

# LAKE 52473

**STATE OF OREGON  
WATER SUPPLY WELL REPORT**

(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L \_\_\_\_\_

START CARD # 209505

Instructions for completing this report are on the last page of this form.

**(1) LAND OWNER** Owner Well I.D. \_\_\_\_\_  
 First Name \_\_\_\_\_ Last Name \_\_\_\_\_  
 Company Oregon - Dogami  
 Address 1225 Ferry St U140  
 City Salem State OR Zip 97301-4285

**(2) TYPE OF WORK**  New Well  Deepening  Conversion  
 Alteration (repair/recondition)  Abandonment

**(3) DRILL METHOD**  
 Rotary Air  Rotary Mud  Cable  Auger  Cable Mud  
 Reverse Rotary  Other \_\_\_\_\_

**(4) PROPOSED USE**  Domestic  Irrigation  Community  
 Industrial/Commercial  Livestock  Dewatering  Injection  
 Thermal  Other \_\_\_\_\_

**(5) BORE HOLE CONSTRUCTION** Special Standard:  Yes (attach copy)  
 Depth of Completed Well 1000 ft.

| BORE HOLE |      |      |          | SEAL |    |        |          |
|-----------|------|------|----------|------|----|--------|----------|
| Dia       | From | To   | Material | From | To | Amount | Scks/lbs |
| 10 3/4    | 0    | 40   | 31K Rock | 0    | 40 | 1      | 26       |
| 6 1/8     | 40   | 1000 |          |      |    |        |          |

How was seal placed: Method  A  B  C  D  E  
 Other \_\_\_\_\_

Backfill placed from 0 ft. to \_\_\_\_\_ ft. Material \_\_\_\_\_  
 Filter pack from 0 ft. to \_\_\_\_\_ ft. Material \_\_\_\_\_ Size \_\_\_\_\_  
 Explosives used:  Yes Type \_\_\_\_\_ Amount \_\_\_\_\_

**(6) CASING/LINER**

| Casing | Linr | Dia | +  | From | To | Gauge | Steel | Plastic | Welded | Thrd |
|--------|------|-----|----|------|----|-------|-------|---------|--------|------|
| 2 3/8  |      |     | +1 | 1000 |    |       | X     |         |        | X    |

Shoe  Inside  Outside  Other Location of shoe(s) \_\_\_\_\_  
 Temporary casing  Yes Diameter \_\_\_\_\_ From \_\_\_\_\_ To \_\_\_\_\_

**(7) PERFORATIONS/SCREENS**  
 Perforations Method None  
 Screens Type \_\_\_\_\_ Material \_\_\_\_\_

| Perf | Scrn | Casing | Linr | Screen Dia | From | To | Screen/slot width | Slot length | # of slots | Tele/pipe size |
|------|------|--------|------|------------|------|----|-------------------|-------------|------------|----------------|
| 0    |      |        |      |            |      |    |                   |             |            |                |

**(8) WELL TESTS: Minimum testing time is 1 hour**  
 Pump  Bailer  Air  Flowing Artesian  

| Yield gal/min | Drawdown | Drill stem/Pump depth | Duration (hr) |
|---------------|----------|-----------------------|---------------|
| <u>None</u>   |          |                       |               |

Temperature \_\_\_\_\_ °F Lab analysis  Yes By \_\_\_\_\_  
 Water quality concerns?  Yes (describe below)  

| From        | To | Description | Amount | Units |
|-------------|----|-------------|--------|-------|
| <u>None</u> |    |             |        |       |

**(9) LOCATION OF WELL (legal description)**  
 County Lake Twp 29 N or S  Range 16 E or W W.M.  
 Sec 36 SW 1/4 of the NE 1/4 Tax Lot \_\_\_\_\_  
 Tax Map Number \_\_\_\_\_ Lot \_\_\_\_\_  
 Lat \_\_\_\_\_ " or \_\_\_\_\_ DMS or DD  
 Long \_\_\_\_\_ " or \_\_\_\_\_ DMS or DD

Street Address of Well (or nearest address) Picture rock  
Gravel Pit

**(10) STATIC WATER LEVEL**

|                            | Date | SWL (psi) | + | SWL (ft) |
|----------------------------|------|-----------|---|----------|
| Existing Well/Predeepening |      | 0         |   |          |
| Completed Well             |      |           |   |          |

Flowing Artesian?  Yes Dry Hole?  Yes  
 WATER BEARING ZONES Depth water was first found \_\_\_\_\_

| SWL Date | From | To | Est Flow | SWL (psi) | + | SWL (ft) |
|----------|------|----|----------|-----------|---|----------|
|          |      |    |          |           |   |          |
|          |      |    |          |           |   |          |
|          |      |    |          |           |   |          |

