PACIFIC groundwater GROUP

GRANT COUNTY
EPHRATA LANDFILL
GROUP B PUBLIC WATER SYSTEM APPLICATION

April 26, 2011

GRANT COUNTY
EPHRATA LANDFILL
GROUP B PUBLIC WATER SYSTEM APPLICATION

Prepared for:

Grant County Public Works
124 Enterprise St. SE
Ephrata, WA 98823
509-754-6082
publicworks@co.grant.wa.us

Prepared by:

Pacific Groundwater Group
2377 Eastlake Avenue East, Suite 200
Seattle, Washington 98102
206-329-0141
www.pgwg.com
and

TD&H Engineering
303 East 2nd Avenue
Spokane, WA 99202
509-622-2888
www.tdhengineering.com

TABLE OF CONTENTS

INTRODUCTION **1**

SECTION I **1**

PART A: BASIC SYSTEM INFORMATION 1
1. Name of Water System: *1*
2. System Mailing Address: *2*
3. County: *2*
4. Well Site Tax Parcel Number: *2*
5. Legal Description of Well Site: *2*
6. Year System Installed: *2*
7. Located in Critical Water Supply Service Area: *2*
8. Number of Services: *2*
9. Type of Service: *3*
10. Vicinity and Service Area Sketch: *3*
PART B: OWNERSHIP AND MANAGEMENT 3
1. Water System Owner: *3*
2. Owner's Statement of Responsibility: *3*
3. System Contact Person: *3*
4. Contact Person for Maintenance, Water Quality Sampling, Customer Notification, and Complaint Response: *4*
5. Person Preparing This Workbook: *4*
6. Owner's Statement of Accuracy: *4*
PART C: WATER SOURCE APPROVAL 4
1. Water Right Permit: *4*
2. Well Site Inspection Report: *4*
3. Sanitary Control Area: *5*

SECTION II **7**

PART D: WATER SOURCE INFORMATION 7
1. Well Construction: *7*
2. Pump Test Results: *7*
3. Water Quality Tests: *7*
4. Covenants and Easements *8*
PART E: FINANCIAL VIABILITY 8
PART F: PUMP AND PUMPHOUSE INFORMATION 9
1. Source Capacity *9*
2. Source Pump *9*
3. Required Pump *10*
4. Pump Specifications *10*
5. Booster Pump *11*
6. Pumphouse *11*
PART G: PRESSURE TANK/STORAGE FACILITIES 11
7. Pressure Tank *11*
8. Storage Tank *12*
PART H: TREATMENT 12
PART I: DISTRIBUTION SYSTEM 13
1. System Diagram (also included in Appendix J): *13*
PART J: RELIABILITY 14

FIGURES

Figure 1: Ephrata Landfill Site Map
Figure 2: Site Protection Map

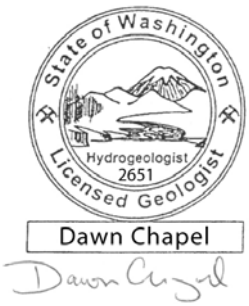
APPENDICES

Appendix A: Water Right Status Assessment
Appendix B: DOH Well Site Inspection Report and Approval Requirements
Appendix C: Well Completion Report
Appendix D: Hydrogeologic Conditions and Groundwater Travel Times
Appendix E: Well Head Capture Zones
Appendix F: Source Aquifer Susceptibility Assessment
Appendix G: Sanitary Control Covenants
Appendix H: Water Quality Reports
Appendix I: Water Facility Inventory (WFI) Form
Appendix J: Design Narrative for Parts F though J and Pump Curve for Proposed Pump

SIGNATURE

This report was reviewed by the undersigned and approved for release.

Pacific Groundwater Group

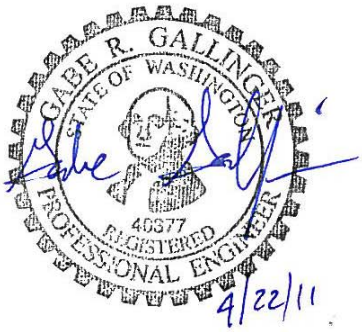


Dawn Chapel
Hydrogeologist
Washington State Hydrogeologist No. 2651

T D & H Engineering

Prepared By:

Approved By:



Adam Jackson, E.I.T.
Project Engineer

Gabe Gallinger, P.E.
Senior Project Manager

INTRODUCTION

Grant County Public Works (County) is planning construction of a new maintenance facility and scale house for the Ephrata Landfill (site). The new facility will be located along the eastern boundary of the Landfill with access off Dodson Road (Figure 1). As part of this project, the County plans to use the landfill's existing water supply well (33M1 in Figure 1) to provide potable water to the new facility. In order to provide potable water to the new facility, the State Department of Health (DOH) requires the County's well (33M1) be approved as a Group B Public Water System.

DOH conducted a well site inspection on November 29, 2010 and subsequently notified the County of specific site improvements and application requirements for approval of a Group B Permit. One of the requirements is to remove the lined evaporation pond that is currently located within the 100 ft Sanitary Control Area (SCA) of the well. The pond is being used for interim corrective actions required as part of the current Remedial Investigation/Feasibility Study (RI/FS) being conducted at the site. The RI/FS is being conducted under Agreed Order DE 3810 (AO) among Washington State, Grant County, and the City of Ephrata. The County has agreed to relocate the pond outside the 100 ft SCA buffer upon completion of the new facility. The current schedule is for design work for the new pond to begin in the fall of 2011 and construction to begin in the spring of 2012.

The landfill's water supply well was originally constructed in 1993 and is cased with extra heavy wall steel below a regional aquitard to a depth of 395 feet. The well is screened between 395 and 640 feet below ground surface and draws water from the deep Grand Ronde aquifer. Given the well depth and stringent well construction design, the landfill's water supply source is sufficiently protected from potential contaminant sources at the site. A source aquifer susceptibility assessment is included in this application.

The main text of this application fulfills Section I and Section II requirements in the Group B Water System Workbook (Parts A through J). A vicinity map (Figure 1), site protection map (Figure 2), and system design map (Figure 3) are also provided in the main text. Additional elements of the application are provided in the appendices (A through J).

SECTION I

This section fulfills Parts A through C in the Washington State Department of Health (DOH) Group B Water System Approval Workbook (DOH, 1994).

PART A: BASIC SYSTEM INFORMATION

1. Name of Water System:

Grant County - Ephrata Landfill Water Supply (33M1)

2. System Mailing Address:

Grant County Public Works
Attn: Derek Pohle (Public Works Director)
124 Enterprise Street SE
Ephrata, WA 98823

3. County:

Grant County

4. Well Site Tax Parcel Number:

160904001

5. Legal Description of Well Site:

NW quarter of the SW quarter, Section 33, Township 21N, Range 26E.
47.2724 N Latitude, 119.5763W Longitude

6. Year System Installed:

Well 33M1 was installed 1993 and has been used for landfill related activities (irrigation, daily cover mix, dust suppression, employee bathroom, and vehicle/machine washing). Drinking water for landfill employees is currently supplied with bottled water. Completion of a new landfill maintenance and scale-house facility, which is to have potable water supplied by well 33M1, is scheduled to occur in late 2011 or early 2012.

