Technical Memorandum

Date: July 16, 2009
To: Mr. Richard Weinman
    Weinman Consulting, LLC
    9350 SE 68th Street
    Mercer Island, Washington 98040

From: Michael S. August
      Curtis J. Koger, P.G., P.E.G., P.Hg.

Project Name: Desert Claim Wind Power
Project No: KG030316F

Subject: Location of Ground Water Users Within or Adjacent to the Western Expansion Area

Associated Earth Sciences, Inc. (AESI) is pleased to present the results of our ground water users update as a supplemental to our initial services for the “Water Resources” portion of the “Desert Claim Environmental Impact Statement” (EIS), (AESI, 2004). The information was focused on properties located within or adjacent to the revised project area (Western Expansion Area), and was based on records obtained during our review of water well log and water right information from the Washington State Department of Ecology (Ecology).

Ground Water Supply

Location of Ground Water Users Within or Adjacent to the Western Expansion Area

Water well logs obtained from Ecology were reviewed and compiled for the expansion area located west of the original Desert Claim project site. Specifically, the expanded search area included Sections 18, 19, the northern half of Section 30 of Township 19N, Range 18E, and the northeast quarter of Section 25 of Township 19N, Range 17E, and Sections 12, 13, 24, and 36 of Township 19N, Range 17E. The wells were located to the nearest quarter-quarter section, or by address when available, and a database was created to compile and retrieve pertinent drilling and well construction information. The well locations are shown on Figure 1, “Water Well Location Map.” Based on the tools and methods used by the sources reporting the well logs and the standard practice of reporting well locations only to the nearest quarter-quarter section, the locations shown on Figure 1 should not be considered highly precise; location inaccuracies in the well logs are relatively common. Figure 1 shows both the original project limits and the current project boundaries.
Identified Water Wells

No water well logs were identified from Ecology’s database within Sections 18, 19, or the northern half of Section 30 of Township 19N, Range 18E, nor were any wells identified in Sections 12, 13, 24, or 36 of Township 19N, Range 17E. Five wells were identified west of the expansion area (NE quarter of Section 25 of Township 19N, Range 17E) in the northwest quarter of Section 25 of Township 19N, Range 17E. All five wells are used for single-family domestic use (according to well logs and water rights claims). Copies of the water well logs are included as an attachment to this technical memorandum.

As reported in the Final EIS for the initial project site, a study of the hydrology of Kittitas Valley and a review of well logs for this study indicate that well yields average 20 to 23 gallons per minute (gpm) in the Desert Claim project vicinity (Owens, 1995). The study concludes that ground water yield and flow in the Kittitas Valley is largely dependent on stratigraphic and structural controls and high well yields do not necessarily correlate to depth, although average yield increases with depth. Grande Ronde Basalt aquifers tend to produce higher yields than the Ellensburg Formation aquifers, probably because Grande Ronde Basalt aquifers are generally confined and have a larger recharge area in the mountains north and south of Kittitas Valley (Owens, 1995).

Drilled depths of the five wells ranged from 125 to 380 feet. Static water levels ranged from 40 to 65 feet below ground surface (bgs), except in well 171, which had a reported water level of 270 feet bgs. Based on the driller’s description and well yield data, it appears likely wells 170 and 171 are completed in bedrock. Wells 167 through 169 are interpreted to be completed in Pleistocene sediments. This interpretation is consistent with the geologic and hydrogeologic information presented in the EIS.

Domestic water wells may use up to 5,000 gallons per day (gpd) of water as allowed by Ecology for exempt wells. However, Ecology estimates that typical use for a single-family home is about 300 gpd (AESI 2004). Assuming typical water use, the 5 existing domestic wells adjacent to the Western Expansion Area withdraw approximately 1,500 gpd of water. All of the homes in the area use on-site septic systems to discharge waste water; therefore, a large portion of the water used is returned to the shallow subsurface.

Water Well Log Database Update

AESI has updated the Final EIS “Water Well Log Database” to include information obtained during our data review. Ground water user data, including owner information, ground surface elevation, total depth, and water level records, and other relevant information are summarized in the attached Table I, “Water Well Database.”