**(11) WELL LOG** Ground Elevation \_\_\_\_\_

| Material             | From | To   |
|----------------------|------|------|
| Black Rock           | 0    | 70   |
| Red clay             | 70   | 95   |
| Black rock           | 95   | 120  |
| gravels - cobbles    | 120  | 155  |
| loss circ no returns | 155  | 170  |
| less circ no returns | 170  | 340  |
| Black rock           | 340  | 425  |
| Red clay             | 425  | 440  |
| Black - Red Rock     | 440  | 840  |
|                      |      | 950  |
| loss circ            | 950  | 1000 |

Date Started 4-30-13 Completed 5-9-13

**(unbonded) Water Well Constructor Certification**  
 I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number \_\_\_\_\_ Date MAY 28 2013  
 Signed \_\_\_\_\_

**(bonded) Water Well Constructor Certification** SALEM, OR  
 I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1946 Date MAY 10-13  
 Signed [Signature]  
 Contact Info. (optional) \_\_\_\_\_

**BOREHOLE SUMMARY LOG**

|  |  |                        |
|--|--|------------------------|
| BOREHOLE NO.<br>ARRASLI                            | FINAL DEPTH (FT)<br>960'   | COMMENTS               |
| PROJECT NAME:<br>GEOHERMAL SUMMER LAKE WELL        | CONTRACTOR:<br>WELSCO  | START DATE:<br>4/30/13 |
| PROJECT DESCRIPTION:<br>GEOHERMAL TEMPERATURE WELL | DRILLER(S):<br>TROY<br>DIM BIFFLE, HOLBROOK  | COMPLETION DATE:       |
| DOGAMI REP(S):<br>Tom WILEY                        | HELPER(S):<br>HECTOR ROBLES CADE WORKINGTON  |                        |
| ELEVATION(FT):                                     | SITE DESCRIPTION: 681768 E, 4764815 N, NAD 27 CORNER<br>ODOT QUARRY AT NORTH END SUMMER LAKE |                        |
| PROPERTY OWNER(S)/CONTACT(S):                      | UNDERGROUND LOCATER(S):  |                        |

|                     |                       |                         |              |
|---------------------|-----------------------|-------------------------|--------------|
| HOLE DIAMETER(S):   | DRILL METHOD(S):      | CASING TYPE/DIA.:       | BIT TYPE(S): |
| BOTTOM OF HOLE (FT) | BOTTOM OF CASING (FT) | NO. OF APPROVED SAMPLES | DRILL FLUID  |

| DATE    | DRILL METHOD | DRILL FROM: | DRILL TO: | START TIME | END TIME         | WEATHER | OTHER            |
|---------|--------------|-------------|-----------|------------|------------------|---------|------------------|
| 4/30    | Rotary Mud   | 0           | 20'       | 1500       | 1800             | BREEZY  |                  |
| 5/1     | Rotary Mud   | 20          | 170'      | 0700       | 1900             | 30-14   |                  |
| 5/2     | Rotary Mud   | 170         | 340'      | 0700       | 1800             |         |                  |
| 5/3     | Rotary Mud   | —           | —         | 1200       | 1800             |         | Lost Circulation |
| 5/4     | Rotary Mud   | 340         | 575'      | 0600       | 1800             |         |                  |
| 5/5     | Rotary Mud   | 575         | 840       | 0600       | 1800             |         |                  |
| 5/6     | Rotary Mud   | 840         | 965       | 0700       | 1700             |         | Lost Circulation |
| 5/7-5/9 | —            | —           | —         | 0700       | Varies 1700-2300 |         | Cement/comp      |

**PVC CASING INSTALLATION**

|                            |                           |            |                  |                  |
|----------------------------|---------------------------|------------|------------------|------------------|
| TOTAL PIPE (FEET):<br>10   | PIPE I.D.:                | PIPE SCH.: | THREAD OR GLUED: | GROUT TECHNIQUE: |
| AMOUNT/TYPE OF GROUT USED: | FILL BOREHOLE WITH WATER: |            | WELL CAP:        |                  |

**MATERIAL ITEMS**

|                             |
|-----------------------------|
| NUMBER OF CORE BOXES        |
| SPLIT PVC (BOTH HALVES)(FT) |
| COMPLETED CASING DEPTH (FT) |
| AUGER FOOTAGE/DEPTHS (FT)   |
| CORE FOOTAGE/DEPTHS (FT)    |
| NUEMAX FOOTAGE/DEPTHS (FT)  |
| MISC.                       |

ADDITIONAL COMMENTS (DELAYS, EQUIP. FAILURES, ETC.):

APPROVED BY: DRILLER: DOGAMI REP:

# BOREHOLE LOG

|  |  |
|--|--|
| Borehole No.: <u>ARRASLI</u>   | Start and End Date: <u>4/30/13</u> ( <u>5/2-5/4</u> )  |
| Location: <u>NORTH SUMMER LAKE PIT</u>   | Contractor and Equipment: <u>WELSCO</u>  |
| Logged by: <u>WILBY</u>  | Drillers: <u>JIM TROY</u> <span style="float:right; font-size: small;">HECTOR CADE</span>                        |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><p style="text-align: center;"><u>CUTTINGS</u></p> Ground Water Table (ft) | Drilling Methods<br>Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other. | Geologic Unit | Comments |
|------------|---------------|------------|----------------|----------|------------|------|-------------|--|---------------|----------|
| 272        |               |            |                |          |            |      |             |  |               |          |
| 280        |               |            |                |          |            |      |             | NO RETURNS   |               |          |
| 290        |               |            |                |          |            |      |             | NO RETURNS   |               |          |
| 300        |               |            |                |          |            |      |             | NO RETURNS   |               |          |
| 310        |               |            |                |          |            |      |             | NO RETURNS   |               |          |
| 320        |               |            |                |          |            |      |             | NO RETURNS   |               |          |
| 330        |               |            |                |          |            |      |             | NO RETURNS   |               |          |
| 340        |               |            |                |          |            |      |             | NO RETURNS   |               |          |

# BOREHOLE LOG

|   |  |
|---|--|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u> ( <u>4/30-5/1</u> )   |
| Location: <u>SUMMER LAKE QUARRY</u>   | Contractor and Equipment: <u>WELSCO</u>  |
| Logged by: <u>WILEY</u>   | Drillers: <u>TROY</u> <u>JIM BIFFLE</u> <u>HECTOR</u> <u>CADE</u>  |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods<br>AIR ROTARY TO 0 Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |  |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.                              | Geologic Unit | Comments          |
|------------|---------------|------------|----------------|----------|------------|------|-------------|---|---------------|-------------------|
| 0          |               |            |                |          |            |      |             |   |               |                   |
| 10         |               |            |                |          |            |      | 0.5<br>0.5  | SAND AND GRAVEL; DARK MEDIUM-TO<br>COARSE-GRAINED SAND WITH VOLCANIC<br>PROVENANCE; VOL. PEBBLES TO .5 CM DIA                         |               |                   |
| 20         |               |            |                |          |            |      |             | GRAVEL AND SAND; AS ABOVE   |               |                   |
| 30         |               |            |                |          |            |      |             | GRAVEL? MIXED MAFC LITHS  |               |                   |
| 35         |               |            |                |          |            |      | 35          | VESICULAR BASALT: COARSE GRANULAR GROUNDMASS<br>WITH CPX, PLAG, OLIV.; MEDIUM GRAY  |               |                   |
| 40         |               |            |                |          |            |      |             |   |               |                   |
| 45         |               |            |                |          |            |      |             | SAME  |               |                   |
| 50         |               |            |                |          |            |      |             |   |               |                   |
| 55         |               |            |                |          |            |      |             | VES. BAS., BROWNISH GRAY TO ORANGISH GRAY<br>MED. GRANULAR GROUNDMASS; ABUN. GM, OLIV.  |               |                   |
| 60         |               |            |                |          |            |      |             |   |               |                   |
| 65         |               |            |                |          |            |      |             | DK. GRAY, FRESH OLIV. BASALT: OLIV. LT. GRN.<br>TO 1.5mm < 1%; PILOTAXTIC GM. W/ DK. PLAG<br>LATH TO 1mm, CPX, OLIV.; WHITE AMYGDULES |               | SAMPLE 40 GEOCHEM |