7. Located in Critical Water Supply Service Area:

No public water supply service exists within 1000 feet of the landfill's property boundary. The closest public water supply service is the City of Ephrata (City). The City's Public Works Director, Bill Sangster, was contacted on March 22, 2011. Mr. Sangster indicated that the City's service area is limited to the City's boundary, which is located about 1300 feet north of the landfill property.

8. Number of Services:

1 Existing:	Parcel #160904001 (To be decommissioned with construction of new facility)
1 Proposed:	Parcels #160904001 and 160904002 (Proposed service for the new facility)

Address of Service: Ephrata Landfill
4002 Road 13 NW
Ephrata, WA 98823

9. Type of Service:

One permanent water service for landfill related activities and potable water for approximately 8 daily employees at the landfill.

10. Vicinity and Service Area Sketch:

See Figure 1

PART B: OWNERSHIP AND MANAGEMENT

1. Water System Owner:

Grant County Public Works
Attn: Derek Pohle (Public Works Director)
124 Enterprise Street SE
Ephrata, WA 98823
(509) 754-6082

2. Owner's Statement of Responsibility:

I, the undersigned, do hereby attest that as the owner of this water system I am responsible for any maintenance or repairs involved in the continuing operation of this system

Signature: Derek Pohle, PE

Date: 5/2/11

3. System Contact Person:

Name: Derek Pohle (Public Works Director)

Address: Grant County Public Works
124 Enterprise Street SE
Ephrata, WA 98823

Telephone Number: (day) 509-754-6082 (evening) 509-754-6082

4. Contact Person for Maintenance, Water Quality Sampling, Customer Notification, and Complaint Response:

Same as above

5. Person Preparing This Workbook:

Name:	Glenn Mutti-Driscoll and Dawn Chapel
Company:	Pacific Groundwater Group
Address:	2377 Eastlake Ave E, Seattle, WA 98107
Telephone:	(day) 206-329-0141 (evening) 206-329-0141

6. Owner's Statement of Accuracy:

I, the undersigned, do hereby attest that I am the owner of this water system and that the information provided in this workbook is accurate to the best of my knowledge.

Signature: [illegible], PE

Date: 5/2/11

PART C: WATER SOURCE APPROVAL

1. Water Right Permit:

No water right permit is required - Exempt (See Appendix A).

2. Well Site Inspection Report:

a. Date of Inspection: December 10, 2010

b. Name and Department of Inspector: Russell Mau, Office of Drinking Water

c. Recommendations/Comments:

- Remove the evaporation pond from the sanitary control area (SCA). If this evaporation pond is reconstructed elsewhere, the DOH recommends placing the pond and leachate piping a significant distance from the well.
- Clean the sanitary control area by removing the metal drums and equipment stored near the well.
- Seal the well house, as there was evidence of rodents.
- Remove the rag from where the wires enter the top of the well casing and seal the opening with silicone sealer.
- Install a screened air vent (see enclosed diagram for example).

- Replace the cut pipe that serves to drain any flows discharged through the air vacuum release discharge line and route it outside the well house. Then, screen the end of this discharge line with 24-mesh, non-corrodible screen.

Appendix B contains a copy of the inspection report from DOH. Improvements made in response to the recommendations are documented with photographs and included in Appendix B. The removal of the evaporation pond from the Sanitary Control Area is scheduled to occur after construction of the new maintenance facility and decommissioning of the old facility, currently scheduled to be completed by late 2011 or early 2012. A new pond is planned to be constructed by the old facility at the north end of the landfill.

3. Sanitary Control Area:

a. Site Protection Map:
Figure 2 delineates the 100-ft Sanitary Control Area and the 1-year, 5-year, and 10-year capture zones for the well calculated with the confined fixed radius method (Appendix E).

b. Wellhead Protection Inventory:
Well head protection areas are defined and inventoried for potential contamination sources in Appendix E. The four well head protection areas are: Sanitary Control Area, 1-year capture zone, 5-year capture zone, and 10-year capture zone (Figure 2). Potential contamination sources within the 10-year capture zone are listed below:

- Likely pesticide application (commercial agriculture & residential): Unknown. The nearest irrigated agriculture occurs roughly 0.75 miles northwest from the wellhead (northwest of West Canal). A single 35 acre irrigation circle is also located about 1 mile northeast of the wellhead. A chicken farm was also historically located about 2000-ft north-northwest of the wellhead. These areas are located beyond the 10-year capture zone.
- Stormwater injection wells or disposal areas: Yes.
    1. Stormwater infiltration structures associated with the non-contact storm water collection system for original landfill.
    2. Clay Pond, located about 1000 feet northwest of water supply well, receives runoff from limited areas to the north (including Old Chicken Farm, Railroad Ave, and State Route 28). The pond is underlain by low permeable silt and clay.
- Other injection wells: No
- Abandoned ground water wells: None. All groundwater monitoring wells on County owned parcels are either active or have been decommissioned in accordance with WAC 173-160-381 (Figure 1).
- Landfills, dumps, disposal areas within 1000 ft: Yes (see below)
- Known hazardous materials site within 1000 ft: No. Household hazardous waste (e.g. oil, paint, and batteries) is collected at the landfill's recycling cen-

ter, located near the current maintenance facility about 1500 feet north of the well head (Figure 2).

- Water sources with known water quality problems: Yes (shallow groundwater, see below)
- Population density greater than 1 house/acre: No
- Residential septic tanks and drainfields: The landfill current maintenance facility's septic drainfield is located immediately north of the facility about 1500 feet north of the well head (Figure 2). No other septic tanks or drainfields are known to occur within the 10-year capture zone.
- Underground and above ground storage tanks: The landfill maintains two above ground fuel tanks (diesel and gasoline) located on the west side of the recycling center near the landfill's current maintenance facility (Figure 2). No other storage tanks are known to occur within the 10-year capture zone.
- Sewer lines: No

Landfills:
Two landfill cells are located near the wellhead; an older "original" unlined landfill (about 200 feet northeast) and a "new" lined landfill (about ¼ mile south-southeast). The original landfill operated from the early 1940's to 2004, the year the new landfill began operation. The original landfill was subsequently capped in 2008 and a gas venting system was installed at that time. Non-contact storm water runoff from the capped landfill is conveyed to infiltration features at the south end of the landfill (Figure 2). Landfill refuse is primarily composed of municipal solid waste; however, 2300 drums of industrial waste were buried at the north end of the landfill in 1975. The drums and surrounding soils were excavated and removed from the site in 2008 as part of the interim remedial actions associated with the RI/FS.