Review of Water Right Information

Water rights data obtained from Ecology indicate that there are three records pertaining to active water rights within the proposed Western Expansion Area. The water right information describes
two wells and one spring owned by Pat Burke. Based on Ecology’s records, the wells and the spring are located in the western portion of the expanded site area. One well is located in Section 25 of Township 19N, Range 17E, while a spring and a well are located within Section 30 of Township 19N, Range 18E. According to Ecology’s records, the spring well is utilized for stock watering and irrigation, while the two wells are categorized as irrigation and general domestic use. No water well logs were identified for the wells and spring during our search of Ecology’s water well log database. Available water right information is included in the attached Table II, “Water Right Information.”

Environmental Impacts of the Proposed Action

This section briefly summarizes the geology and potential environmental impacts to ground water resources from the proposed Western Expansion Area. Excerpts from the Desert Claim Wind Power Final EIS are presented in the following sections for reference.

Desert Claim Project Area Geology (3.1.1.3)

“Geologic conditions of the Desert Claim project area were evaluated using data obtained from field explorations by Associated Earth Sciences, Inc. (AESI) and AESI’s review of regional geologic maps and publications...[d]etailed exploration logs documenting the findings of the field studies are available for review from Kittitas County.

The surficial geology of the project area consists of Recent-age postglacial alluvial fans and other stream deposits that overlie and carve into older Pleistocene-age sidestream glacial outwash (Kittitas Drift) and Pliocene-age sidestream alluvium (Thorp Gravel). Erosion by the younger streams has carved distinct terraces in the older deposits. Miocene-age Grande Ronde Basalt underlies the sediments described above and the entire project area.”

Ground Water Supply (3.3.2.2)

“A limited amount of ground water would be needed for long-term operation of the project. This would be provided either by a participating landowner or through development of an exempt well, per the Washington State Water Code, Chapter 90.03 RCW. Less than 5,000 gpd would be extracted for domestic use for the O&M building, as allowed by Ecology for an exempt well. Restroom and kitchen facilities would drain into an on-site septic system, recharging the ground water in the vicinity of extraction. No quantifiable impacts to ground water supply would result from this usage.”

Ground Water Conclusions (3.3.2.2)

“Potential impacts to ground water from the proposed project include disruption to ground water flow, recharge, or discharge, depletion of ground water supply, or lowering of ground water quality. Impervious surfaces would be created by the project, but they are limited in size and extent across the project area and are expected to have minimal impacts to recharge, discharge or ground water flow if recommended mitigations are followed. Impacts to ground water supply are not
not expected from the proposed project. Localized impacts to ground water quality are possible from wastewater and petroleum product spills, but can be avoided if recommended mitigations are followed. Minor short-term turbidity due to water level fluctuations in wells from blasting vibration is a potential water quality impact, but would be minimized by following the applicable regulations. Overall, the project is not expected to result in the potential for significant adverse impacts to ground water flow, recharge or discharge, ground water supply or ground water quality.”

Summary

The review of water well logs and water rights information has revealed no new potential impacts to ground water supply or resources within or adjacent to the Western Expansion Area. Therefore consistent with the findings and conclusions presented in the Desert Claim Wind Power Final EIS, it is our professional opinion that the current project is not expected to result in any impacts to ground water supply or resources within or adjacent to the Western Expansion Area.

Attachments:  Table I:   Water Well Database
                Table II:  Water Right Information
                Figure 1:  Water Well Location Map
                Water Well Logs
### Table I. Water Well Database

<table>
<thead>
<tr>
<th>Well ID</th>
<th>Owner's Name</th>
<th>Date Completed</th>
<th>Log Avail?</th>
<th>USE</th>
<th>GS Elev.</th>
<th>Total Depth</th>
<th>Well Depth</th>
<th>Static WL</th>
<th>WL Elev.</th>
<th>Aquifer Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>19/17/25/D167</td>
<td>Fred Norman</td>
<td>11/3/95</td>
<td>Y</td>
<td>Dom</td>
<td>2090</td>
<td>165</td>
<td>165</td>
<td>60</td>
<td>2030</td>
<td>8</td>
</tr>
<tr>
<td>19/17/25/D168</td>
<td>Gerard Warnechuck</td>
<td>4/20/00</td>
<td>Y</td>
<td>Dom</td>
<td>2080</td>
<td>210</td>
<td>210</td>
<td>65</td>
<td>2015</td>
<td>17</td>
</tr>
<tr>
<td>19/17/25/D169</td>
<td>Glenn Parker</td>
<td>3/15/06</td>
<td>Y</td>
<td>Dom</td>
<td>2090</td>
<td>125</td>
<td>125</td>
<td>40</td>
<td>2050</td>
<td>11</td>
</tr>
<tr>
<td>19/17/25/D170</td>
<td>Paula Hake</td>
<td>4/27/94</td>
<td>Y</td>
<td>Dom</td>
<td>2060</td>
<td>300</td>
<td>290</td>
<td>40</td>
<td>2020</td>
<td>3</td>
</tr>
<tr>
<td>19/17/25/D171</td>
<td>Rob Grossman</td>
<td>6/20/00</td>
<td>Y</td>
<td>Dom</td>
<td>2050</td>
<td>380</td>
<td>318</td>
<td>270</td>
<td>1780</td>
<td>1</td>
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</tbody>
</table>

