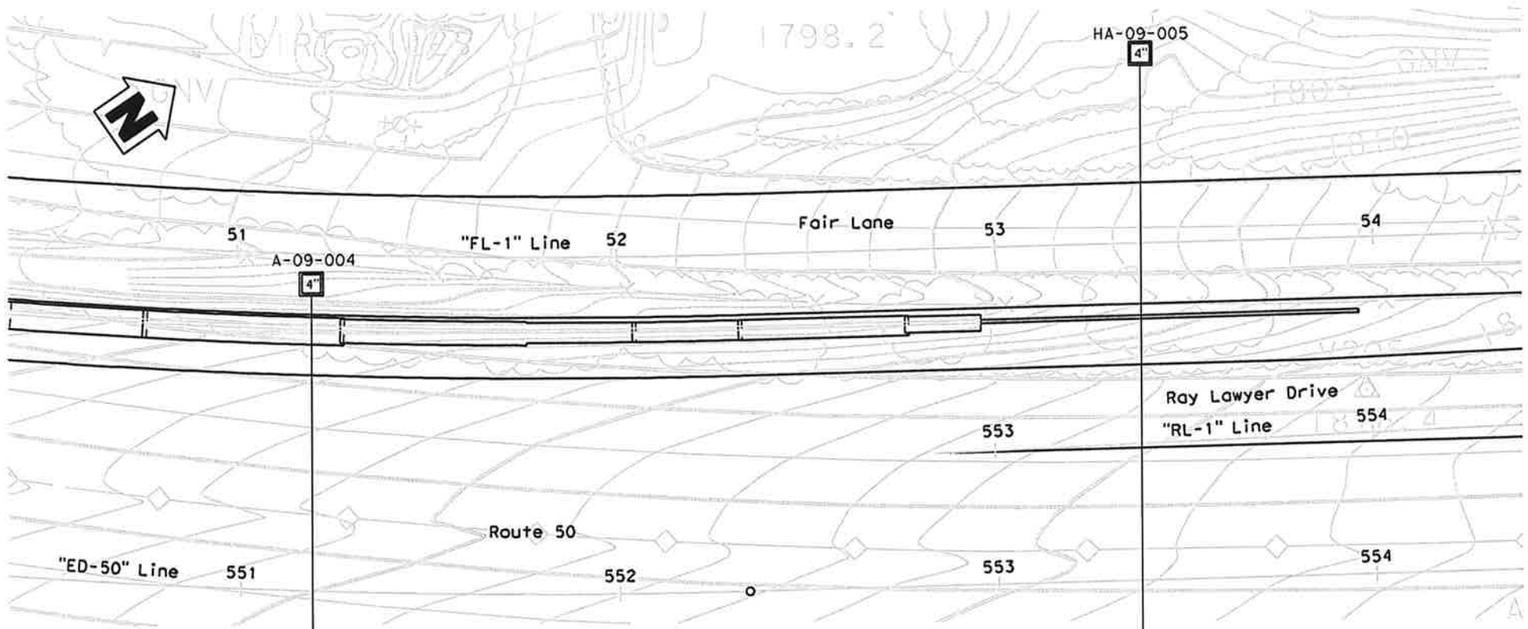
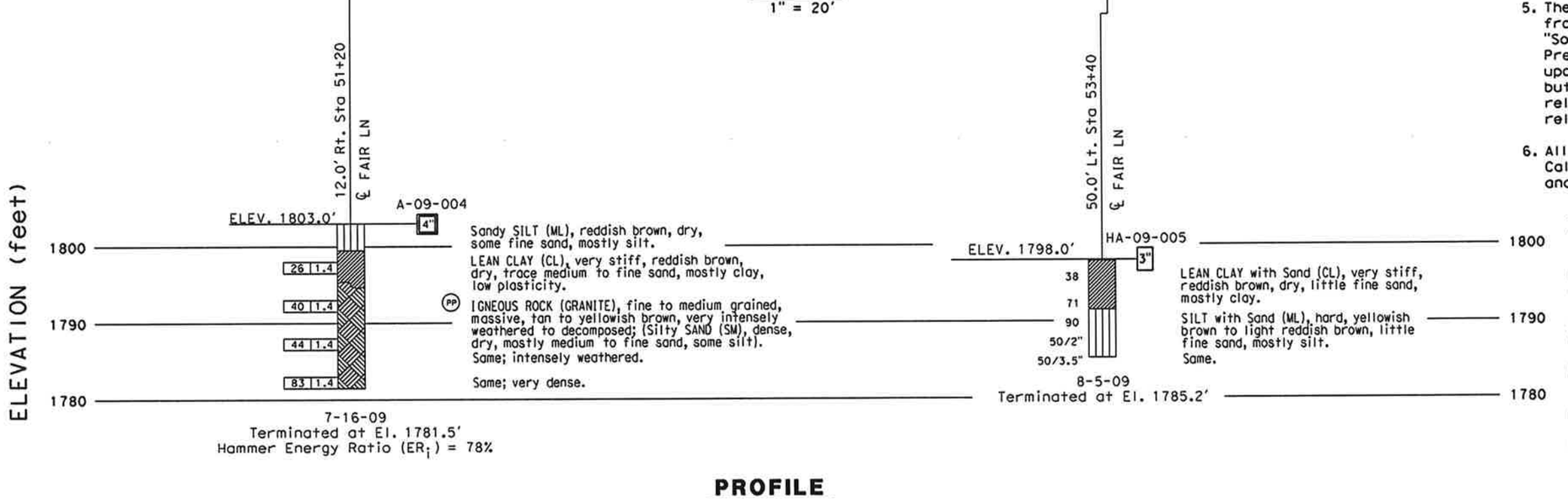



**PLAN**

1" = 20'




**PROFILE**

No Scale

## NOTES:

1. Boring A-09-004 was drilled using 4.25" ID hollow-stem augers with a drilling plug.
2. Boring HA-09-005 was drilled using 3.25" ID hand auger.
3. The 1.4" ID split barrel sampler was driven with a 140-lb. hammer falling 30" in accordance with conducting the Standard Penetration Test (ASTM D 1586). The blows for the second and third 6" drive lengths (12" total) were recorded as the Blow Count and appears on the Log of Test Borings. These are actual raw field blow counts and were not corrected for energy, overburden, or any other standard corrections.
4. A 2.5" ID split barrel sampler was driven with a 45-lb. hand hammer falling 30" in. The blows for the first and second 6" drive lengths (12" total) were recorded as the Blow Count and appears on the Log of Test Borings. These are actual raw field blow counts and were not corrected for energy, overburden, or any other standard corrections.
5. The strength/relative density descriptors are from Sections 1.3 and 1.4 of the Caltrans "Soil & Rock Logging, Classification and Presentation Manual". These descriptors are based upon the Standard Penetration Test (ASTM D 1586) but have been modified sufficiently as not to relate to the Standard Penetration strength/ relative density correlations.
6. All of the soil descriptions are based upon the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual".

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05)

| | BY | CHECKED |
|---|---|---|
| DESIGN | R. Burns | X |
| DETAILS | C. Houghton | X |
| QUANTITIES | X | X |