Shallow Groundwater:
Long-term groundwater monitoring at the landfill indicates groundwater quality in the shallow aquifers above the regional Vantage aquitard is contaminated. Contaminants detected in the shallow groundwater include landfill leachate salts and metals and volatile organic compounds (VOCs). Groundwater contaminant concentrations are highest in the shallowest aquifers at the north end of the original landfill and decrease significantly with both lateral distance and vertical depth.

The landfill's water supply well draws groundwater from the deeper non-impacted Grand Ronde basalt aquifer, beneath the Vantage aquitard. The Vantage aquitard is about 30 ft thick and occurs at a depth of about 340 to 350 ft below ground surface at the site. The landfill's water supply well is cased through the Vantage with heavy-wall steel to a depth of 395 ft and open between 395 and 640 ft. The well was tested in 1993, 2004 and most recently in 2011 and contaminants have not been detected.

Additional information on well construction, hydrogeology, source susceptibility, and groundwater quality can be found in the following appendices:

Appendix C: Well Completion Report
Appendix D: Hydrogeologic Conditions and Groundwater Travel Times
Appendix E: Well Head Capture Zones
Appendix F: Source Aquifer Susceptibility Assessment
Appendix H: Water Quality Report

SECTION II

This section fulfills Parts D through J in the DOH Group B Water System Approval Workbook (DOH, 1994).

PART D: WATER SOURCE INFORMATION

1. Well Construction:

a. Existing Well: Well 33 M1, constructed 1993

b. Well Log: A well completion report (including well log and testing results) for well 33M1 is included in Appendix C.

c. Totalizing Source Meter: A totalizing source meter will be installed at the wellhead with the construction of the new landfill facility and connection to the existing water supply.

d. How will water level measurements be made: Tape

2. Pump Test Results:

Pumping test results are included in Appendix C. Following the 7 hour and 40 minute test where the well was pumped at a constant rate of 165 gpm, 1.11 ft of drawdown was observed. The transmissivity is estimated to be between 37,000 and 50,000 ft^2/dy. The source capacity of the well is much higher than will be used by this water system. A sustained pumping rate of over 1000 gpm is possible based on the pumping test results and over 150 ft of available drawdown in the well.

3. Water Quality Tests:

A sample of the source water was collected on January 13, 2011 and February 17, 2011. The samples were collected from a hose bib near the wellhead in the wellhouse. Complete water quality test results can be found in Appendix H. The samples were analyzed

by Edge Analytical Laboratories, Cascade Analytical, and Test America. All labs used are state-certified for the drinking water analyses performed. Analyses run included total coliform, inorganics (IOCs), volatile organic compounds (VOCs), synthetic organic compounds (SOCs: general pesticide, herbicide, insecticide, fumigant, benzo and dioxin test panels), and radionuclides (gross alpha and radium 228). Organic compounds were not detected and all other compounds were either not detected or detected at concentrations below MCLs (Appendix H).

4. Covenants and Easements

a. Declaration of Covenant:
A declaration of covenant for the County owned land that lies within the well's sanitary control area (SCA) is included in Appendix G.

b. Restrictive Covenant:
In a letter dated March 31, 2011, Grant County Public Works requested a restrictive covenant for the portion of the SCA that extends onto an undeveloped private parcel owned by the Atkins Family Trust. In a letter dated April 5, 2011, the Atkins Family Trust declined the County's request for a restrictive covenant. A copy of both letters is included in Appendix G.

c. Well, Water-line, and Equipment Easements:
The well and all water lines and associated equipment for the new facility will be located within Grant County owned parcels (Figure 1).

PART E: FINANCIAL VIABILITY

The water supply system for the Ephrata Landfill is owned and operated by Grant County Public Works. The County will cover all costs for development, construction, operation, maintenance, and long-term monitoring of the water supply system in compliance with Sate and Local drinking water regulations.

For further information on the County's financial viability contact Grant County Public Works:

Grant County Public Works
Attn: Derek Pohle (Public Works Director)
124 Enterprise Street SE
Ephrata, WA 98823
(509) 754-6082

PART F: PUMP AND PUMPHOUSE INFORMATION

1. Source Capacity

a. Number of connections 2 (irrigation and building) , Maximum required peak flow 103 (gpm).

Maximum required peak flow based on the proposed building demand of 80 gpm and an irrigation demand for 23 gpm.

b. Required daily production:
103 (gpm): 80 gpm for building and 23 gpm for irrigation.
33,828 (gpd): 1,500 gpd for building and 32,328 gpd for irrigation.

Required daily production is based on maximum expected daily demands. Building demands considers daily filling of water trucks (1000 gallons) while simultaneously experiencing all building uses (sink, bath, shower, etc). Irrigation demands are based on the peak irrigation season requirements (4 months of continuous irrigation of ½ the landfill's poplar trees).

c. Source Capacity (gpm): >165 (based on pump test, see Part D section 2)

2. Source Pump

a. Pump rate 103 gpm (must be no less than required peak instantaneous demand)

b. Required Pump Head Calculation:

TABLE A - Headloss

From:	To:	Connection:	Peak Hourly Design Flow (gpm)	Diameter (in)	Headloss per 100'	Length (ft)	Total Headloss (ft)
Well pump	Well head	1	103	3	1.8	625	11.14
Well head	New Facility	1	80	6	0.07	2700	1.9
Well head	Irrigation System	1	23	1.25	varies	varies	negligible

TABLE B – Required Pump Head

	WELL PUMP
Distance From Pumping Level in Well to Ground Surface (Well Head)	483 FEET
Elevation Difference from Well Head to Point of Delivery	-40 FEET (Building) 0 FEET (Irrigation)
Greatest Headloss (pipe friction)	13 FEET
Pressure Residual Head (45 psi required at building = 104-ft) (65 psi current tank pressure = 150-ft)	150 FEET
Total Required Pump Head	606 FEET

3. Required Pump

a. Total Required Pump Head 606 feet

b. Pump Rate 103 gpm

c. Select Pump from pump catalog for 606 head and pump rate of 103 gpm.

4. Pump Specifications

a. Type: Submersible

b. Manufacturer: Franklin

c. Model: #100FA25S6

d. RPM: 3450

e. Horepower: 25

f. Pump Rate: 103 gpm

g. Single phase/Tree phase: 3 phase

Pump curve is included in Appendix J

5. Booster Pump

The system does not require booster pumps

6. Pumphouse

Well 33M1 is located in a pump house. A pitless adapter is not used.