### Table II. Water Right Information

<table>
<thead>
<tr>
<th>File #</th>
<th>Owner</th>
<th>Status</th>
<th>Doc</th>
<th>Purpose</th>
<th>County</th>
<th>TRS</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>G4-300075CL</td>
<td>Burke, Pat</td>
<td>Active</td>
<td>Claim</td>
<td>IR,DG</td>
<td>KITTITAS</td>
<td>19.0N 17.0E 25</td>
<td>Well</td>
</tr>
<tr>
<td>G4-097559CL</td>
<td>Burke, Pat</td>
<td>Active</td>
<td>Claim Long</td>
<td>ST,IR</td>
<td>KITTITAS</td>
<td>19.0N 18.0E 30</td>
<td>Spring</td>
</tr>
<tr>
<td>G4-300074CL</td>
<td>Burke, Pat</td>
<td>Active</td>
<td>Claim</td>
<td>IR,DG</td>
<td>KITTITAS</td>
<td>19.0N 18.0E 30</td>
<td>Well</td>
</tr>
</tbody>
</table>

Purpose - IR=Irrigation, DG=Domestic General, ST=Stock Watering
WATER WELL REPORT

STATE OF WASHINGTON

(1) OWNER: Name NORMAN, FRED
Address 1001 BURCH LN, ELK BURN, WA 98826

(2) LOCATION OF WELL: County KENNEBECK
(2a) STREET ADDRESS OF WELL: (or nearest address) PARCEL#17-292-0026-550

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WELL: Owner's Number of well
(If more than one)

NEW WELL Method: MORTARY

(5) DIMENSIONS:
Diameter of well 6 inches
Depth of completed well 165 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6' Dia. from +2 ft. to 105 ft.
STL CAS/PVC 4' Dia. from -5 ft. to 105 ft.
* Dia. from ft. to ft.

Performances: YES
Type of perforator used: SKILL RAIN
Size of perforations 1/8 in. by 6 in.
102 perforations from 165 ft. to 145 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name
Type
Dia. slot size from ft. to ft.
Dia. slot size from ft. to ft.

Gravel packed: NO
Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES
To what depth? 18 ft.
Material used in seal: MORTARY
Did any strata contain unsalable water? NO
Type of water?
Depth of strata ft.
Method of sealing strata off: OVERBEND

(7) PUMP: Manufacturer's Name
Type

(8) WATER LEVELS:
Land-surface elevation
Above mean sea level
Static level 60 ft. below top of well Date 11/03/95
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below
static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / 
Bailer test gal/min: ft. drawdown after hrs.
Air test 7-9 gal/min w/ stand set at ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water
Was a chemical analysis made? NO

(10) WELL LOG
Formation: Describe by color, character, size of material and structure, and show thickness of aquifiers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

MATERIAL
FROM TO
HARD LOAM 0 2
HARD CEMENTED GRAVEL 2 27
Cemented gravel Boulder 27 69
Cemented gravel clay 69 97
SANDY CEMENTED GRAVEL 97 165

Received

NOV 29 1995

DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work started 11/03/95 Completed 11/03/95

WELL CONTRACTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME FREDERICK DRILLING (Person, firm, or corporation) (Type or print)
ADDRESS 6012 BROADWAY (Address)
(SIGNED) (License No. 2200)
Contractor's Registration No. PN-100412 Date 11/04/95

D167
The Department of Ecology does NOT Warranty the Data and the information on this Well Report.
WATER WELL REPORT
STATE OF WASHINGTON

1. OWNER: Name: Gerard Wanze R K Address: 620 Clark Rd. Ellensburg

2. LOCATION OF WELL: County Kittitas SW 1/4 SW 1/4 Sec. 25 T 19 N R 17 E WM

3. TAX PARCEL NO.: 

4. PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

5. TYPE OF WORK: Owner's number of well (if more than one):
New Well [ ] Method: Bored [ ]
Reconditioned [ ] Cable [ ]
Demolition [ ] Drill [ ]
DeWater [ ] Rotary [ ]