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

J. Bishop
PROJECT ENGINEER

CU X
EA X

FILE => $REQUEST

BRIDGE NO. X
POST MILE X

# RETAINING WALL NO. 1
# LOG OF TEST BORINGS NO. 2

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 8-1-09

SHEET X OF X

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| 03 | ED | 50 | | | |

REGISTERED CIVIL ENGINEER — X — DATE

PLANS APPROVAL DATE

R. LAWRENCE No. 63076 EXP. 6-30-10 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

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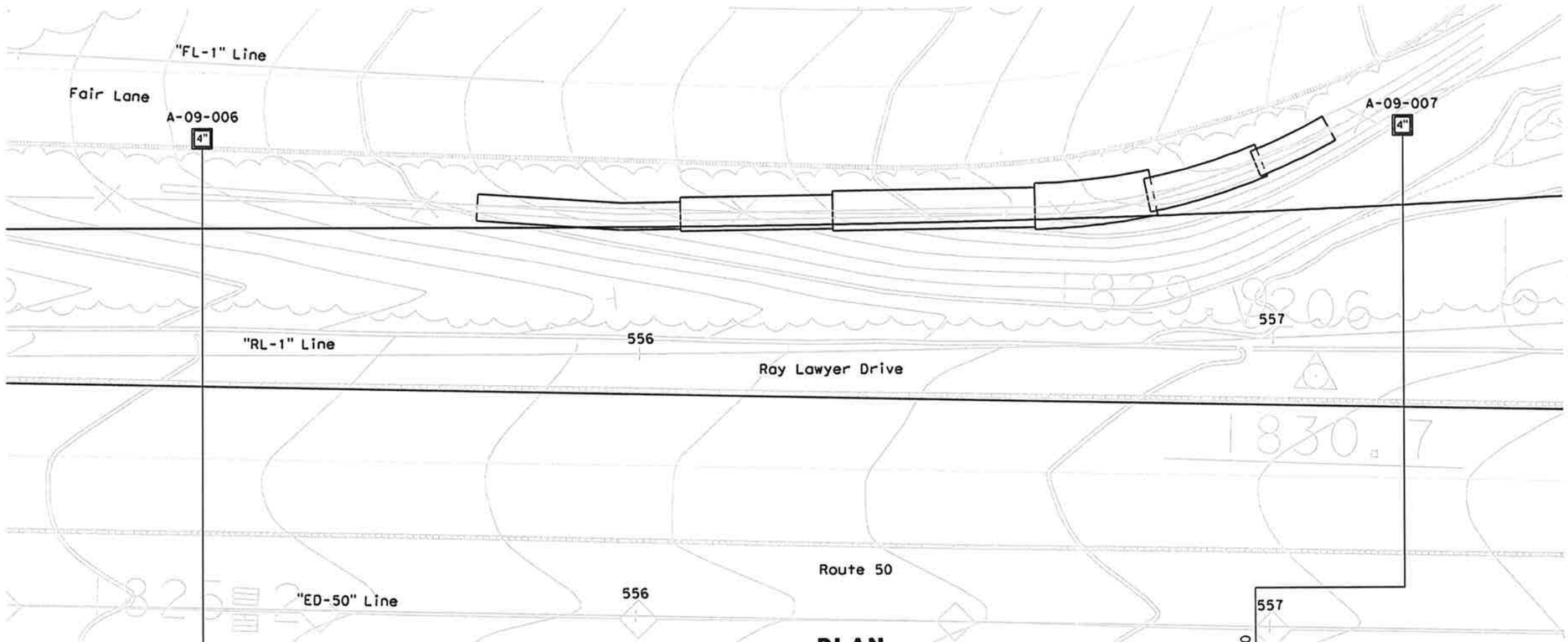
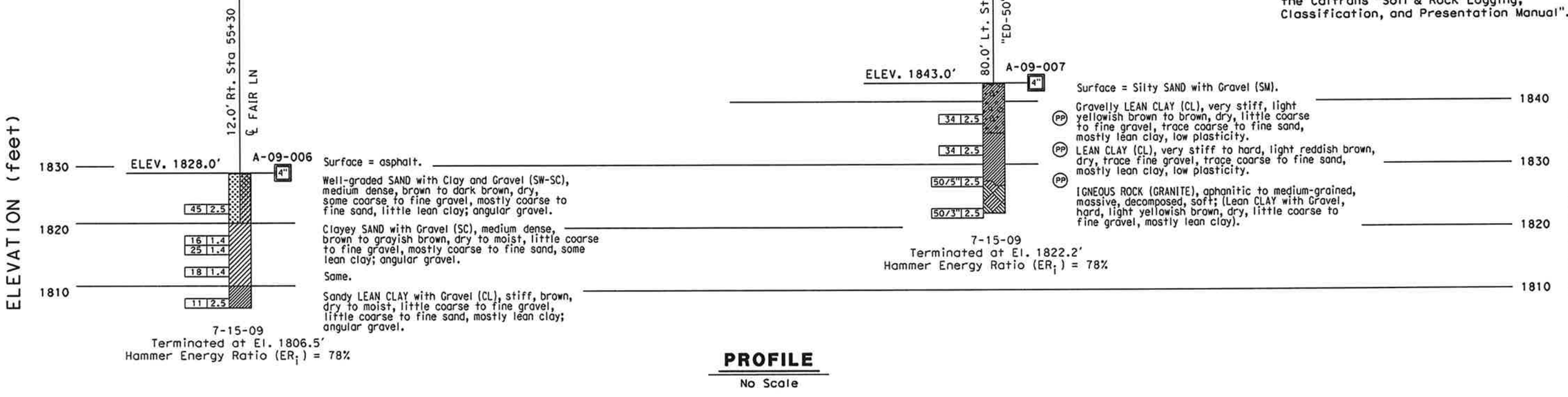



## PLAN

1" = 10'




## PROFILE

No Scale

## NOTES:

1. All of the borings were drilled using 4.25" ID hollow-stem augers with a drilling plug.
2. The 1.4" ID split barrel sampler was driven with a 140-lb. hammer falling 30" in accordance with conducting the Standard Penetration Test(ASTM D 1586). The blows for the second and third 6" drive lengths 12" total) were recorded as the Blow Count and appears on the Log of Test Borings. These are actual raw field blow counts and were not corrected for energy, overburden,or any other standard corrections.
3. The strength/relative density descriptors are from Sections 1.3 and 1.4 of the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual". These descriptors are based upon the Standard Penetration Test (ASTM D 1586) but have been modified sufficiently as not to relate to the Standard Penetration strength/relative density correlations.
4. All of the soil descriptions are based upon the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual".

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05)

| | BY | CHECKED |
|---|---|---|
| DESIGN | R. Burns | X |
| DETAILS | C. Houghton | X |
| QUANTITIES | X | X |

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

CU X
EA X

FILE => @REQUEST

| BRIDGE NO. | RETAINING WALL NO. 2 |
|---|---|
| X | |
| POST MILE | LOG OF TEST BORINGS NO. 3 |
| X | |

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 1-1-08

| SHEET | OF |
|---|---|
| X | X |

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|---|
| 03 | ED | 50 | | | |

REGISTERED CIVIL ENGINEER — DATE X

PLANS APPROVAL DATE

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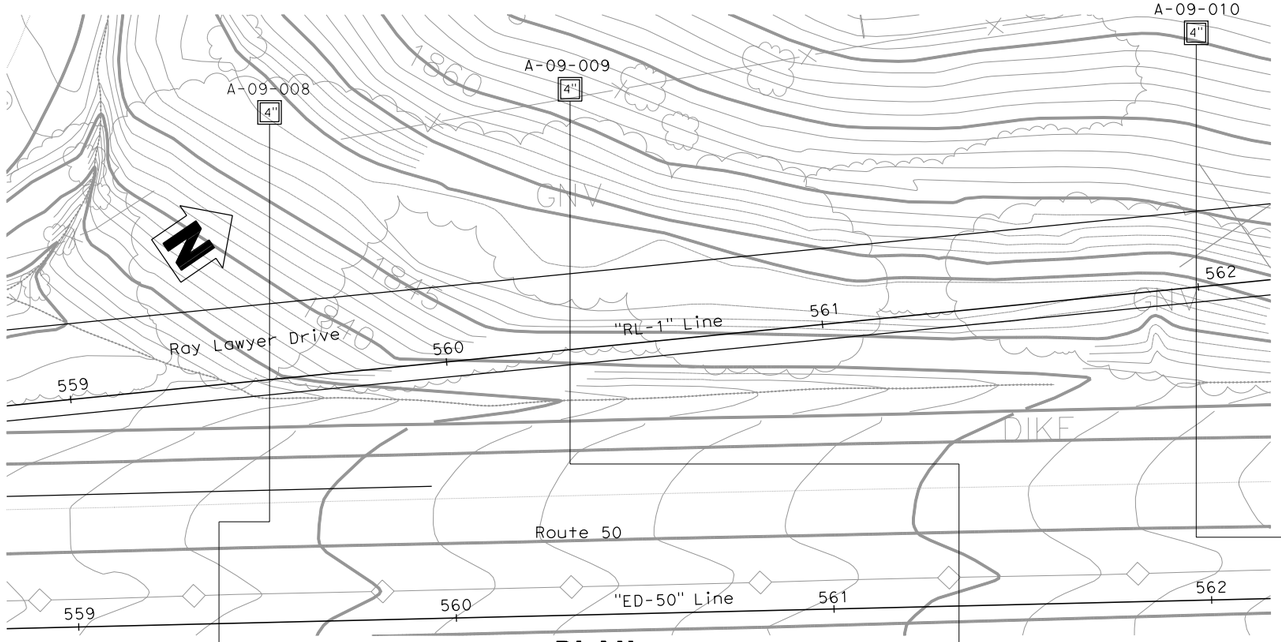
REGISTERED PROFESSIONAL ENGINEER — R. LAWRENCE — No. 63076 — Exp. 6-30-10 — CIVIL — STATE OF CALIFORNIA

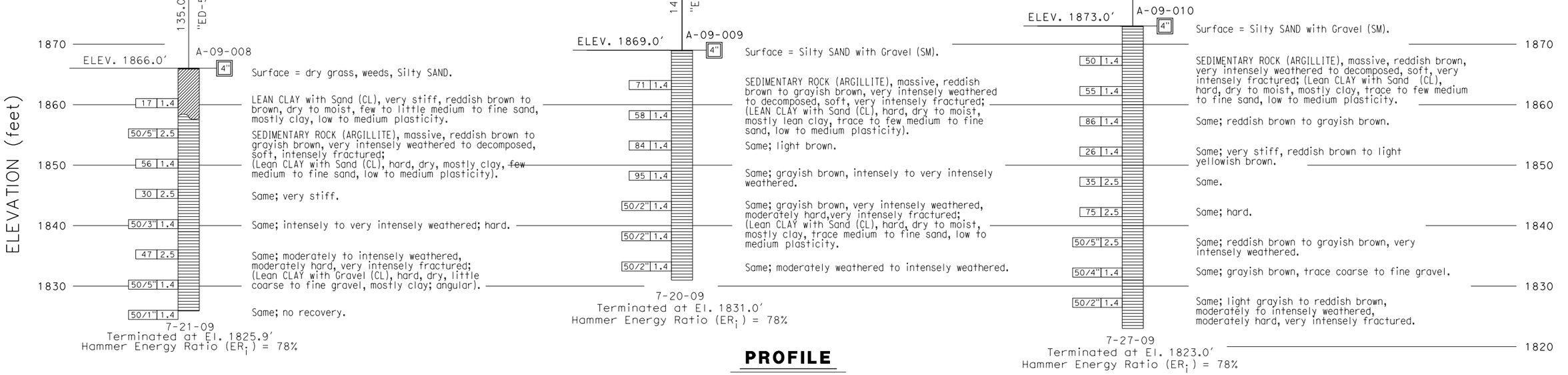
## NOTES:

1. All of the borings were drilled using 4.25" ID hollow-stem augers with a drilling plug.
2. The 1.4" ID split barrel sampler was driven with a 140-lb. hammer falling 30" in accordance with conducting the Standard Penetration Test (ASTM D 1586). The blows for the second and third 6" drive lengths (12" total) were recorded as the Blow Count and appears on the Log of Test Borings. These are actual raw field blow counts and were not corrected for energy, overburden, or any other standard corrections.
3. The strength/relative density descriptors are from Sections 1.3 and 1.4 of the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual". These descriptors are based upon the Standard Penetration Test (ASTM D 1586) but have been modified sufficiently as not to relate to the Standard Penetration strength/ relative density correlations.
4. All of the soil descriptions are based upon the Caltrans "Soil & Rock Logging, Classification, and Presentation Manual".