Additional Information:

a. Sanitary Seal on Well Casing: Yes

b. Pressure Gauge: Yes

c. Does well casing extend a minimum 6 inches above finished floor surface: Yes

d. Screened Casing Vent: Yes

e. Insulation: No

f. Heating: No

g. Approved Wiring: Yes

h. Concrete Flooring: Yes

i. Floor Drain: No

j. Sample Tap Prior to Pressure Tank: Yes

k. Pumphouse Ventilation: Yes

l. Locks for Doors: Yes

m. Rodent Proof: Yes

PART G: PRESSURE TANK/STORAGE FACILITIES

Two pressure tanks are located in the well house. Tank specifications are below.

7. Pressure Tank

a. Manufacturer: ProFlow, Model: PF-86

b. Equivalent ASME Spcifications: NSF Standard 6 / Listed

c. Is Pressure tank for Pump protection: Yes

d. Is Pressure tank used for other purposes: Yes, to control system pressure.

e. Pressure Tank is: Vertical and Bladder Type

f. Capacity: 2 tanks at 86 gallons = 172 gallons total

g. ASME Pressure Relief Valve Installed: Yes

h. Pressure Range Settings: Minimum: 60 Maximum: 125 psi

8. Storage Tank

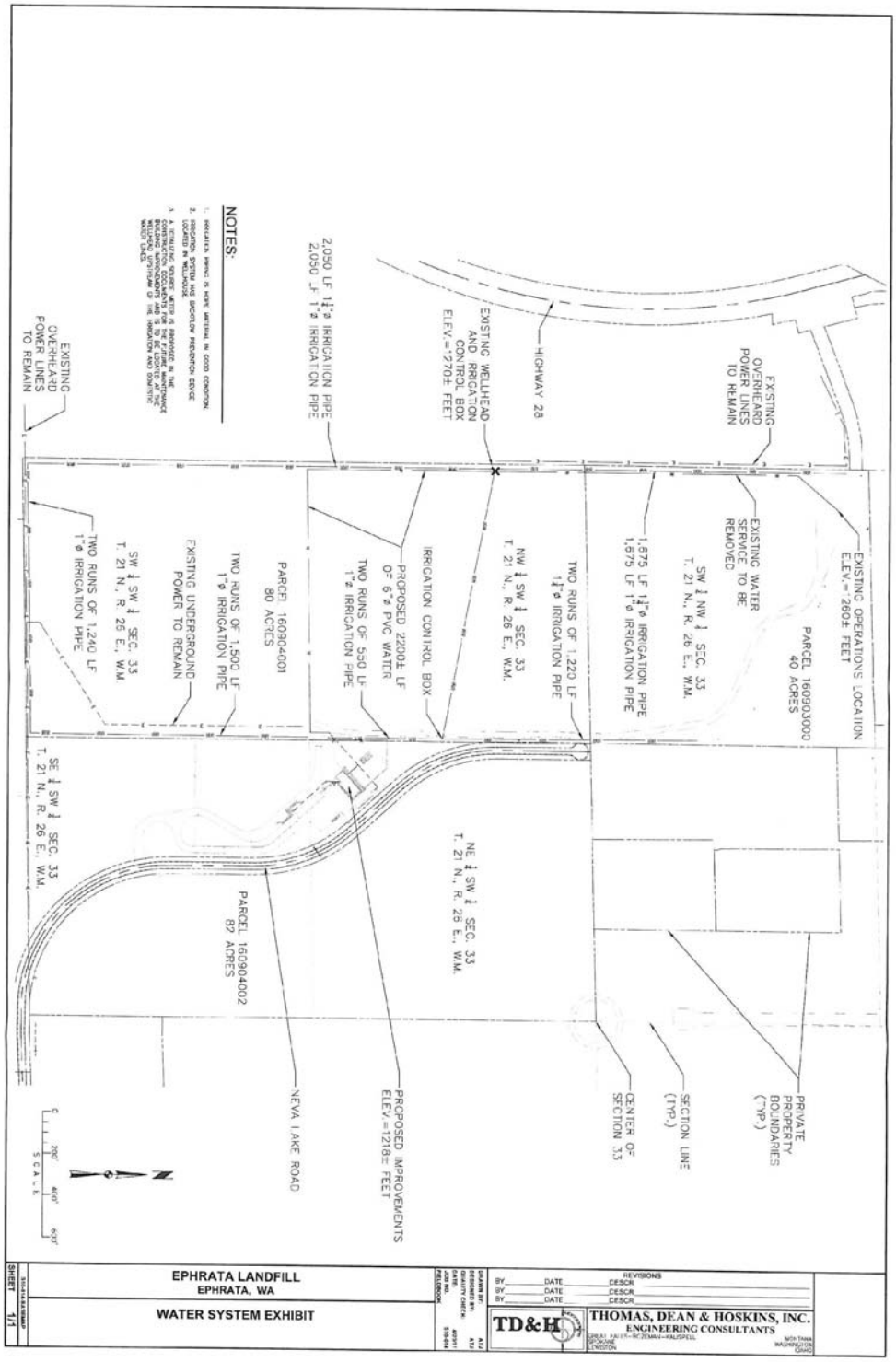
No storage tank for potable water use.

PART H: TREATMENT

No water treatment will be pursued as water quality data indicated no contamination is present.