# BOREHOLE LOG

|   |  |
|---|--|
| Borehole No.: <u>ARRASLI</u>                      | Start and End Date: <u>4/30</u> <u>(5/1-</u>                             |
| Location: <u>SUMMER LAKE QUARRY</u>               | Contractor and Equipment: <u>WELSCO</u> <u>CADE</u>                      |
| Logged by: <u>WILEY</u>                           | Drillers: <u>TROY HOLBROOK</u> , <u>JIM RIFFLE</u> <u>HECTOR ROBLETS</u> |
| <u>Sampling Method, Total Tests and Intervals</u> | <u>Drilling Methods</u>  |
| SPT- Standard Penetration Test                    | AIR ROTARY Auger interval _____  |
| <u>CUTTINGS</u>                                   | _____ Coring interval _____  |
| <u>Ground Water Table (ft)</u>                    | _____ PVC Casing depth _____   |
|   | _____ Total Depth _____  |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.   | Geologic Unit | Comments |
|------------|---------------|------------|----------------|----------|------------|------|-------------|--|---------------|----------|
| 70         |               |            |                |          |            |      |             | BROWN TO ORANGE SANDY CLAY w/ BASALT FRAGMENT<br>PALEOSOL?, IGNEIMBRITE?, SOME EHDHEDRAL PLAG.<br>AS SAND; POORLY SORTED, ANGULAR TO WEIL ROUNDED                | TIG           |          |
| 80         |               |            |                |          |            |      |             | TUFF/TUFFACEOUS SILTSTONE w/ BASALT FRAGMENTS; SIMILAR TO ABOVE BUT BETTER INDURATED, SHARDS, REWORKED? BROWNISH ORANGE  | TIG           |          |
| 90         |               |            |                |          |            |      |             | AS ABOVE, CHANGING TO: (OR w/ BOULDER) OLIVINE BASALT; MEDIUM GRAY, DIKTYXITIC, OLIVINE IS GREEN WITH BROWNISH PRIMIS, FEW/NO INCLUSIONS                         | Tb            |          |
| 100        |               |            |                |          |            |      |             | BASALT AS ABOVE, TRANSITION THROUGH VESICULAR ZONE INTO ORANGE CRYSTAL LITHIC TUFF   |               |          |
| 110        |               |            |                |          |            |      |             | OXIDIZED/VESICULAR/AMYGDALOIDAL ZONE; ORANGE, GREEN, RED, YELLOW; WITH MEDIUM GRAY BASALT, PLAG PHYRIC <math>2.8mm</math> 4%, OLIVINE MICROPHENOS TO 1mm, CRINCL |               |          |
| 120        |               |            |                |          |            |      |             | LIGHT GRAY OLIVINE BASALT: OLIV <math>2mm</math>, ~2%; GRANULAR PLAG (80%), OL (10%) Cpx (8%) GROUNDMASS; OTHER LITHS AS ABOVE                                   |               |          |
| 130        |               |            |                |          |            |      |             | GRAVEL<br>PINKISH GRAY VESICULAR, Cpx MICROPHYRIC BASALT; TRACHYTIC; Cpx TO 0.8mm, ~2% SOME AMYG. (YELLOW/CREAM)   |               |          |

# BOREHOLE LOG

|   |   |                        |
|---|---|------------------------|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u>        | <u>(5/1-5/2)</u>       |
| Location: <u>SUMMER LAKE QUARRY</u>   | Contractor and Equipment: <u>WELSCO</u>   |                        |
| Logged by: <u>WILEY</u>   | Drillers: <u>JIM BIFFLE, TROY HOLCOMB</u> |                        |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods                          |                        |
|   | <u>AIR ROTARY</u>                         | Auger interval _____   |
| Ground Water Table (ft)   | <u>MUD ROTARY</u>                         | Coring interval _____  |
|   |   | PVC Casing depth _____ |
|   |   | Total Depth _____      |

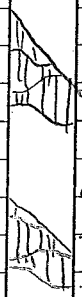
| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log   | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.   | Geologic Unit | Comments                    |
|------------|---------------|------------|----------------|----------|------------|------|---|--|---------------|-----------------------------|
| 136        |               |            |                |          |            |      |   |  |               |                             |
| 140        |               |            |                |          |            |      |   | BASALTIC ANDESITE(?); RED TO MEDIUM GRAY;<br>DARK PLAGIOCLASE LATH DEFINE TRACHYTIC<br>GROUNDMASS, APHYRIC(?)<br>ALSO OL BASALT  |               |                             |
| 150        |               |            |                |          |            |      |   | SAME   |               | TRANSITION TO<br>MUD ROTARY |
| 160        |               |            |                |          |            |      |   |  |               | NO RETURNS/LOST CUTS.       |
| 170        |               |            |                |          |            |      |   |  |               | ↓                           |
| 175        |               |            |                |          |            |      |  | MEDIUM GRAY<br>OLIVINE BASALT; PLAGIOCLASE PHYRIC<br>~2mm, ~1%; OLIVINE <1.5mm, ~1%;<br>MEDIUM GRANULAR GROUNDMASS,<br><1% VESICLES ~1-2mm; GROUNDMASS<br>OLIVINE IS REDDISH |               | LOTS OF SAW DUST            |
| 180        |               |            |                |          |            |      |   | SAME, ALSO TRACHYTIC GREENISH-GRAY<br>MAFIC LAVA W/ OLIVINE  |               | SAWDUST                     |
| 190        |               |            |                |          |            |      |   | MEDIUM GRAY TRACHYTIC BAS./BAS. AND<br>WITH REDDISH GROUNDMASS OLIVINE,<br>A FEW VESICLES TO 2mm,  |               |                             |
| 200        |               |            |                |          |            |      |   | SAME   |               | SAWD                        |