## PLAN

1" = 20'




## PROFILE

No Scale

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| X DESIGN OVERSIGHT<br>X SIGN OFF DATE | | DESIGN | BY R. Burns | CHECKED X | PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | J. Bishop PROJECT ENGINEER | BRIDGE NO. X<br>POST MILE X |
| | | DETAILS | BY C. Houghton | CHECKED X | | | RETAINING WALL NO. 3<br>LOG OF TEST BORINGS NO. 4 |
| DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05) | | QUANTITIES | BY X | CHECKED X | ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3 | CU X EA X | DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES (PRELIMINARY STAGE ONLY) 8-4-09 — SHEET X OF X |

FILE => J:\1773_W_Placerville_IC\517\1773LOTB4.dgn

USERNAME => untitled DATE PLOTTED => 9/11/2009 TIME PLOTTED => 8:49:33 AM

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|---|
| - | - | - | | | |

REGISTERED CIVIL ENGINEER — X DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — R. LAWRENCE — No. 63076 — Exp. 6-30-10 — CIVIL — STATE OF CALIFORNIA

## CEMENTATION

| Description | Criteria |
|---|---|
| Weak | Crumbles or breaks with handling or little finger pressure. |
| Moderate | Crumbles or breaks with considerable finger pressure. |
| Strong | Will not crumble or break with finger pressure. |

## CONSISTENCY OF COHESIVE SOILS

| Description | Unconfined Compressive Strength (tsf) | Pocket Penetrometer Measurement (tsf) | Torvane Measurement (tsf) | Field Approximation |
|---|---|---|---|---|
| Very Soft | < 0.25 | < 0.25 | < 0.12 | Easily penetrated several inches by fist |
| Soft | 0.25 to 0.50 | 0.25 to 0.50 | 0.12 to 0.25 | Easily penetrated several inches by thumb |
| Medium Stiff | 0.50 to 1.0 | 0.50 to 1.0 | 0.25 to 0.50 | Penetrated several inches by thumb with moderate effort |
| Stiff | 1 to 2 | 1 to 2 | 0.50 to 1.0 | Readily indented by thumb but penetrated only with great effort |
| Very Stiff | 2 to 4 | 2 to 4 | 1.0 to 2.0 | Readily indented by thumbnail |
| Hard | > 4.0 | > 4.0 | > 2.0 | Indented by thumbnail with difficulty |

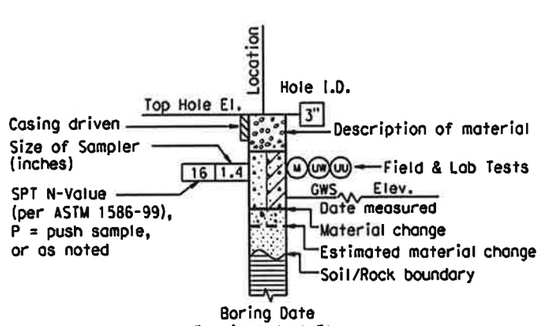
## BOREHOLE IDENTIFICATION

| Symbol | Hole Type | Description |
|---|---|---|
| Size | A | Auger Boring |
| Size | R<br>P | Rotary drilled boring<br>Rotary percussion boring (air) |
| Size | R | Rotary drilled diamond core |
| Size | HD<br>HA | Hand driven (1-inch soil tube)<br>Hand Auger |
| ● | D | Dynamic Cone Penetration Boring |
| ▲ | CPT | Cone Penetration Test (ASTM D 5778-95) |
| [ ] | O | Other |

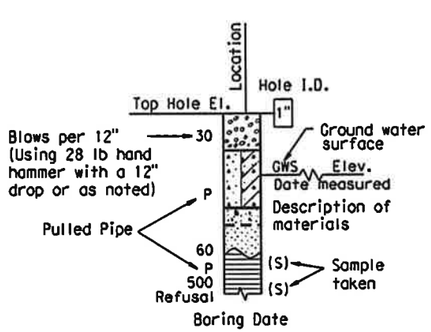
**Note: Size in inches.**

## PLASTICITY OF FINE-GRAINED SOILS

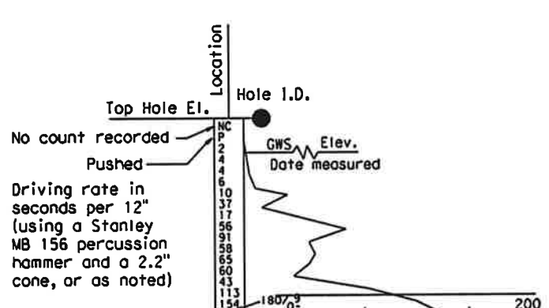
| Description | Criteria |
|---|---|
| Nonplastic | A 1/8-inch thread cannot be rolled at any water content. |
| Low | The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit. |
| Medium | The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit. |
| High | It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit. |



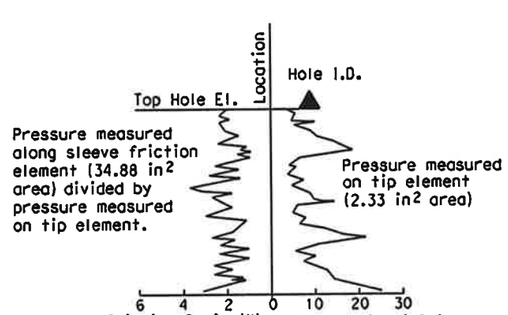

**ROTARY BORING**




**HAND BORING**




**DYNAMIC CONE PENETRATION BORING**




**CONE PENETRATION TEST (CPT) SOUNDING**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| X DESIGN OVERSIGHT | | DESIGN | BY X | CHECKED X | PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION | X PROJECT ENGINEER | BRIDGE NO. X |
| X SIGN OFF DATE | | DETAILS | BY X | CHECKED X | | | POST MILE X |
| | | QUANTITIES | BY X | CHECKED X | | | |

WP1

LOG OF TEST BORINGS NO. 5

DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU X EA X

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) .

SHEET X OF X

FILE => $REQUEST

DATE PLOTTED => $DATE

THE PLOTTED => $TIME

ACCESSIBLE => $ACCESSIBLE

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

## GROUP SYMBOLS AND NAMES

| Graphic/Symbol | Group Names |
|---|---|
| GW | Well-graded GRAVEL<br>Well-graded GRAVEL with SAND |
| GP | Poorly graded GRAVEL<br>Poorly graded GRAVEL with SAND |
| GW-GM | Well-graded GRAVEL with SILT<br>Well-graded GRAVEL with SILT and SAND |
| GW-GC | Well-graded GRAVEL with CLAY (or SILTY CLAY)<br>Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND) |
| GP-GM | Poorly graded GRAVEL with SILT<br>Poorly graded GRAVEL with SILT and SAND |
| GP-GC | Poorly graded GRAVEL with CLAY (or SILTY CLAY)<br>Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND) |
| GM | SILTY GRAVEL<br>SILTY GRAVEL with SAND |
| GC | CLAYEY GRAVEL<br>CLAYEY GRAVEL with SAND |
| GC-GM | SILTY, CLAYEY GRAVEL<br>SILTY, CLAYEY GRAVEL with SAND |
| SW | Well-graded SAND<br>Well-graded SAND with GRAVEL |
| SP | Poorly graded SAND<br>Poorly graded SAND with GRAVEL |
| SW-SM | Well-graded SAND with SILT<br>Well-graded SAND with SILT and GRAVEL |
| SW-SC | Well-graded SAND with CLAY (or SILTY CLAY)<br>Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) |
| SP-SM | Poorly graded SAND with SILT<br>Poorly graded SAND with SILT and GRAVEL |
| SP-SC | Poorly graded SAND with CLAY (or SILTY CLAY)<br>Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL) |
| SM | SILTY SAND<br>SILTY SAND with GRAVEL |
| SC | CLAYEY SAND<br>CLAYEY SAND with GRAVEL |
| SC-SM | SILTY, CLAYEY SAND<br>SILTY, CLAYEY SAND with GRAVEL |
| PT | PEAT |
| | COBBLES<br>COBBLES and BOULDERS<br>BOULDERS |