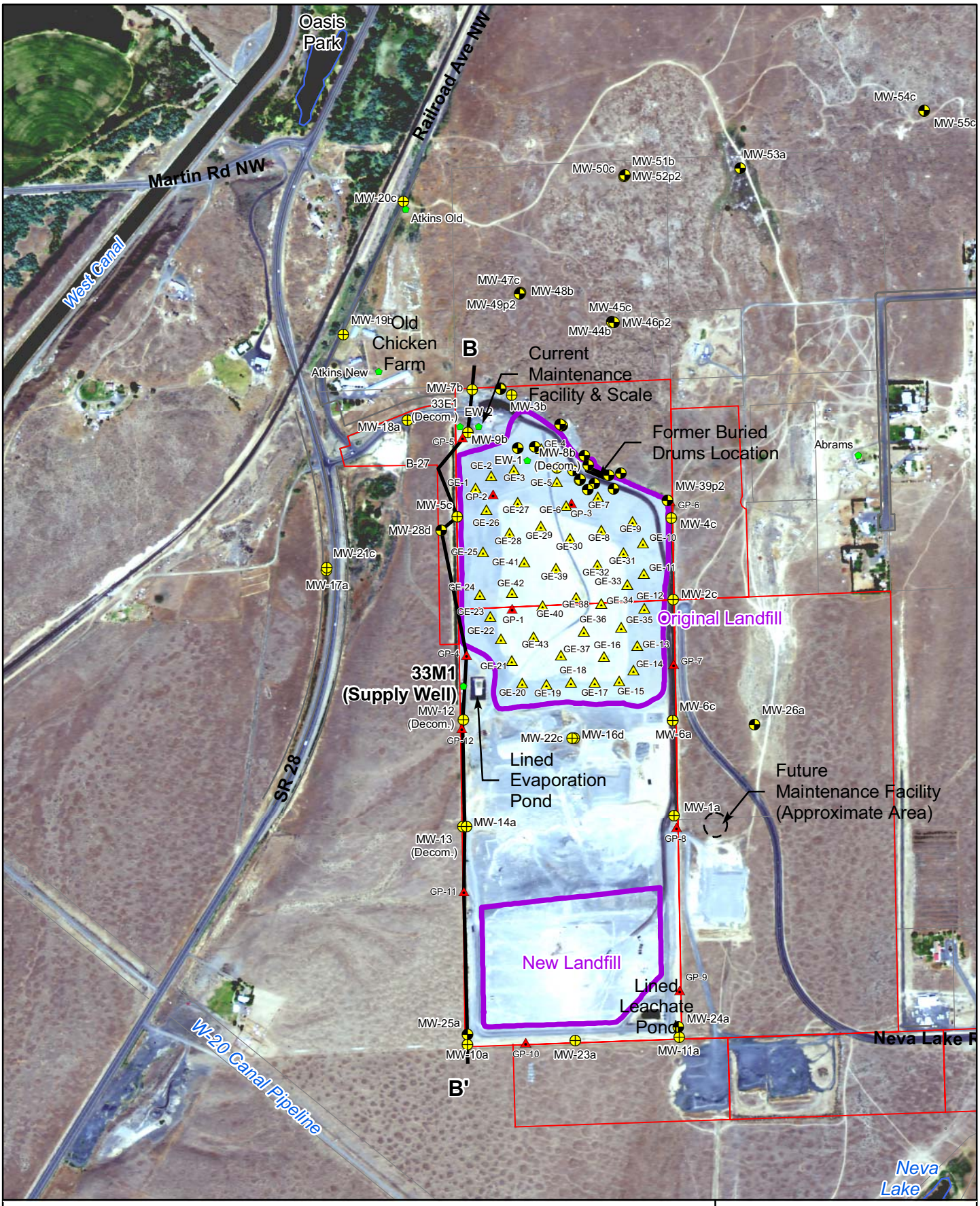
PART I: DISTRIBUTION SYSTEM

1. System Diagram (also included in Appendix J):



PART J: RELIABILITY

None



K:\PONY\Ephrata\GIS\mxds\33M1_Vicinity.mxd - 4/2011

Quarterly Monitoring Well (MW)

Remedial Investigation Monitoring Well (MW)

Gas Extraction (GE)

Gas Probe (GP)

Other Well

Cross Section B-B' (See Appendix D)

County Owned Parcels

Landfill Extents

0 Feet 800

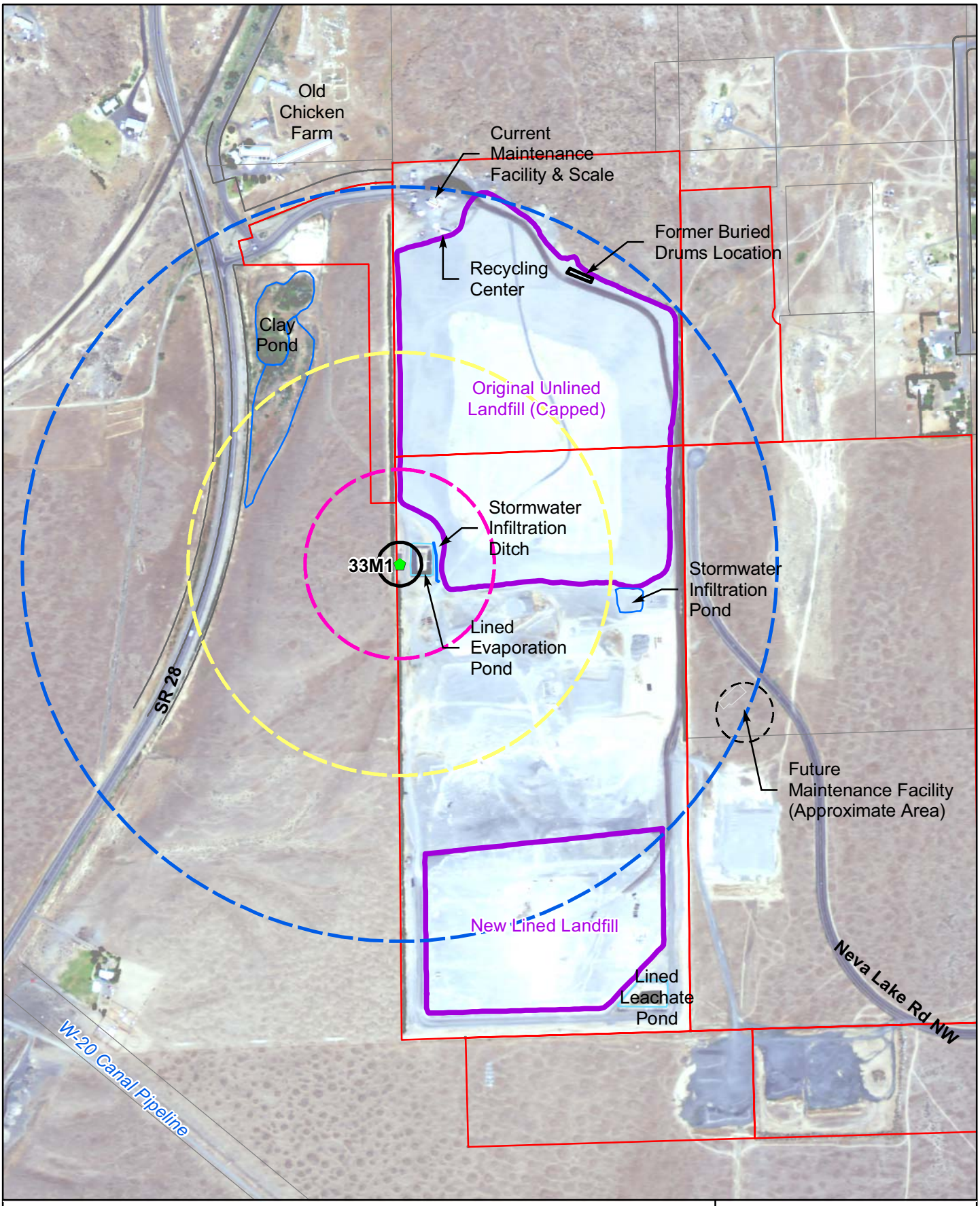
2009 NAIP Orthophoto

N

Figure 1
Vicinity Map

Ephrata Landfill
Water Supply Well

PgG



K:\PONY\Ephrata\GIS\mxds\33M1_SiteProtection.mxd

Well 33M1 (Supply Well)
1-Year Capture Zone (435-ft radius)
5-Year Capture Zone (973-ft radius)
10-Year Capture Zone (1,376-ft radius)
Sanitary Control Area (100-ft radius)
Parcels
Landfill Extents

0 Feet 600

2009 NAIP Orthophoto

N

Figure 2
Site Protection Map

Ephrata Landfill
Water Supply Well

PgG

APPENDIX A
WATER RIGHT ASSESSMENT

APPENDIX A - WATER RIGHT STATUS

The Ephrata Landfill water system will operate under the ground water permit exemption consistent with the provisions of Revised Code of Washington 90.44.050. The relevant portion of the statute provides that the withdrawal of public ground waters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for single or group domestic uses in an amount not exceeding five thousand gallons a day, or as provided in RCW 90.44.052, or for an industrial purpose in an amount not exceeding five thousand gallons a day, is and shall be exempt from the provisions of this section.