6. DIMENSIONS: Diameter of well 8.0 ft. Depth of completed well 210 ft.

7. CONSTRUCTION DETAILS
Steel pipe:

top: 5/17 7.2
Banded gravel 2.11

Brown Clay 11 138 gravel 188 188
Gravel & water 188 188
Brown Clay 188 gravel 188 188

Soft Sandstone 198 210 & water

8. MATERIALS

9. PUMP: Manufacturer's Name
Type:

10. WATER LEVELS: Land surface elevation above mean sea level: 68 ft. below top of well: 198 ft.
Static level: 68 ft. below top of well Date: 4/18/06
Aristean pressure: psf per square inch Date: 4/18/06
Aristean water is controlled by:

11. WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [ ] No If yes, by whom? 
Yield: gpm. with ft. Drawdown after hrs.

12. WELL CONSTRUCTION CERTIFICATION:

I, , hereby certify that I have constructed and hereby accept responsibility for the construction of the well and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Trainer Name: 
Drilling Company: 
Address: 
Registration No. 

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6606.
Water Well Report

Construction/Decommission

Original Installation Notice of Intent Number

PROPOSED USE: Domestic ☐ Irrigation ☐ Industrial ☐ Municipal ☐ Other ☐

TYPE OF WORK: New well ☐ Reconditioned ☐ Method: Drilled ☐ Drilled and Cased ☐ Drilled and Cased and Grouted ☐ Drilled and Cased and Grouted and Passed a Pump Test ☐

DIMENSIONS: Diameter of well 6 inches, drilled 13.5 ft. Diameter of completed well 12.5 ft.

CONSTRUCTION DETAILS

Casing: Welded 6 ft. Diam. from 6 ft. to 7.5 ft. Threaded 6 ft. 3 ft. Diam. from 3 ft. to 7.5 ft.

Perforation: Yes ☐ No ☐ Type of perforation used: 5/8 in. and 1/2 in. on 8 in. of perforation

Screens: Yes ☐ No ☐ PE: No Location

Manufacturer's Name

Type of gravel/Filter pack: Yes ☐ No ☐ Size of gravel/Filter pack

Materials placed from: Epoxy

Surface Seal: Yes ☐ No ☐ To what depth? 22 ft.

Material used in seal: Bentonite

Did any exist contain unusable water? Yes ☐ No

Type of water: Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type of pump

WATER LEVELS: Land-surface elevation above mean sea level 40 ft. below top of well Date 3-15-06

Water level 10 ft. per square inch

Artesian water is controlled by

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom?

Yield: gal/min. with B 10 ft. drawdown after hrs.

Date of test

Boiler test: gal/min. with B 10 ft. drawdown after hrs.

Artesian flow

Temperature of water Was a chemical analysis made? Yes ☐ No

WELL CONSTRUCTION CERTIFICATION: I, constructing and/or accepting responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller/Engineer/Technique Name (Print) Mike Macefield

Driller/Engineer/Technique Signature

Driller or Trainee License No 2361

ITRNEE, Driller's Licensed No.

The Department of Ecology does NOT Warranty the Data or the Information on this Well Report.

Please print, sign and return to the Department of Ecology

Current Notice of Intent No. W170957

Unique Ecology Well ID Tag No. 1F 393

Water Right Permit No.

Property Owner Name Glenn Parker

Well Street Address 14618 15th Street W

City Lakewood

Location N48°45'44" S, W85°26'41"

Lat/Long (s, t, r) Lat Deg Lat Min/Sec

still REQUIRED

Tax Parcel No 19170957200008

CONSTRUCTION OR DECOMMISSION PROCEDURE: Format: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY).

MATERIAL FROM TO

Brown cable 2 12

Brown gravel Hard 12 45

Brown gravel 1/2" clay 45 75

Brown gravel 1/2" sandstone 75 105

Brown gravel + water 105 125

Only pump clean

9-10 gal/min.

Start Date 3-14-06 Completed Date 3-15-06

DEPT OF ECOLOGY Received

APR 1ST 2006

DEPT OF ECOLOGY

ECY 050-1-20 (Rev 2003)
WATER WELL REPORT

STATE OF WASHINGTON

OWNER: Name: HANE, PAULA D.
Address: P.O. BOX 125
ELYSIAN, WA 98244

LOCATION: Kittitas County

PROPOSED USE: DOMESTIC

TYPE OF WELLS: Owner's Number of wells

NEW WELL

DIMENSIONS: Diameter of well 6 inches

CONSTRUCTION DETAILS:

Perforations: YES
Type of perforator used: "BIH" BLOW
Size of perforations: 1/4 in. by 7 in.