ZDH



# BOREHOLE LOG

|  |  |
|--|--|
| Borehole No.: <u>ARRASLI</u>   | Start and End Date: <u>4/30/13</u> <u>(5/4-5/4)</u>  |
| Location: <u>NORTH SUMMER LAKE PIT</u>   | Contractor and Equipment: <u>WELSCO</u>  |
| Logged by: <u>WILEY</u>  | Drillers: <u>JIM BIFFLE, TROY HOLBROOK</u> <span style="float: right;">HECTOR ROULES<br/>CADE</span>             |
| Sampling Method, Total Tests and Intervals<br>SPT-Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods<br>Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)  |  |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log  | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.   | Geologic Unit | Comments  |
|------------|---------------|------------|----------------|----------|------------|------|--|--|---------------|---|
| 340        |               |            |                |          |            |      |  |  |               |   |
| 350        |               |            |                |          |            |      |  |  |               | ADDED 3/4" TO RESTORE CIRCULATION INCLUDING SMALL ROUNDED PEBBLES |
| 360        |               |            |                |          |            |      |  | ROUND GRAVEL (FROM MATERIAL ADDED TO RESTORE CIRCULATION); BASALT, PINKISH GRAY TO GRAY, APHYRIC, MEDIUM GRANULAR GROUNDMASS, BASALTIC ANDESITE, PINKISH MEDIUM GRAY, GRANULAR TO TRACHYTIC MEDIUM GROUNDMASS, ALTERED OLIVINE MICROPHENOS, PLAG. PHENO TO >2mm ~1%; |               | SLOW DRILLING TO 378  |
| 370        |               |            |                |          |            |      |  | BASALT, HARD, MEDIUM GRAY, GRANULAR TO PILOTAXITIC FINE GROUNDMASS WITH OLIVINE MICROPHENOCRYSTS <0.9mm ~1%<br>YELLOW TO OLIVE TO BROWN  |               | SCREEN FOR GEOCHEM  |
| 380        |               |            |                |          |            |      |  | SAME, ONE 3mm PLAG. PHENOCRYST   |               | CHANGE BIT  |
| 390        |               |            |                |          |            |      |  | SAME, WITH DARK GRAY VESICULAR BASALT WITH FINE GROUNDMASS AND REDDISH VESICLE LININGS   |               | HECTOR REPORTS SOME REDDISH CLAY                                  |
| 400        |               |            |                |          |            |      |  | SAME, WITH RED OXIDIZED SCORIA AND BLACK SCORIA  |               |   |







# BOREHOLE LOG

|   |  |
|---|--|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u> ( <u>5/4-5/5</u> )  |
| Location: <u>NORTH SUMMER LAKE PIT</u>  | Contractor and Equipment: <u>WELSCO</u>  |
| Logged by: <u>WILEY</u>   | Drillers: <u>TROY</u> <u>JIM</u> <u>HECTOR</u> <u>CADE</u>   |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods<br>Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |  |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.   | Geologic Unit | Comments                      |
|------------|---------------|------------|----------------|----------|------------|------|-------------|--|---------------|-------------------------------|
| 544        |               |            |                |          |            |      |             |  |               |                               |
| 550        |               |            |                |          |            |      |             | SAME; WITH INCREASING BLACK SCORIA WITH REDDISH VESICLE LININGS  |               | ENOUGH FOR GEOCHEM            |
| 560        |               |            |                |          |            |      |             | SAME, PERHAPS SLIGHTLY COARSER GROUNDMASS; NO SCORIA   |               |                               |
| 570        |               |            |                |          |            |      |             | glomeroporphyritic OLIVINE BASALT: FINE GRANULAR GROUNDMASS - DARK GRAY, OLIVINE GREEN TO GREENISH BROWN TO 2mm, ~2%; OL. + PLAG, TO 3mm, <2%; PLAG. >2mm <1%, CLEAR TO GRANULAR |               | Top or Bottom Ter? DO GEOCHEM |
| 580        |               |            |                |          |            |      |             |  |               |                               |
| 585        |               |            |                |          |            |      | 585         | GLOM, OLIV, BAS., MEDIUM- TO REDDISH GRAY GRANULAR TO TRACHYTIC GM   |               |                               |
| 590        |               |            |                |          |            |      |             | SAME, CS GROUNDMASS, GLOMS OF OL + PL TO >2mm; ABUND OLIV MICRO PHENOCRYSTS  |               |                               |
| 600        |               |            |                |          |            |      |             | DARK GRAY VESICULAR BAS/BAS AND/AND WITH FINE TRACHYTIC GM, VESICLE LINING/ BORDERS REDDISH, PLAG <2mm and OL <2mm in sparse GLAUCOPHYSTS; OTHER LITHS AS ABOVE                  |               |                               |
| 610        |               |            |                |          |            |      |             | SAME   |               |                               |
| 612        |               |            |                |          |            |      |             |  |               |                               |