| Graphic/Symbol | Group Names |
|---|---|
| CL | Lean CLAY<br>Lean CLAY with SAND<br>Lean CLAY with GRAVEL<br>SANDY lean CLAY<br>SANDY lean CLAY with GRAVEL<br>GRAVELLY lean CLAY<br>GRAVELLY lean CLAY with SAND |
| CL-ML | SILTY CLAY<br>SILTY CLAY with SAND<br>SILTY CLAY with GRAVEL<br>SANDY SILTY CLAY<br>SANDY SILTY CLAY with GRAVEL<br>GRAVELLY SILTY CLAY<br>GRAVELLY SILTY CLAY with SAND |
| ML | SILT<br>SILT with SAND<br>SILT with GRAVEL<br>SANDY SILT<br>SANDY SILT with GRAVEL<br>GRAVELLY SILT<br>GRAVELLY SILT with SAND |
| OL | ORGANIC lean CLAY<br>ORGANIC lean CLAY with SAND<br>ORGANIC lean CLAY with GRAVEL<br>SANDY ORGANIC lean CLAY<br>SANDY ORGANIC lean CLAY with GRAVEL<br>GRAVELLY ORGANIC lean CLAY<br>GRAVELLY ORGANIC lean CLAY with SAND |
| OL | ORGANIC SILT<br>ORGANIC SILT with SAND<br>ORGANIC SILT with GRAVEL<br>SANDY ORGANIC SILT<br>SANDY ORGANIC SILT with GRAVEL<br>GRAVELLY ORGANIC SILT<br>GRAVELLY ORGANIC SILT with SAND |
| CH | Fat CLAY<br>Fat CLAY with SAND<br>Fat CLAY with GRAVEL<br>SANDY fat CLAY<br>SANDY fat CLAY with GRAVEL<br>GRAVELLY fat CLAY<br>GRAVELLY fat CLAY with SAND |
| MH | Elastic SILT<br>Elastic SILT with SAND<br>Elastic SILT with GRAVEL<br>SANDY elastic SILT<br>SANDY elastic SILT with GRAVEL<br>GRAVELLY elastic SILT<br>GRAVELLY elastic SILT with SAND |
| OH | ORGANIC fat CLAY<br>ORGANIC fat CLAY with SAND<br>ORGANIC fat CLAY with GRAVEL<br>SANDY ORGANIC fat CLAY<br>SANDY ORGANIC fat CLAY with GRAVEL<br>GRAVELLY ORGANIC fat CLAY<br>GRAVELLY ORGANIC fat CLAY with SAND |
| OH | ORGANIC elastic SILT<br>ORGANIC elastic SILT with SAND<br>ORGANIC elastic SILT with GRAVEL<br>SANDY ORGANIC elastic SILT<br>SANDY ORGANIC elastic SILT with GRAVEL<br>GRAVELLY ORGANIC elastic SILT<br>GRAVELLY ORGANIC elastic SILT with SAND |
| OL/OH | ORGANIC SOIL<br>ORGANIC SOIL with SAND<br>ORGANIC SOIL with GRAVEL<br>SANDY ORGANIC SOIL<br>SANDY ORGANIC SOIL with GRAVEL<br>GRAVELLY ORGANIC SOIL<br>GRAVELLY ORGANIC SOIL with SAND |

## FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90)<br>Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166)<br>Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 4767)
- (VS) Vane Shear (AASHTO T 223)

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET NO | TOTAL SHEETS |
|---|---|---|---|---|---|
| - | - | - | | | |

REGISTERED CIVIL ENGINEER — X — DATE

R. LAWRENCE No. 63076 Exp. 6-30-10 CIVIL — REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA

PLANS APPROVAL DATE

*The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.*

### APPARENT DENSITY OF COHESIONLESS SOILS

| Description | SPT $N_{60}$ (Blows / 12 inches) |
|---|---|
| Very loose | 0 - 4 |
| Loose | 5 - 10 |
| Medium Dense | 11 - 30 |
| Dense | 31 - 50 |
| Very Dense | > 50 |

### MOISTURE

| Description | Criteria |
|---|---|
| Dry | Absence of moisture, dusty, dry to the touch |
| Moist | Damp but no visible water |
| Wet | Visible free water, usually soil is below water table |

### PERCENT OR PROPORTION OF SOILS

| Description | Criteria |
|---|---|
| Trace | Particles are present but estimated to be less than 5% |
| Few | 5 to 10% |
| Little | 15 to 25% |
| Some | 30 to 45% |
| Mostly | 50 to 100% |

### PARTICLE SIZE

| Description | | Size |
|---|---|---|
| Boulder | | > 12" |
| Cobble | | 3" to 12" |
| Gravel | Coarse | 3/4" to 3" |
| | Fine | No. 4 to 3/4" |
| Sand | Coarse | No. 10 to No. 4 |
| | Medium | No. 40 to No. 10 |
| | Fine | No. 200 to No. 40 |

X
DESIGN OVERSIGHT

X
SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05)

| | BY | CHECKED |
|---|---|---|
| DESIGN | X | X |
| DETAILS | X | X |
| QUANTITIES | X | X |

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS: 0 1 2 3

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

CU X
EA X

BRIDGE NO. X
POST MILE X

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY) -

SHEET X OF X

FILE => $REQUEST

WP 1

# LOG OF TEST BORINGS NO. 6

FILE PLOTTED BY $USER

$ACCDATE $ACCTIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (JUNE 2007)

| DIST | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET No | TOTAL SHEETS |
|---|---|---|---|---|---|
| - | - | - | | | |

REGISTERED CIVIL ENGINEER — X — DATE

PLANS APPROVAL DATE

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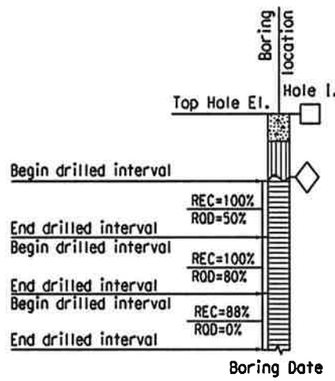
REGISTERED PROFESSIONAL ENGINEER — R. LAWRENCE — No. 63076 — EXP. 6-30-10 — CIVIL — STATE OF CALIFORNIA

## PERCENT CORE RECOVERY (REC) & ROCK QUALITY DESIGNATION (RQD)

$$REC = \frac{\sum \text{Length of the recovered core pieces (inches)}}{\text{Total length of core run (inches)}} \times 100\%$$

$$RQD = \frac{\sum \text{Length of intact core pieces} \geq 4\text{"}}{\text{Total length of core run (inches)}} \times 100\%$$




## RELATIVE STRENGTH OF INTACT ROCK

| Term | Uniaxial Compressive Strength (PSI) |
|---|---|
| Extremely Strong | > 30,000 |
| Very Strong | 14,500 - 30,000 |
| Strong | 7,000 - 14,500 |
| Medium Strong | 3,500 - 7,000 |
| Weak | 700 - 3,500 |
| Very Weak | 150 - 700 |
| Extremely Weak | < 150 |

## BEDDING SPACING

| Description | Thickness / Spacing |
|---|---|
| Massive | Greater than 10 ft |
| Very thickly bedded | 3 to 10 ft |
| Thickly bedded | 1 to 3 ft |
| Moderately bedded | 3-5/8" to 1 ft |
| Thinly bedded | 1-1/4" to 3-5/8" |
| Very thinly bedded | 3/8" to 1-1/4" |
| Laminated | Less than 3/8" |

## LEGEND OF ROCK MATERIALS

- IGNEOUS ROCK
- SEDIMENTARY ROCK
- METAMORPHIC ROCK

## ROCK HARDNESS

| Description | Criteria |
|---|---|
| Extremely Hard | Specimen cannot be scratched with a pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows. |
| Very Hard | Specimen cannot be scratched with a pocket knife or sharp pick. Breaks with repeated heavy hammer blows. |
| Hard | Specimen can be scratched with a pocket knife or sharp pick with difficulty (heavy pressure). Heavy hammer blows required to break specimen. |
| Moderately Hard | Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure. Core breaks with moderate hammer pressure. |
| Moderately Soft | Specimen can be grooved 1/6" deep with a pocket knife or sharp pick with moderate or heavy pressure. Breaks with light hammer blow or heavy manual pressure. |
| Soft | Specimen can be grooved or gouged easily by a pocket knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure. |
| Very Soft | Specimen can be readily indented, grooved or gouged with fingernail, or carved with a pocket knife. Breaks with light manual pressure. |

## FRACTURE DENSITY

| Description | Observed Fracture Density |
|---|---|
| Unfractured | No fractures. |
| Very slightly fractured | Lengths greater than 3 feet. |
| Slightly fractured | Lengths from 1 to 3 feet with few lengths less than 1 foot or greater than 3 feet. |
| Moderately fractured | Lengths mostly in 4" to 1 foot range with most lengths about 8" |
| Intensely fractured | Lengths average from 1 to 4" with scattered fragmented intervals with lengths less than 4" |
| Very intensely fractured | Mostly chips and fragments with a few scattered short core lengths. |

Combination descriptors (such as "Very intensely to intensely fractured") are used where equal distribution of both fracture density characteristics is present over a significant interval or exposure, or where characteristics are "in between" the descriptor definitions. Only two adjacent descriptors may be combined.