There are three possible components of water use that will occur at the facility, domestic use for the employees at the office complex, irrigation of the buffer strip which is comprised of Lombardi Popular trees, and industrial needs which could include water for such purposes as dust control, fire suppression and daily cover spray.

Ecology's current interpretation of the exemption is based on the guidance of the Attorney General's office (AGO No. 17 (2005) and AGO No. 6 (2009)) and allows both for multiple uses of the exemption based on category of use, and also for unlimited irrigation of a half acre of non-commercial vegetation. The Ephrata facility's water demand for domestic use (e.g. sinks, toilets, drinking fountains, and showers) will be modest and is estimated to amount to 500 gallons per day – which is well below the 5,000 gallon per day threshold. Irrigation will be limited to a half acre which is configured in long strips buffering the property. Industrial use will not exceed 5000 gallons per day with an estimate 1,000 gpd being used each for dust control and spray cover, with fire suppression water being used as needed to insure the storage tank remains full.

APPENDIX B
DOH WELL SITE INSPECTION REPORT AND APPROVAL REQUIREMENTS

RECEIVED
DEC 1 0 2010
GRANT CO. PUBLIC WORKS

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
EASTERN DRINKING WATER REGIONAL OPERATIONS
16201 East Indiana Avenue, Suite 1500, Spokane Valley, Washington 99216-2830
TDD Relay 1-800-833-6388

December 10, 2010

Ms. Janice Goeden
Grant County Solid Waste
PO Box 37
Ephrata, WA 98823

Subject: Ephrata Landfill; Grant County; Well No. 33M1, Well Site Inspection

Dear Ms. Goeden:

This letter is a follow-up to the well site inspection performed by Danielle Finley and myself on November 29, 2010. One of the primary objectives when inspecting the site is to ensure that the Sanitary Control Area (SCA) is adequate. WAC 246-291-100 (4)(a) states that the purveyor shall maintain a SCA around all sources for the purpose of protecting them from existing and potential sources of contamination.

Most of the well contaminants that commonly cause concern originate above ground, often as the result of human activities. Pesticides, fuels, and industrial chemicals are examples of pollutants that can contaminate a groundwater supply. This 100-foot radius around the wellhead is intended to add distance between potential contamination sources and the well. The regulation requires that activities that could contaminate the water source not be allowed within the SCA.

Unfortunately, several potential sources of contamination are located near the well. In order for this well to be considered approvable, the following will need to be completed prior to DOH approving the well for connection to the new Ephrata Landfill office:

- Remove the evaporation pond from the SCA. If this evaporation pond is re-constructed elsewhere, the Department of Health (DOH) recommends placing the pond and leachate piping a significant distance from the well.
- Clean the sanitary control area by removing the metal drums and equipment stored near the well.
- Seal the well house, as there is evidence of rodents.
- Remove the rag from where the wires enter the top of the well casing and seal the opening with a silicone sealer.

- Install a screened air vent (see enclosed diagram for example).
- Replace the cut pipe that serves to drain any flows discharged through the air vacuum release discharge line and route it outside the well house. Then, screen the end of this discharge line with a 24-mesh, non-corrodible screen.

WAC 246-290-990 authorizes the implementation of a fee for this inspection. An invoice for $205.00 is enclosed.

You can reach me at (509) 329-2116, or by email at russell.mau@doh.wa.gov, if you have any questions,

Sincerely,

Russell Mau, PE, PhD
Regional Engineer
Office of Drinking Water
Division of Environmental Health

Enclosures: Invoice
Drinking Water Tech Tips: Simple Fixes for Wellhead Openings

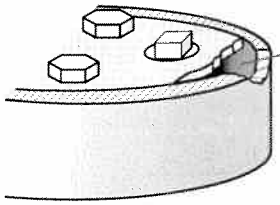
cc: Grant County Health District
Danielle Finley, DOH

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

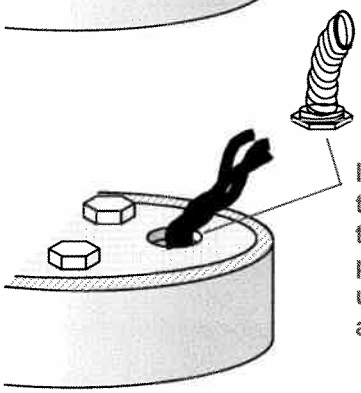
DOH 331-232
Nov. 2010
Revised

Drinking Water Tech Tips

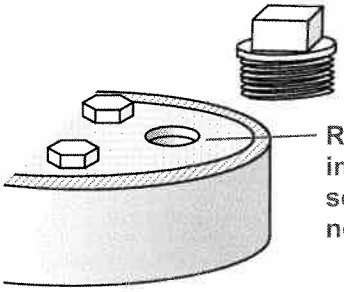
Simple Fixes for Wellhead Openings



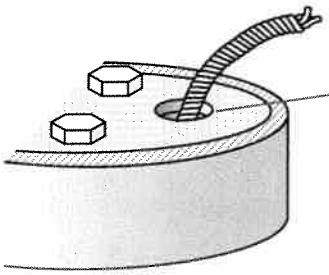
Replace damaged seal and repair well casing. Repairs must be durable and watertight.



Install an electrical conduit to seal the opening around the wires on a submersible pump. For a temporary fix, use clear silicone sealer around the opening.

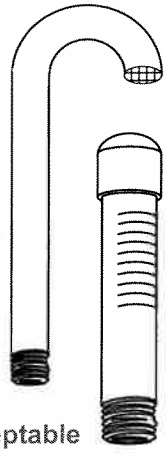


Replace access plug or install an inverted, screened well vent if one is not present.