616 HARD DRILLING  
630



# BOREHOLE LOG

|   |   |
|---|---|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u> <span style="float:right;"><u>(5/5-5/5)</u></span>   |
| Location: <u>NORTH SUMMER LAKE PCT</u>  | Contractor and Equipment:   |
| Logged by: <u>WILEY</u>   | Drillers: <u>TROY HOLBROOK</u> <span style="float:right;"><u>HECTOR, CADE</u></span>  |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods<br><u>MUD ROTARY</u><br>Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |   |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.  | Geologic Unit | Comments             |
|------------|---------------|------------|----------------|----------|------------|------|-------------|---|---------------|----------------------|
| 680        |               |            |                |          |            |      |             |   |               |                      |
| 685        |               |            |                |          |            |      | ↗           | BAS; MEDIUM GRAY, DIRTY, OL MICROPHENOS TO 1mm ~2-3%, SPARSE (TWO) Zoned OLIV. AND PLAG.; ONE PIECE WHITE XTAL TUFF A FEW VESICULAR CHIPS.  |               |                      |
| 690        |               |            |                |          |            |      |             | SAME  |               |                      |
| 700        |               |            |                |          |            |      |             | OLIV. BASALT; MED. GRAY, FINE TO MED GROUNDMASS, OLIV TO 1.5mm <1%, OLIV. MICROPHENOCRYSTS ARE YELLOW-BROWN TO BROWN, ANHEDRAL, MAY BE GRANULAR, A FEW DARK GRAY, VESICULAR, BASALT(?) WITH REDDISH EDGES |               | DRILL BOUNCING @ 698 |
| 710        |               |            |                |          |            |      |             | SAME, INCREASING PERCENTAGE OF REDDISH TO COPPER-BROWN COLORED CHIPS AND VESICULAR CHIPS. PHOTAXITIC/TRACHYTIC/DIRTY VARIABLE   |               |                      |
| 720        |               |            |                |          |            |      |             | SAME  |               | DRILL BOUNCING @ 719 |
| 730        |               |            |                |          |            |      |             | SAME, FEWER OLIV. MICROPHENOCRYSTS YELLOW-GREEN FRESH, REDDISH ALTERED  |               |                      |
| 740        |               |            |                |          |            |      |             |   |               |                      |
| 745        |               |            |                |          |            |      | ↗           | BASALT, LIGHT GRAY, MEDIUM GRANULAR GROUNDMASS, <sup>VERY</sup> SPARSE PLAG PHENOS < 3mm  |               |                      |

748

# BOREHOLE LOG

|   |  |
|---|--|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u> <span style="float:right;">(<u>5/5-5/5</u>)</span>        |
| Location: <u>NORTH SUMMER LAKE PIT</u>  | Contractor and Equipment:  |
| Logged by: <u>WILEY</u>   | Drillers: <u>TROY HOLBROOK</u> <span style="float:right;"><u>HECTAR, CADE</u></span>         |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods   |
|   | Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |  |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.  | Geologic Unit | Comments             |
|------------|---------------|------------|----------------|----------|------------|------|-------------|---|---------------|----------------------|
| 680        |               |            |                |          |            |      |             |   |               |                      |
| 685        |               |            |                |          |            |      | ↗           | BAS; MEDIUM GRAY, DIRTY, OL MICROPHENOS TO 1mm ~2-3%, SPARSE (TND) Zoned OLIV. AND PLAG.; ONE PIECE WHITE XTAL TUFF A FEW VESICULAR CHIPS.  |               |                      |
| 690        |               |            |                |          |            |      |             | SAME  |               |                      |
| 700        |               |            |                |          |            |      |             | OLIV. BASALT; MED. GRAY, FINE TO MED GROUNDMASS, OLIV TO 1.5mm <1%, OLIV. MICROPHENOCRYSTS ARE YELLOW-BROWN TO BROWN, ANHEDRAL, MAY BE GRANULAR, A FEW DARK GRAY VESICULAR BASALT(?) WITH REDDISH EDGES |               | DRILL BOUNCING @ 698 |
| 710        |               |            |                |          |            |      |             | SAME, INCREASING PERCENTAGE OF REDDISH TO COOPER. BROWN COLORED CHIPS AND VESICULAR CHIPS. PHOTAXITIC/TRACHYTIC/DIRTY VARIABLE  |               |                      |
| 720        |               |            |                |          |            |      |             | SAME  |               | DRILL BOUNCING @ 719 |
| 730        |               |            |                |          |            |      |             | SAME, FEWER OLIV. MICROPHENOCRYSTS YELLOW-GREEN FRESH, REDDISH ALTERED  |               |                      |
| 740        |               |            |                |          |            |      |             |   |               |                      |
| 745        |               |            |                |          |            |      | ↘           | BASALT, LIGHT GRAY, MEDIUM GRANULAR GROUNDMASS, <sup>VERY</sup> SPARSE PLAG PHENOS < 3mm  |               |                      |