30 perforations from 100 ft. to 200 ft.
30 perforations from 200 ft. to 300 ft.

Screens: No
Manufacturer's Name

Gravel packed: No
Gravel placed from ft. to ft.

Surface seal: YES
To what depth? 10 ft.

Material used in seal: BENTONITE
Do any strata contain unpalatable material? No
Type of water: Hardness of strata

Method of sealing: Strata off DRAINAGE

FRACTIONS: Describe by color, character, size of material, and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAND GRAY CLAY</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>SAND GRAY</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>CEMENTED SAND GRAY</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>BENTONITE</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>SAND GRAY WITH WATER</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>CEMENTED SAND GRAY</td>
<td>20</td>
<td>35</td>
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<tr>
<td>SAND GRAY WITH WATER</td>
<td>35</td>
<td>50</td>
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<tr>
<td>CEMENTED SAND GRAY</td>
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<tr>
<td>SAND CLAY</td>
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<tr>
<td>SANDSTONE WITH WATER</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>SANDSTONE</td>
<td>75</td>
<td>80</td>
</tr>
</tbody>
</table>

(2) WATER LEVELS:

STATIC LEVEL: 40 ft. below top of well Date 04/27/94
Artesian Pressure: 15 ps. per square inch Date
Artesian water controlled by

(3) WELL TESTS: Drawdown is equal water level is lowered below static level

Has a pump test made? No

Yield: gal./min with ft. drawdown after hrs.

Recovery data

WATER LEVELS: Time Water Level Time Water Level Time Water Level

Date of test there. Gal/min. ft. drawdown after hrs.

App. test 3 gal/min. w/ site set at 295 ft. for 1 hrs.

Artesian flow g.p.a. Date

TEMPERATURE OF WATER: Has a chemical analysis made? No

WELL CONSTRUCTOR CERTIFICATION:

I affix my name and state that I have constructed this well, in compliance with Washington well construction standards. (Signed)

NAME: RONDO INDIAN DRILLING

ADDRESS: HOLLAND, BROADWAY

LICENSE NO.: 13

REGISTRATION NO.: PD-064184612

DATE: 04/29/94
**WATER WELL REPORT**

**STATE OF WASHINGTON**

**WATER RIGHT Permit No.**

**Owners Name:** Rod Grossman

**Address:** 2402 Hamana Rd Ellensberg

**Tax Parcel No.:**

**Location of Well:** County Klickitat SW 1/4 NW 1/4 Sec. 25 T 19 N R 17 E WM

**New Well:** Yes

**Method:** Drilled

**Diameter of well:** 6 inches

**WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**

- **Top Soil:** 0 to 4 ft. 
- **Sandy Clay & Gravel:** 4 to 8 ft. 
- **Sandy Clay & Water:** 8 to 14 ft. 
- **Sticky Brown Clay:** 14 to 19 ft. 
- **Gray Clay & Gravel:** 19 to 20 ft. 
- **Gray Sandstone:** 20 to 23 ft. 
- **Sand & Water:** 23 to 236 ft. 
- **Gray Clay & Sand:** 236 to 257 ft. 
- **Gravel & Sand:** 257 to 275 ft. 
- **Sediment:** 275 to 277 ft.
- **Gray Clay & Sand:** 277 to 380 ft.

**PUMP:**

**Manufacturer's Name:**

**Type:** H.P.

**WATER LEVELS:**

<table>
<thead>
<tr>
<th>Static level</th>
<th>Depth below top of well</th>
</tr>
</thead>
<tbody>
<tr>
<td>270 ft.</td>
<td>240 ft.</td>
</tr>
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</table>

**Artesian pressure**

- **Date:** 1980

**WELL CONSTRUCTION CERTIFICATION:**

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

**Type or Print Name:** Mathews Drilling

**License No.:** 1267

**Travis:** Mathews Drilling

**Address:** 2317 11th Ave. M. L. Wa

**Contractor's Registration No.:** NA01X117

**Date:** 6/10 00

**Completed:** 6/20 00

**ECY 050-1-20 (11/98)**

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The Department of Ecology does NOT warranty the data and/or the information on this Well Report.