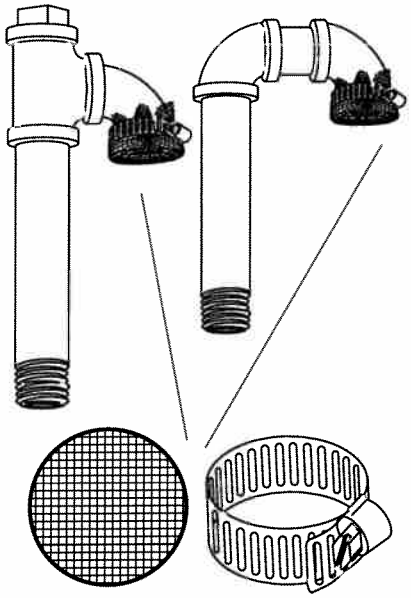


To seal the opening, remove the rope or attach it to an eyebolt on the sanitary seal bottom or drop pipe and use a square-head access plug. For a temporary fix, use clear silicone sealer around the opening.

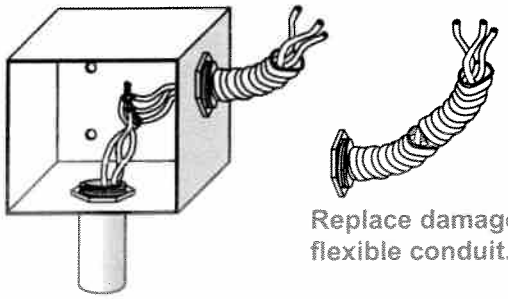
Replace straight, open well vents with inverted screened vents such as those below. Use non-corrodible 24-mesh screen to exclude insects, rodents and other small animals.



Acceptable commercially available vent designs



½-inch galvanized pipe with non-corrodible 24-mesh screen and a #12 stainless steel adjustable clamp



Replace damaged flexible conduit.

Replace the missing front panel of the electrical box and seal the small holes in the back.

Eliminate rodents from the well house and area around the wellhead. Airborne fecal material can contaminate the well or coliform samples. To keep rodents out, seal all entry points. Consider replacing fiberglass with solid insulation.

Avoid Hantavirus: When removing rodent nests and waste, use these precautions:

- Air out building for 1 hour before entering.
- Wear disposable gloves and a dust mask.
- Mix solution of disinfectant (1 cup bleach to 10 cups water).
- Thoroughly spray or soak dead mice or droppings with disinfectant before you remove them or clean nesting areas.
- Use rags or sponges soaked in the disinfectant solution.

RECEIVED
2011
GRANT CO. PUBLIC WORKS

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
EASTERN DRINKING WATER REGIONAL OPERATIONS
16201 East Indiana Avenue, Suite 1500, Spokane Valley, Washington 99216-2830
TDD Relay 1-800-833-6388

December 30, 2010

Ms. Janice Goeden
Grant County Solid Waste
PO Box 37
Ephrata, WA 98823

Subject: Ephrata Landfill; Grant County; Well No. 33M1;
Source and Water System Approval Requirements

Dear Ms. Goeden:

This letter outlines DOH requirements for approving Well No. 33M1 for potable water usage and approving the water system for serving the new Ephrata Landfill office. Based on review of your facilities and various information submittals, inspection of the well-site, and communications with your consultants, DOH requires the following for approving this well for potable water use and other human contact applications such as hand washing and showering (unless otherwise noted, DOH is applying WAC 249-290-100 due to the location of this well with respect to the landfill):

- Provide a summary of the hydrogeologic conditions in the vicinity of the landfill and well, including nature and extent of hydrogeologic units, directions of groundwater flow, groundwater velocities and groundwater travel times between the old and current landfill areas and the well, both lateral in the upper aquifer and vertical through the confining layer.
- Complete a groundwater contamination susceptibility assessment.
- Conduct initial water quality analyses of the source water (i.e., raw water collected at the well head), including bacteria, complete IOC, complete VOC, SOCs (general pesticide, herbicide, insecticide, fumigant benzo and dioxin test panels), and radionuclides (gross alpha and radium 228).
- Complete a Group B Water System Approval Package (in accordance with WAC 249-291).

Following source approval, DOH will require that the Ephrata Landfill conduct annual IOC and VOC monitoring of the well and may require additional monitoring, depending on the result of the initial monitoring.

If you have any questions, you can reach me at (509) 329-2116 or email: russell.mau@doh.wa.gov.

Sincerely,

Russell Mau, Ph.D., P.E.
Regional Engineer
Office of Drinking Water
Division of Environmental Health

cc: Grant County Health District
Bryony Stasney, DOH
Danielle Finley, DOH

PROFLO
Screened Air Vent and sealed with silicone sealer.
Replaced air vacuum release discharge line and routed outside.

Sealed holes
by door and
installed new
lock

Screened air
vacuum discharge
line and irrigation
discharge line.

Wellhouse
SCA cleared of metal drums and equipment.
Lined pond to be relocated after new facility
constructed

Wellhouse
SCA cleared of metal drums and equipment.

APPENDIX C
WELL COMPLETION REPORT

Pacific Groundwater Group

Well Completion Report, Well No. 33M1, Ephrata Landfill, Grant County, Washington

December 23, 1993

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SUMMARY OF FINDINGS 1

3.0 DRILLING AND WELL INSTALLATION 2

4.0 HYDROGEOLOGY 2

5.0 AQUIFER TESTING 3
- 5.1 Step Tests 3
- 5.2 Constant-Rate Test 3
- 5.3 Aquifer Test Analysis 4

6.0 WATER QUALITY 4

7.0 REFERENCES 7

LIST OF FIGURES

FIGURE 1, SITE PLAN

FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT

FIGURE 3, DRAWDOWN AND RECOVERY DATA FROM THE PUMPED WELL 33M1

LIST OF APPENDICES

APPENDIX A: GROUNDWATER ANALYTICAL RESULTS

GRANT COUNTY LANDFILL WELL INSTALLATION

1.0 INTRODUCTION

This report summarizes the installation and testing of Grant County's Ephrata Landfill water supply well 33M1. The location of the well is shown on Figure 1. The purpose of this work was to assist the County with the development of a water supply for the landfill: related work resulted in the abandonment of the supply well 33E1 and of monitoring well MW-8. This related work is described under separate cover.

The role of Pacific Groundwater Group was to:

- Observe the well drilling and produce a geologic log,
- Recommend well construction,
- Manage and analyze aquifer-testing,
- Arrange the analysis of groundwater samples, and
- Recommend a pump setting depth.

The work was performed and this report prepared in accordance with generally accepted hydrogeologic practices at this time, and in this area, for the exclusive use of Grant County and their designated consultants for the specific application of this project. No other warranty, express or implied, is made.

2.0 SUMMARY OF FINDINGS

The following findings were made as a result of this investigation:

- The well was drilled and constructed as specified and completed at a total depth of 640 feet.
- The well is completed in the Upper Grande Ronde Formation of the Columbia River Basalts.
- Static water level was at 481 feet below ground surface on September 9, 1993. 1275 - 481 = ~794 ft elv.
- The Upper Grande Ronde aquifer transmissivity at the site is between 37,000 and 50,000 ft^2/day.