748

# BOREHOLE LOG

|   |  |
|---|--|
| Borehole No.: <u>ARRASL1</u>  | Start and End Date: <u>4/30/13</u>   |
| Location: <u>NORTH SUMMER LAKE PIT</u>  | Contractor and Equipment: <u>WELSCO</u>  |
| Logged by: <u>WILEY</u>   | Drillers: <u>TROY HOLBROOK</u> <u>HECTOR CADE</u>  |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods<br>Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |  |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.   | Geologic Unit | Comments             |
|------------|---------------|------------|----------------|----------|------------|------|-------------|--|---------------|----------------------|
| 748        |               |            |                |          |            |      |             |  |               |                      |
| 750        |               |            |                |          |            |      |             | SAME, INCREASING OLIVINE MICROPHENOS   | ENDS          | DRILL BOUNCING @ 750 |
| 760        |               |            |                |          |            |      |             | SAME, BECOMING ALTERED REDDISH (OXIDIZED)<br>VESICULAR, PILOTAXITIC TO LOCALLY<br>TRACHYTIC / DIRTY TAXITIC  |               |                      |
| 770        |               |            |                |          |            |      |             | MED GRAY TO REDDISH GRAY BASALT WITH<br>FINE TO MEDIUM GRANULAR GROUNDMASS;<br>< 1% OL, MICROPHENOCRYSTS, OCCASIONALLY<br>IN TINY (< 1.5mm) GRANULAR AGGREGATES (60um)<br>A FEW REDDISH TRACHYTIC VESICULAR CHIPS. |               |                      |
| 780        |               |            |                |          |            |      |             | SAME, REDDISH TRACHYTIC VESICULAR<br>CHIPS NOW 50%; MORE <sup>BLACK</sup> CFX MICROPHENOS<br>IN MEDIUM GRAY BASALT   |               |                      |
| 790        |               |            |                |          |            |      |             | SAME, REDDISH TO BROWNISH CUTTINGS<br>HAVE IRREGULAR SHAPES; 1 CHIP<br>OF VEIN w/ 10% CALCITE  |               |                      |
| 800        |               |            |                |          |            |      |             | BASALT, LIGHT TO MED. GRAY, MEDIUM TO<br>FINE GRANULAR GROUNDMASS; OLIVINE MICRO-<br>PHENOS AND GRANULAR AGGREGATES ≤ 1.5 mm<br>~2% WITH EQUANT OXIDES; GROUND MASS WITH<br>EQUANT Fe/Ti OXIDES                    |               | DRILL BOUNCING @ 799 |
| 810        |               |            |                |          |            |      |             | SAME: A FEW PLAG. MICROPHENOS w/ OLIVINE,<br>GROUNDMASS LOCALLY PILOTAXITIC  |               | DRILL BOUNCING @ 809 |

# BOREHOLE LOG

|   |   |
|---|---|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u> <span style="float:right;"><u>(5/6-5/6)</u></span>                                       |
| Location: <u>NORTH SUM</u>  | Contractor and Equipment: <u>WELSCD "130"</u>   |
| Logged by: <u>WILEY</u>   | Drillers: <u>TROY HOLBROOK, HECTOR ROBLES, CADE</u>   |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><span style="float:right;"><u>CUTTINGS</u></span> | Drilling Methods<br>MUD ROTARY Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |   |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.  | Geologic Unit | Comments                                    |
|------------|---------------|------------|----------------|----------|------------|------|-------------|---|---------------|---|
| 816        |               |            |                |          |            |      |             |   |               |   |
| 820        |               |            |                |          |            |      | ↗           | DIKTYTAXITIC OLIVINE BASALT;<br>DARK GRAY MOTTLED BASALT, COARSE<br>DIKTY. GROUND MASS, PILOTAXITIC; OLIVINE SERIATE,<br>GREEN, <1.5mm, <1%; PLAG. AS LATH, SERIATE<br>TO 3mm;  |               |   |
| 830        |               |            |                |          |            |      |             | SAME, DARK FRACTURE LINES ARE FINE<br>GRAINED (GOUGE?)  |               | GEOCHEM <span style="float:right;">G</span> |
| 840        |               |            |                |          |            |      |             | SAME, INCREASE OF OXIDIZED AND/OR<br>VESICULAR CHIPS TO ~16%  |               |   |
| 850        |               |            |                |          |            |      |             | APHYRIC<br>BASALTIC ANDESITE? MEDIUM REDDISH<br>BROWNISH GRAY; MEDIUM GRANULAR<br>GROUND MASS, W/PINKISH DPX(?), REDDISH OLIV,<br>PLAG. CLEAR TO WHITE; OLIV. MICROPHENOS<br>ARE ≤ 0.6mm, <1%; NO OXIDIZED OR VESICULAR CHIPS,                                |               | DRILL BOUNCING, HESITATING                  |
| 860        |               |            |                |          |            |      |             | SAME, BECOMING PILOTAXITIC, ~1%<br>OXIDIZED/VESICULAR   |               |   |
| 870        |               |            |                |          |            |      |             | SAME, LARGELY OXIDIZED TO BROWN;<br>ALSO MED GRAY OLIVINE BASALT WITH<br>FINE GRANULAR(?) GROUND MASS; OLIVINE IS<br>YELLOW GREEN WITH EQUANT OXIDE<br>INCLUSIONS; PLAGIOCLASE ELONGATE 4:1, <del>2.5mm</del><br><2.5mm, <1%; A COUPLE 1mm globs of OLIV/PLAG |               |   |
| 880        |               |            |                |          |            |      |             | SAME  |               |   |