## WEATHERING DESCRIPTORS FOR INTACT ROCK

| Description | Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Body of Rock | Diagnostic features: Chemical Weathering-Discoloration and/or oxidation — Fracture Surfaces | Diagnostic features: Mechanical Weathering-Grain boundary conditions (disaggregation) primarily for granitics and some coarse-grained sediments | Diagnostic features: Texture and Solutioning — Texture | Diagnostic features: Texture and Solutioning — Solutioning | General Characteristics |
|---|---|---|---|---|---|---|
| Fresh | No discoloration, not oxidized. | No discoloration or oxidation. | No separation, intact (tight). | No change. | No solutioning. | Hammer rings when crystalline rocks are struck. |
| Slightly Weathered | Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull. | Minor to complete discoloration or oxidation of most surfaces. | No visible separation, intact (tight). | Preserved. | Minor leaching of some soluble minerals may be noted. | Hammer rings when crystalline rocks are struck. Body of rock not weakened. |
| Moderately Weathered | Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy." | All fracture surfaces are discolored or oxidized. | Partial separation of boundaries visible. | Generally preserved. | Soluble minerals may be mostly leached. | Hammer does not ring when rock is struck. Body of rock is slightly weakened. |
| Intensely Weathered | Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in-situ disaggregation, see grain boundary conditions. | All fracture surfaces are discolored or oxidized, surfaces friable. | Partial separation, rock is friable; in semiarid conditions granitics are disaggregated. | Texture altered by chemical disintegration (hydration, argillation). | Leaching of soluble minerals may be complete. | Dull sound when struck with hammer, usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures, or veinlets. Rock is significantly weakened. |
| Decomposed | Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay. | | Complete separation of grain boundaries (disaggregated). | Resembles a soil, partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete. | | Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes." |

Combination descriptors (such as "slightly weathered to fresh") are permissible where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant, identifiable zones can be delineated. Only two adjacent descriptors may be combined. "Very intensely weathered" is the combination descriptor for "intensely weathered to decomposed."

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV. 2/25/05)

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| DESIGN | X | X |
| DETAILS | X | X |
| QUANTITIES | X | X |

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS — 0 1 2 3

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

CU X
EA X

| BRIDGE NO. | WP I |
|---|---|
| X | LOG OF TEST BORINGS NO. 7 |
| POST MILE | |
| X | |

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

| SHEET | OF |
|---|---|
| X | X |

FILE => $REQUEST

PLOT DATE => $TIME

NORCAL GEOPHYSICAL CONSULTANTS, INC.

May 18, 2009

Mr. Michael Wilson
Senior Project Geologist
Dokken Engineering
2365 Iron Point Road, Suite 200
Folsom, CA 95630

RE: SEISMIC REFRACTION SURVEY REPORT
WESTERN PLACERVILLE INTERCHANGE PROJECT
PLACERVILLE, CALIFORNIA

NORCAL Job No. 09-953.01

Gentleman:

## INTRODUCTION

NORCAL Geophysical Consultants, Inc. conducted a seismic refraction survey at two sites associated with the Western Placerville Interchange Project. The first site (Site 1) is located north of US Route 50 approximately one-half mile east of the Forni Road interchange. This site (see Location Map, Plate 1) concerns the construction of several retaining walls to be cut in existing slopes underlain by shallow bedrock. The second site (Site 2) is located south of US Route 50 just east of the Forni Road overpass (see Location Map, Plate 2). This site is an open, elevated parcel of land thought to have potential as a barrow area to supply fill to other construction sites involved with the Interchange project.

The survey was performed by NORCAL Geophysicists William J. Henrich and Sierra Boyd assisted by geophysical technician Travis Black during the period April 19 through 20, 2009. The purpose of the seismic survey at Site 1 was to measure subsurface seismic P-wave velocities and determine depths to weathered and unweathered bedrock. This information will be used to assess rippability characteristics of bedrock down to 20 feet. The purpose of this seismic survey at Site 2 was to determine the thickness of alluvium as a possible barrow source and evaluate rippability of bedrock down to 25 feet.

Locations of the seismic lines were determined in advance of the field survey under the direction of Mr. Michael Wilson of Dokken Engineering on April 19, 2009

## METHODOLOGY

The seismic refraction method provides information regarding the seismic velocity structure of the subsurface. An impulsive source is used to produce compressional (P) wave seismic energy. The P-waves propagate into the earth and are refracted along interfaces caused by an increase in velocity. A portion of the P-wave energy is refracted back to the surface where it is detected by sensors (geophones) that are coupled to the ground surface in a collinear array (spread). The detected signals are recorded on a multi-channel seismograph and are analyzed

to determine the shot point-to-geophone travel times. These data can be used along with the corresponding shot point-to-geophone distances to determine the velocity and of subsurface seismic layers, including their depth and thickness.

The seismic velocity of fill, sediments, and rock are dependent on physical properties such as compaction, density, hardness, and induration. However, other factors such as bedding, fracturing, weathering, and saturation also effect seismic velocity. In general, low velocities are indicative of loose soil, poorly compacted fill material, poorly to semi-consolidated sediments, and deeply weathered or decomposed rock. Higher velocities are indicative of weathered rock or dense and or highly compacted sediments and fill. The highest velocities are measured in unweathered and sparsely fractured rock.

## SURVEY PROCEDURES

The seismic refraction survey consisted of two seismic refraction lines positioned along a southwest to northeast trending hillside at Site 1 (see Plate 1, Site 1 Location Map) and one seismic refraction line in the center of a southwest to northeast trending elongated field at Site 2 (see Plate 2, Site 2 Location Map). The seismic refraction lines are labeled as Line 1 through Line 3. These seismic refraction lines contained a series of 24- geophone spreads. Seismic Refraction Line 1 contained four end-to-end geophone spreads. Seismic Refraction Line 2 contained three geophone spreads with some spread overlap at the northeast end of the seismic refraction line. The distance between geophones was a constant five feet. Line 3 contained two end to end geophone spreads. The distance between geophones was a constant six feet. All geophone spreads contained three shotpoints (forward, middle and reverse shots). Depending on the refraction line, end shot points were positioned five or six feet from the ends of the spread. Seismic energy was generated by impacts to a metal ground plate with a sixteen pound sledgehammer. Seismic motion was recorded with a ***Geometrics*** Model ***Strataviewer*** signal enhancement seismograph and Mark Products 14 Hertz geophones. Resulting seismic records were written to the seismograph hard drive and printed in the field. Elevations of shotpoints and geophones were determined on detailed maps supplied by Dokken Engineering. All end shot points were marked with survey lath.

## REDUCTION PROCEDURES

Seismic compressional (P-) wave arrival times are identified as first downward declinations (breaks) on each geophone channel of the seismogram. These data (forward, middle and reverse) were plotted on time-distance graphs for each seismic line. Straight line fit to these data points form the initial estimate as to the number of velocity layers and apparent seismic velocities of each layer. We entered arrival times, shotpoint to geophone distances, velocity layer assignments, and elevation coordinates into the seismic reduction computer program ***SIP***

(*RIMROCK Geophysics*,1996, Lakewood, Colorado). This program outputs a weighted average calculation of seismic refraction velocities and depths (via a ray tracing procedure) to the various seismic layer velocities below each seismic refraction line. In instances (Seismic Refraction Line 1) where significant subsurface lateral velocity variations are indicated by time distance plots, the program has an option for the interpreter to assign specific layer velocities below individual geophone spreads. This utility operation improves the subsurface model accuracy and at the same time, accounts for lateral velocity changes related to geologic properties or structure.

## PRESENTATION-RESULTS

The results of the seismic refraction survey are presented as seismic refraction profiles and are shown on Plates 3 through 5. The Profiles display the distribution of geophone spreads, surface elevation, seismic velocities and the calculated depths to the various seismic velocity layers. The velocity layers are differentiated by variations in shading, coloring and stipple pattern.

The summary of these data and depth range of the velocity layers relative to the ground surface is presented in Table 1.

**Table 1**. Summary of Seismic Velocities and Layer Depths

| Seismic Refraction Line | Geophone Spread | V1 Layer Seismic Velocity (fps) | V2 Layer Seismic Velocity (fps) | Depth Range to V2 Layer (feet) | V3 Layer Seismic Velocity (fps) | Depth Range to V3 Layer (feet) |
|---|---|---|---|---|---|---|
| 1 | A | 1300 | 2500 | 1-10 | 8000 | 13-27 |
| 1 | B | 1300 | 3500 | 0-5 | ? | ? |
| 1 | C | 1300 | 2700 | 3-10 | 6500 | 14-25 |
| 1 | D | 1300 | 2100 | 3-15 | 6200 | 14-23 |
| 2 | E | 1300 | 3000 | 2-10 | 6700 | 13-32 |
| 2 | F | 1300 | 3000 | 2-10 | 6700 | 9-40 |
| 2 | G | 1300 | 3000 | 0-10 | 6700 | 20-46 |
| 3 | H | 1300 | 3200 | 4-6 | 8000 | 16-22 |
| 3 | I | 1300 | 3200 | 4-9 | 7000 | 17-22 |

Note: Seismic Velocities in units of feet per second (fps)

## INTERPRETATION

### A.) Site 1 - Profile Lines 1 and 2

Our final interpretation of the seismic refraction data resolved the subsurface into three seismic velocity layers. Based on comparisons of trench and borehole information to our seismic refraction profiles, the near-surface low velocity V1 layer primarily represents unconsolidated alluvial deposits of clay, silt and sand. The V2 layer represents both alluvium and highly fractured, highly weathered, fine-grained meta-volcanic bedrock, and the V3 layer represents less fractured, less weathered, massive meta-volcanic bedrock.

Profile Line 1 contained four geophone spreads (see Plate 3). Data analysis showed that three of the spreads indicated that three seismic layers are present. The exception to this subsurface three layer configuration was indicated below Spread B where a relatively high V2 layer velocity (3500 fps) was indicated but no underlying V3 layer. It is likely that a higher V3 layer is present below Spread B but it is at elevation beyond the depth of exploration for the length of the seismic spread (125 feet) given the thickness and higher V2 layer velocity. As an approximation, we have dashed a V2/V3 layer interface below Spread B to be comparable depth of the adjacent geophone spreads.

Profile Line 2 shows a more irregular V2/V3 interface than observed along Profile Line 1, however, seismic velocities are comparable. Locally the V3 layer is within 10 feet of the ground surface.