# BOREHOLE LOG

|   |   |
|---|---|
| Borehole No.: <u>ARRASLI</u>  | Start and End Date: <u>4/30/13</u> <u>5/6-5/6</u>   |
| Location: <u>NORTH SUMMER LAKE Pit</u>  | Contractor and Equipment: <u>WELSCO</u>   |
| Logged by: <u>WILLEY</u>  | Drillers: <u>TROY HOLBROOK, HECTOR ROBLES, CADE</u>   |
| Sampling Method, Total Tests and Intervals<br>SPT- Standard Penetration Test<br><u>CUTTINGS</u> | Drilling Methods<br>MUD ROTARY Auger interval _____<br>Coring interval _____<br>PVC Casing depth _____<br>Total Depth _____ |
| Ground Water Table (ft)   |   |

| Depth, ft. | Sample Number | Box Number | Blows/6 inches | Recovery | % Recovery | USCS | Graphic Log | Material Description:<br>Color; Strength; Density; Plasticity; Organics;<br>Weathering; Jointing; Other.   | Geologic Unit | Comments  |
|------------|---------------|------------|----------------|----------|------------|------|-------------|--|---------------|---|
| 824        |               |            |                |          |            |      |             |  |               |   |
| 890        |               |            |                |          |            |      |             | MIXED; MED GRAY TO REDDISH GRAY OLIVINE<br>BASALT W/ FINE GRANULAR TO TRACHYTIC, DKTY<br>GM; RED TO ORANGE SCORIA AND ALTERED<br>OLIVINE BASALT; TRACHYTIC, YELLOW-<br>GREEN ALTERED, BASALT                 |               |   |
| 900        |               |            |                |          |            |      |             | BASALT, LIGHT GRAY TO REDDISH GRAY,<br>FINE GRANULAR GROUNDMASS; OLIVINE<br>MICROPHENOCRYSTS, <0.7mm, 1-5%;<br>RED + RED VESICULAR LITHS ~ 7%  |               | METAL IN CUTTINGS @ 900<br>DRILL BOUNCING @ 901           |
| 910        |               |            |                |          |            |      |             | SAME; RED LITHS TO 50%   |               |   |
|            |               |            |                |          |            |      | 915-        | SAME, SPARSE PLAG PHENOCRYSTS<br>< 10% < 1.5mm   |               |   |
| 920        |               |            |                |          |            |      |             | NO SAMPLE  |               |   |
| 930        |               |            |                |          |            |      |             | OLIVINE BASALT, MEDIUM GRAY, FINE<br>GRANULAR GROUNDMASS; OLIVINE YELLOW<br>GREEN FRESH, REDDISH BROWN ALTERED WITH<br>EQUANT BLACK OXIDES, SUBHEDRAL OR GRANULAR,<br>SERIATE ≤ 1.3mm, ~ 3%; 1-2% RED LITHS, |               |   |
| 940        |               |            |                |          |            |      |             | SAME, < 1% OXIDIZED OR VESICULAR CHIPS   |               | SLOW DRILLING<br>POSSIBLE GEOCHEM<br>- 2 1/2 MINUTES/FOOT |
| 950        |               |            |                |          |            |      |             | SAME, FEW OLIVINE ≥ 1mm, INCREASINGLY<br>MOTTLED REDDISH GRAY  |               | DRILL BOUNCING @ 952                                      |
| 952        |               |            |                |          |            |      |             |  |               | DROPPED ~ 1' @ 953'                                       |