### B.) Site 2 - Profile Line 3

Our final interpretation of the seismic refraction data resolved the subsurface into three seismic velocity layers. Based on comparisons of borehole information to our seismic refraction profiles, the near-surface low velocity V1 layer represents unconsolidated alluvial deposits of silt and clay. The V2 layer represents highly fractured, weathered granitic (igneous) bedrock; the V3 layer representing less fractured, less weathered granitic rock.

## EXCAVATION CHARACTERISTICS (RIPPABILITY)

### A.) Site 1 - Profile Lines 1 and 2

Seismic velocity charts relating seismic velocity and excavation characteristics have been developed from field tests by others. These charts list the seismic velocity of various types of bedrock materials and their relative ease of excavation using different types of rippers (multi or single shank). Caterpillar Tractor Company (October, 2002) published a performance manual that lists ripper performance charts for various size tractors and types of rippers. The ripper performance chart for bedrock type "*Slate*", which is a close lithology match to metamorphic bedrock geologically logged below Profile Lines 1 and 2 is presented as follows:

| RIPPABILITY CHART FOR METAMORPHIC SLATE | | | |
|---|---|---|---|
| Tractor Model | Rippable | Marginally Rippable | Non-Rippable |
| D8R | less than 6300 | 6300 to 8400 | greater than 8400 |
| D9R | less than 7200 | 7200 to 9200 | greater than 9200 |
| D10R | less than 8000 | 8000 to 9800 | greater than 9800 |
| D11R | less than 8500 | 8500 to 11000 | greater than 11000 |

note: Seismic velocities in feet per second

Based on the observed velocities and assuming a D9R size tractor used to perform the slope cuts, our seismic velocity profiles indicate that most of the rock is rippable (7200 fps or less) down to depths of the proposed slope cuts (20 feet). One possible exception is below the east end of Spread A, Profile Line 1 where a 8000 fps V3 layer shoals to within 20 feet of the surface. This velocity indicates bedrock is only marginally rippable according to the Caterpillar Chart.

**B.) Site 2 - Profile Line 3**

With regards to granitic rock geologically logged below Profile Line 3, the following chart from Caterpillar is shown below as a guide relating rock rippability to seismic refraction velocities.

| **RIPPABILITY CHART FOR GRANITE** | | | |
|---|---|---|---|
| **Tractor Model** | **Rippable** | **Marginally Rippable** | **Non-Rippable** |
| D8R | less than 5800 | 5,800 to 8,000 | greater than 8000 |
| D9R | less than 6800 | 6,800 to 8,000 | greater than 8000 |
| D10R | less than 7200 | 7200 to 8600 | greater than 8600 |
| D11R | less than 8000 | 8000 to 9600 | greater than 9600 |

Note: velocities in feet per second

Based on the observed velocities, depths to the various velocity layers and a D9R tractor performing the excavation, Profile Line 3 indicates that most of the bedrock down to the depths ranging from 16 to 22 feet is rippable (less than 6800 fps). This depth range corresponds to the V2/V3 layer interface. However, for rock cuts down to the proposed 25 feet below the ground surface, bedrock can be marginally rippable (less than 8000 fps).

This information should only be used as a general guide, however, as many other factors should also be considered. These factors include the frequency of rock discontinuities in the form of faults, fractures, joints and bedding, rock fabric and degrees of weathering and the experience of the equipment operator, and the equipment and excavation methods selected are rippable to marginally rippable with a D9R tractor. However, this information should be combined with a complete and thorough analysis of future boring information as well as local ripping experience (if available) to make a final assessment.

**LIMITATIONS**

In general, there are limitations unique to the seismic refraction method. These limitations are primarily based on assumptions that are made by the data analysis routine. The data analysis routine assumes that the velocities along the length of each spread are uniform. If there are localized zones within each layer where the velocities are higher or lower than indicated, the analysis routine will interpret these zones as changes in the surface topography of the underlying layer. A zone of higher velocity material would be interpreted as a low in the surface of the underlying layer. Zones of lower velocity material would be interpreted as a high in the underlying layer.

The data analysis routine also assumes that the velocity of subsurface materials increase with depth. Therefore, if a layer exhibits velocities that are slower than those of the material above it, the slower layer will not be resolved. Also, a velocity layer may simply be too thin to be detected.

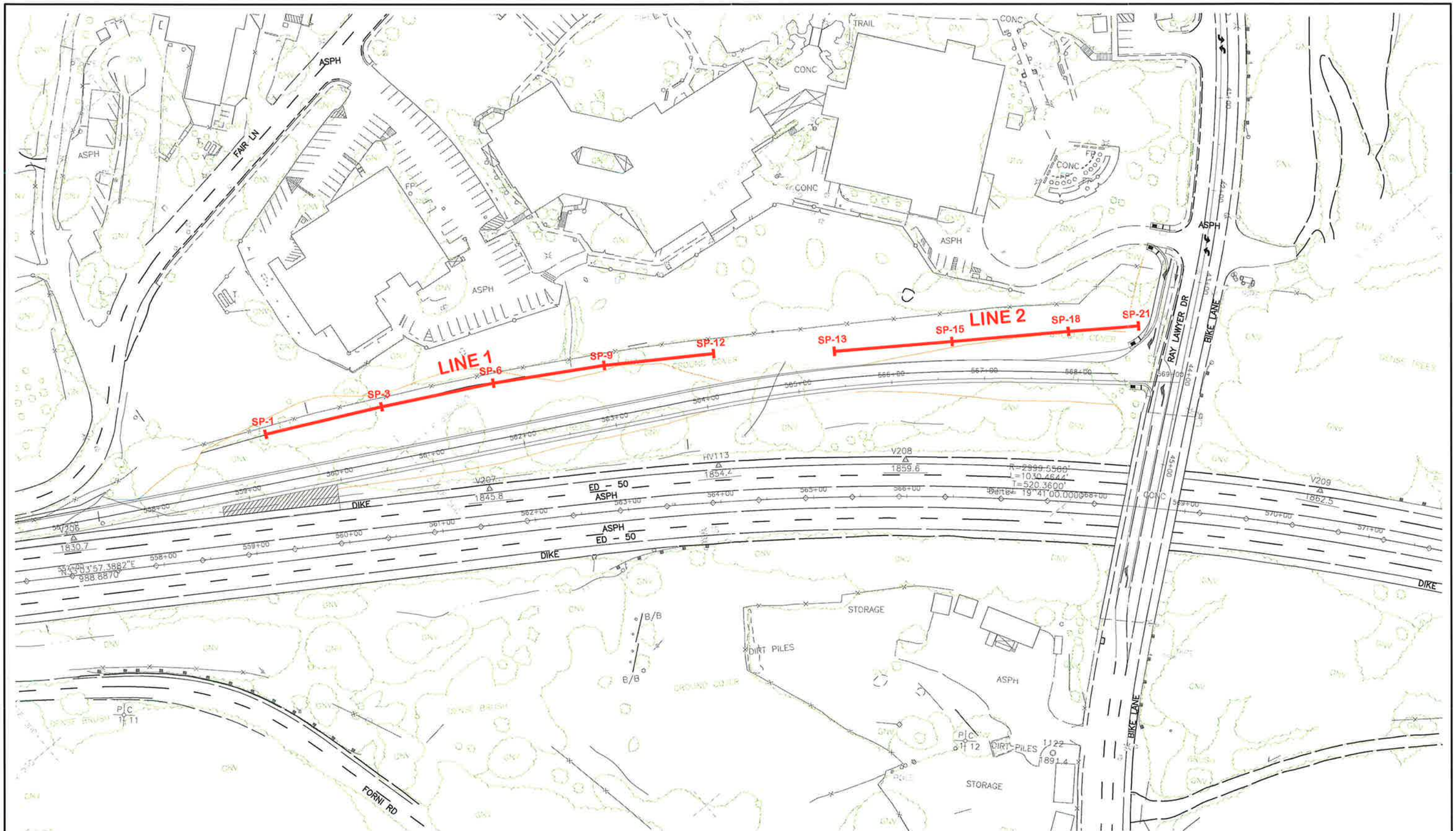
Due to these and other limitations inherent to the seismic refraction method, the profiles sections shown on Plates 3 through 5 should be considered only as approximations of the subsurface conditions. The actual conditions may vary locally.

Thank you for the opportunity to participate on this project. Please call me at your convenience concerning any questions.

Yours very truly,

William J. Henrich
Professional Geophysicist, PGp-893

Enclosures: Plates 1 thru 5




## LEGEND

| | |
|---|---|
| ——— | SEISMIC REFRACTION LINE |
| SP-13 | SHOT POINT |

NOTE: BASE MAP PROVIDED BY DOKKEN ENGINEERS

SCALE
0 50 100 200
(1 inch = 100 feet)

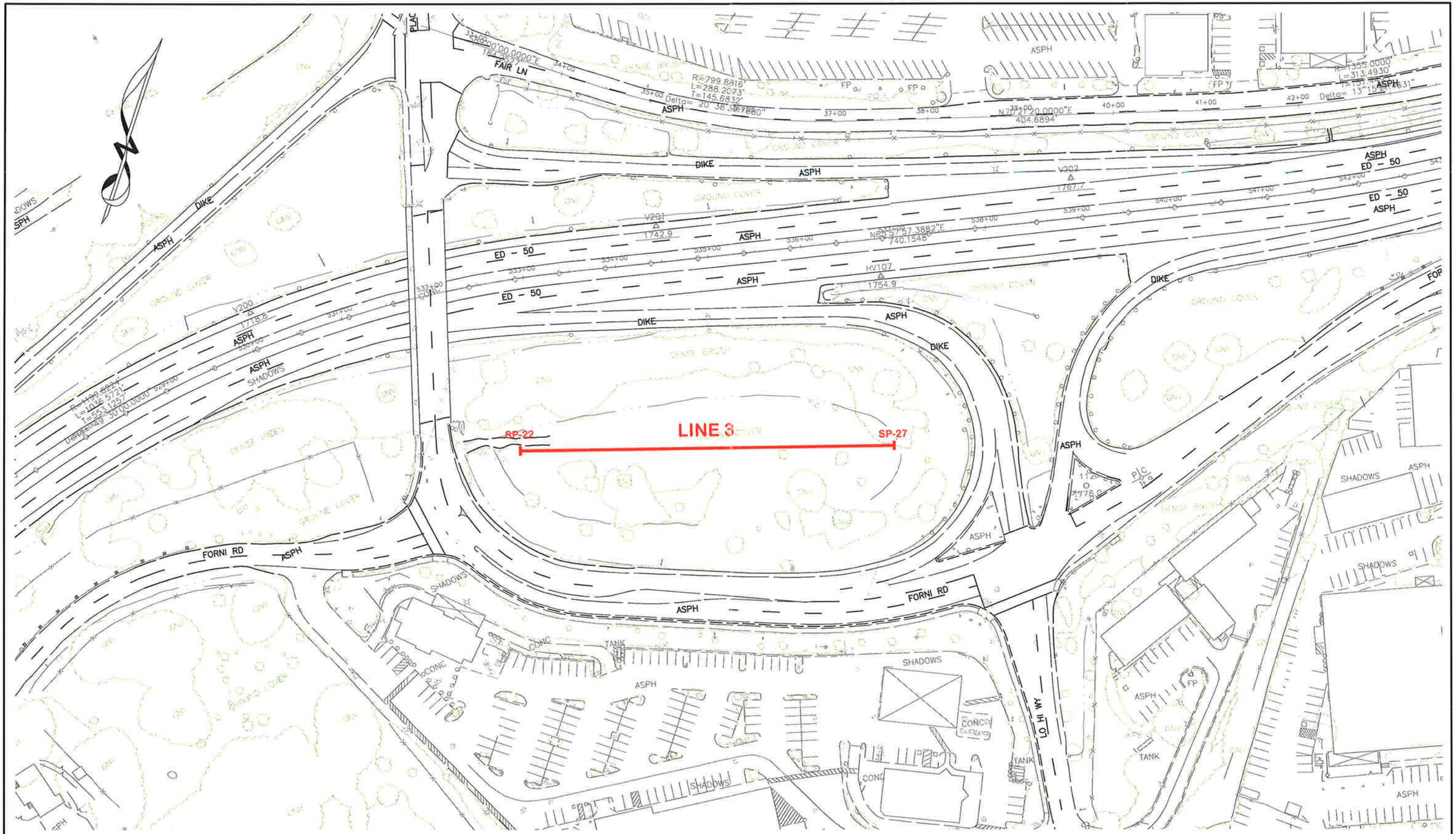
NORCAL

# LOCATION MAP – SITE 1
# SEISMIC REFRACTION LINES 1 & 2
# WESTERN PLACERVILLE INTERCHANGE

LOCATION: PLACERVILLE, CALIFORNIA
CLIENT: DOKKEN ENGINEERS
NORCAL GEOPHYSICAL CONSULTANTS INC.

JOB #: 09-953.01
DATE: MAY 2009
DRAWN BY: G.RANDALL
APPROVED BY: WJH

PLATE 1




| LEGEND | |
|---|---|
| | SEISMIC REFRACTION LINE |
| SP-13 | SHOT POINT |

NOTE: BASE MAP PROVIDED BY DOKKEN ENGINEERS

NORCAL

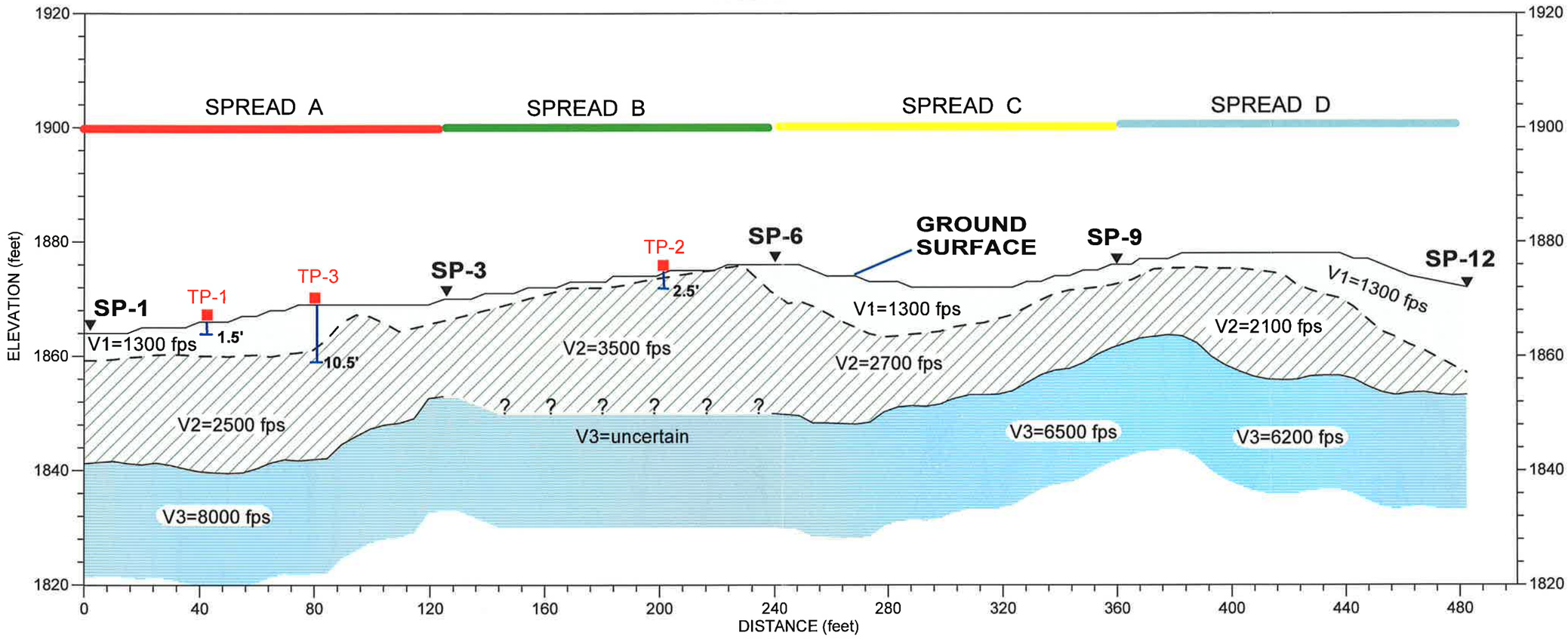
LOCATION MAP – SITE 2
SEISMIC REFRACTION LINE 3
WESTERN PLACERVILLE INTERCHANGE

LOCATION: PLACERVILLE, CALIFORNIA
CLIENT: DOKKEN ENGINEERS
NORCAL GEOPHYSICAL CONSULTANTS INC.

JOB #: 09-953.01
DATE: MAY 2009
DRAWN BY: G.RANDALL
APPROVED BY: WJH

PLATE 2

## PROFILE LINE 1




### LEGEND

| | | | |
|---|---|---|---|
| SP-1 ▼ | SHOT POINT LOCATION | TP-1 ■ | TEST PIT LOCATION |
| SPREAD A | 24-CHANNEL GEOPHONE ARRAY | ✦ | TEST BORING |
| – – – – – | V1/V2 VELOCITY INTERFACE | 2.5' | TOP OF BEDROCK INFEET BELOW GROUND SURFACE |
| – – – – – | V2/V3 VELOCITY INTERFACE | | |
| V2=2500 fps | VELOCITY OF LAYER 2 IN FEET PER SECOND | | |

NOTE: ONLY A SELECT NUMBER OF SHOT POINTS ARE LOCATED ON PROFILE TO STREAMLINE PLOTTING INFORMATION

HORIZONTAL SCALE: 1 INCH = 40 FEET
VERTICAL EXAGGERATION 2:1

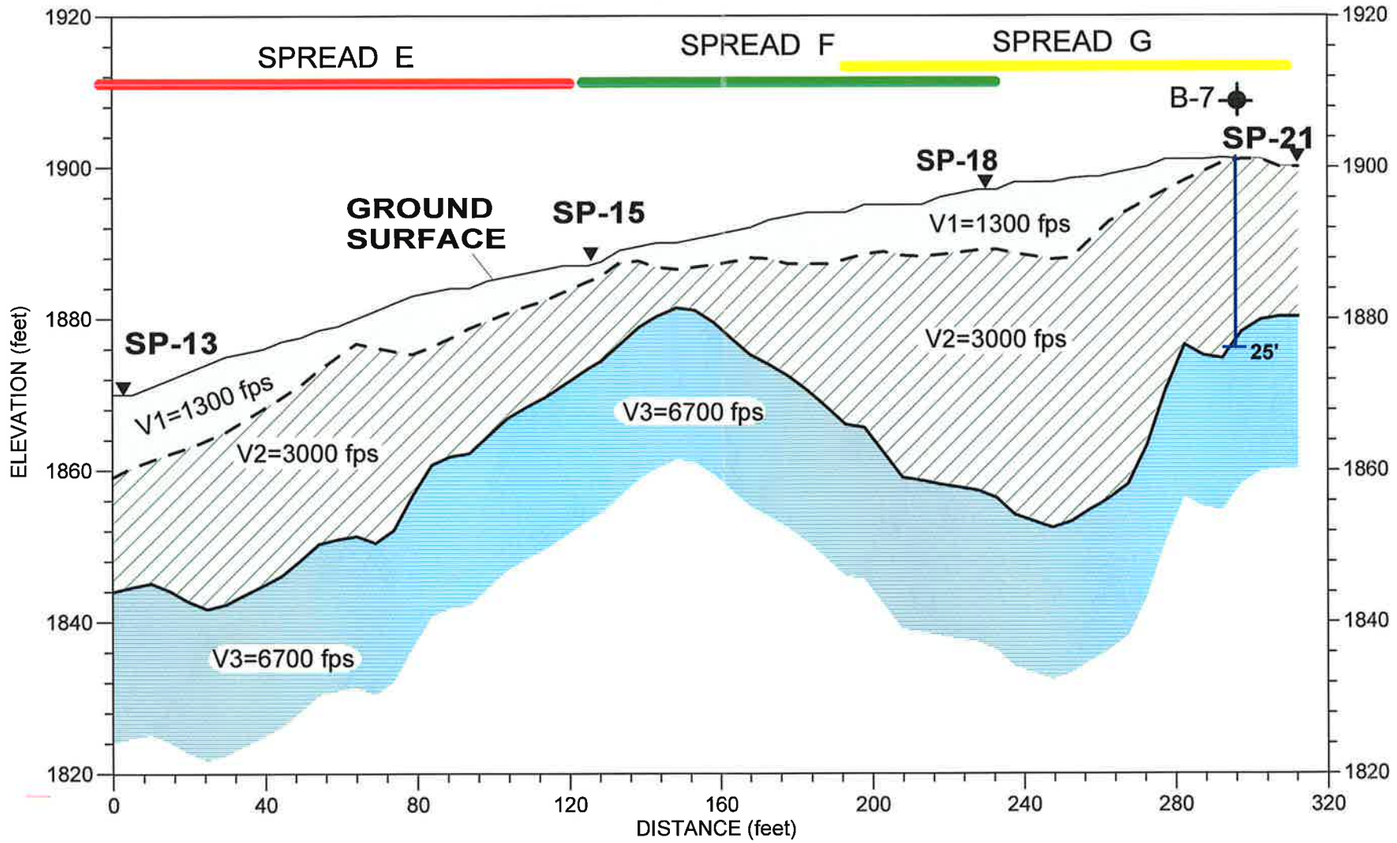
NORCAL

SEISMIC VELOCITY PROFILE - LINE 1
WESTERN PLACERVILLE
INTERCHANGE PROJECT

LOCATION: PLACERVILLE, CALIFORNIA
CLIENT: DOKKEN ENGINEERS
JOB #: 09-953.01
NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAY 2009
DRAWN BY: W. HENRICH
APPROVED BY: WJH

PLATE 3

## PROFILE LINE 2




### LEGEND

| | | | |
|---|---|---|---|
| SP-1 ▼ | SHOT POINT LOCATION | TP-1 ■ | TEST PIT LOCATION |
| SPREAD A | 24-CHANNEL GEOPHONE ARRAY | ⊕ | TEST BORING |
| – – – – – · | V1/V2 VELOCITY INTERFACE | ⊥ 2.5' | TOP OF BEDROCK INFEET BELOW GROUND SURFACE |
| – – – – – · | V2/V3 VELOCITY INTERFACE | NOTE: | ONLY A SELECT NUMBER OF SHOT POINTS ARE LOCATED ON PROFILE TO STREAMLINE PLOTTING INFORMATION |
| V2=2500 fps | VELOCITY OF LAYER 2 IN FEET PER SECOND | | |

HORIZONTAL SCALE: 1 INCH = 40 FEET
VERTICAL EXAGGERATION 2:1

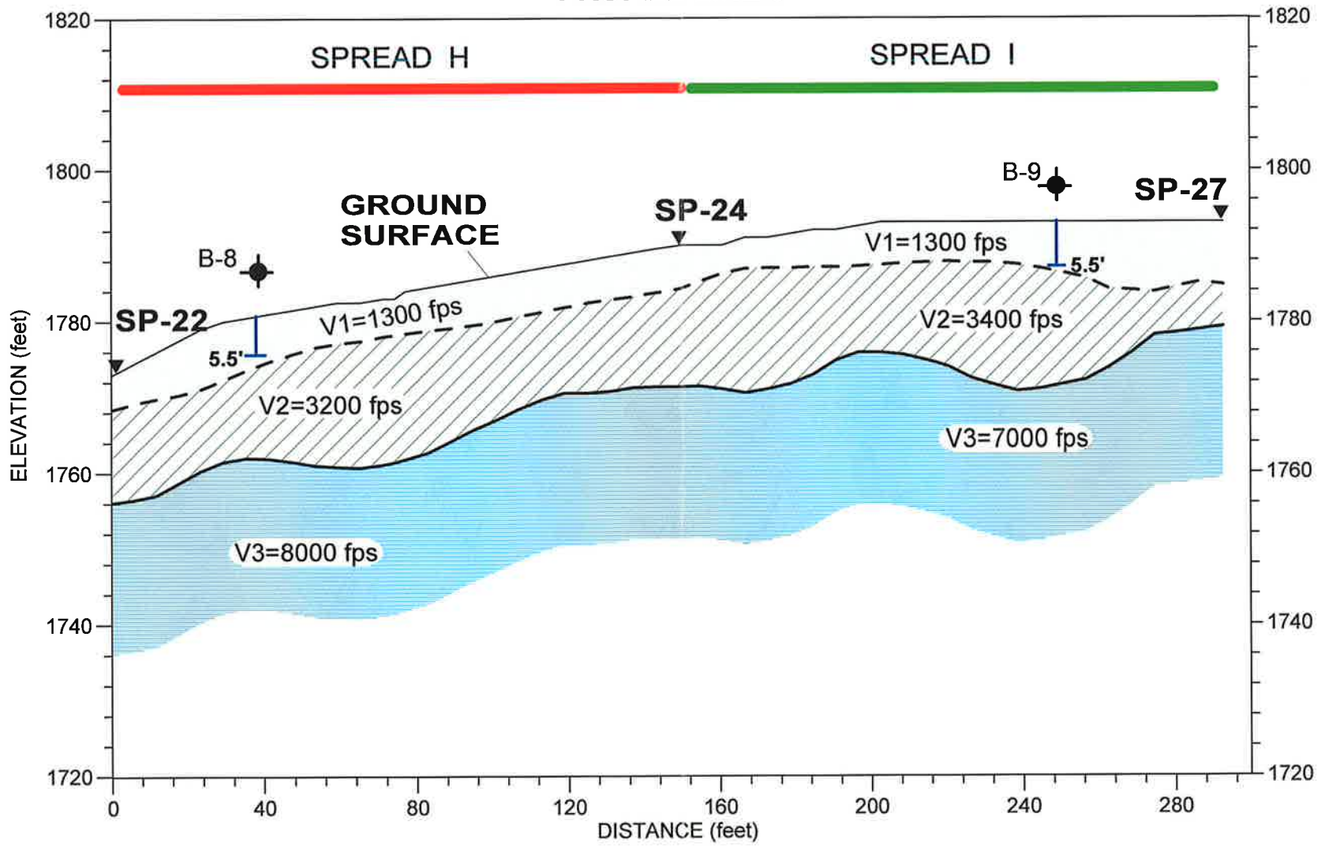
NORCAL

SEISMIC VELOCITY PROFILE - LINE 2
WESTERN PLACERVILLE
INTERCHANGE PROJECT

LOCATION: PLACERVILLE, CALIFORNIA
CLIENT: DOKKEN ENGINEERS
JOB #: 09-953.01
NORCAL GEOPHYSICAL CONSULTANTS INC.
DATE: MAY 2009
DRAWN BY: W. HENRICH
APPROVED BY: WJH

PLATE 4

## PROFILE LINE 3




### LEGEND

| | | | |
|---|---|---|---|
| SP-1 ▼ | SHOT POINT LOCATION | TP-1 ■ | TEST PIT LOCATION |
| SPREAD A | 24-CHANNEL GEOPHONE ARRAY | ✛ | TEST BORING |
| – – – – – · | V1/V2 VELOCITY INTERFACE | 2.5' | TOP OF BEDROCK INFEET BELOW GROUND SURFACE |
| – – – – – · | V2/V3 VELOCITY INTERFACE | | |
| V2=2500 fps | VELOCITY OF LAYER 2 IN FEET PER SECOND | | |

NOTE: ONLY A SELECT NUMBER OF SHOT POINTS ARE LOCATED ON PROFILE TO STREAMLINE PLOTTING INFORMATION

HORIZONTAL SCALE: 1 INCH = 40 FEET
VERTICAL EXAGGERATION 2:1

NORCAL

SEISMIC VELOCITY PROFILE - LINE 3
WESTERN PLACERVILLE
INTERCHANGE PROJECT

LOCATION: PLACERVILLE, CALIFORNIA
CLIENT: DOKKEN ENGINEERS
NORCAL GEOPHYSICAL CONSULTANTS INC.

JOB #: 09-953.01
DATE: MAY 2009
DRAWN BY: W. HENRICH
APPROVED BY: WJH

PLATE 5