- The recommended pump setting depth is at 500 feet below ground surface or slightly lower.
- Water quality samples collected during advancement of the borehole through shallow aquifers indicate the presence of contaminants possibly derived from the landfill.
- Water quality from the completed well meets drinking water criteria for all analyzed constituents.
- The well discharges a non-flammable, natural gas.

3.0 DRILLING AND WELL INSTALLATION

Well 33M1 was drilled by Staco Drilling of Mount Angel, Oregon between July 7 and August 22, 1993. The well was drilled using an air rotary rig. A 20-inch diameter hole was advanced to a depth of 78 feet and a 16-inch steel casing grouted in place. A 16-inch hole was continued to a depth of 150 feet and a 12-inch casing was grouted in place to that depth. A 12-inch hole was continued to a depth of 395 feet and an eight-inch, extra-heavy wall casing was grouted in place to that depth. An 8-inch hole was continued to a depth of 640 feet and a six-inch diameter, factory slotted, thin walled, steel liner was installed from 380 feet to 640 feet.

The well was video logged after completion at 640 feet. The video is on file with the Grant County Public Works Department.

During well installation and testing, gas vented out of the well and the water appeared to be carbonated. A sample of the gas was sent to National Chem Lab and was found to be noncombustible. The analysis was otherwise inconclusive.

4.0 HYDROGEOLOGY

The well was completed in the Upper Grande Ronde Formation of the Columbia River Basalts which is composed if a series of lava flows each ranging in thickness from a few feet to more that 100 feet. The dominant material of the individual flows is dense, dark, generally fine-grained basalt which often displays prominent vertical jointing. The upper portions of many of the flows are porous and vesicular, and have a scoriaceous crust (Walters and Grolier, 1960). The Wanapum and Grande Ronde formations were encountered during drilling. The well produces water from the Grande Ronde. The overlying Wanapum basalts were sealed off.

At places, individual flows are separated by sedimentary "interbeds" consisting of tuffaceous material, volcanic ash, sand, and clay. The Vantage interbed is one such unit and was

encountered from 340 to 370 feet in the well. The static water level in the well dropped more that 175 feet after penetrating the Vantage interbed indicating that the interbed acts as a substantial aquitard that restricts vertical downward flow. Groundwater in the overlying Wanapum Basalts appears to be perched on the Vantage interbed.

5.0 AQUIFER TESTING

Aquifer testing was performed in the well to assess the proper pump placement depth. Both a step-test and a constant-rate test were performed.

5.1 Step Tests

Step-drawdown testing was conducted on September 8, 1993. Static water level in the well before testing was 481.00 feet below the top of casing. Water levels were measured with a 1000 foot electric water level probe marked in five-foot increments. Water levels were measured to the nearest 100th of a foot using a tape measure. Flow rate was measured using an inline flow meter which read from zero to 800 gallons per minute (gpm) in 10 gpm increments. A 55-gallon drum and stopwatch were also used to confirm the flow meter data.

During the first step, the well was pumped at 30 gpm for six minutes. Water level measurements were taken between 0.5 and six minutes into the test. During this time, the water level recovered from 0.85 feet to 0.1 feet of drawdown. This may be because the initially high flow rate before the water reached the gate valve drew the water table down, followed by recovery during the lower flow rate after the water reached the valve.

The second step was conducted at 60 gpm for four minutes after which no drawdown was measured. During the third step, the gate valve was opened up all the way resulting in a flow rate of 165 gpm. The step lasted for 23 minutes and produced 0.80 feet of drawdown.

5.2 Constant-Rate Test

The constant-rate test began at 8:00 am on September 9, 1993. The test was conducted at the maximum rate of 165 gpm because of the small amount of drawdown produced during the step tests. The static water level before the test was 481.04 feet below the top of casing. The test was conducted for a total of seven hours and 40 minutes (460 minutes).

The water produced during the test was clear and free from sand but produced a foamy head when pumped in to the 55-gallon drum. The foam decreased during the course of the test. The water also appeared to be slightly carbonated which may be associated with the venting described above.

The flow rate during the test as measured by the flow meter fluctuated between 160 and 180 gpm at the beginning of the test and decreased to between 150 and 170 gpm by the end of the test. The flow rate as measured using the 55-gallon drum method varied from 183 gpm at the beginning of the test to 153 gpm at the end of the test. Total drawdown at the end of the test was 1.11 feet.

A groundwater sample was collected at the end of the test and is further described in the Water Quality section. After 460 minutes the pump was turned off and recovery data were collected. Early time recovery data are suspect because the lack of check valve allowed the water in the pipe above the pump to re-enter the well after termination of the test thus causing more recovery than under ideal conditions.

5.3 Aquifer Test Analysis

Semi-logarithmic plots of time versus drawdown were plotted for the constant rate test and the recovery test and are shown on Figure 3. Transmissivity was calculated using the Jacob-Cooper method:

$$T = \frac{2.3\ Q}{4\pi\ s_{log}}$$

Where
T = Transmissivity, in square feet/day
Q = Pumping rate, ft^3/day
s_{log} = Drawdown per log cycle of time, in feet

Using this method, a transmissivity of 50,000 ft^2/day was calculated for the constant-rate test and a transmissivity of 30,000 ft^2/day was calculated using the recovery data.

Because of the small drawdown shown at a pumping rate of approximately 150 gpm, long term drawdown is not sufficient to affect pump placement. Therefore, we recommend that the pump be set at 500 feet or slightly lower. Long term changes in the regional water table could affect the water level in the well and therefore required pump placement. We recommend quarterly static water level measurements.

6.0 WATER QUALITY

Water quality samples were collected at the following depths as the borehole was advanced:

- 78 feet: bottom of the outwash sands,
- 150 feet: Interflow aquifer,

- 325 feet: Lower Frenchman Springs aquifer, and
- 640 feet: Upper Grande Ronde Basalts (completed well).

The landfill hydrogeologic assessment report (BVWST, 1990a) and Rosa Aquifer Report (BVWST, 1990b) explain the Wanapum hydrostratigraphy and identify the aquifers.

The following paragraphs describe sample collection and analysis results.

A groundwater sample was collected with the cased borehole at 78 feet depth at the bottom of the outwash sands and gravels (Sample NSW-1 (78') - Appendix A). Very little water was encountered at this depth. The borehole was evacuated by air-lift and the sample was collected using a stainless steel bailer after recovery. The sample was submitted to National Chem Lab of Ephrata for volatile organic carbon analysis (VOC) by EPA method 601/602. Results indicate the presence of benzene, toluene, ethylbenzene, and xylenes which are common light petroleum fuel constituents. No chlorinated VOCs were detected. None of the compounds occurred in the sample above State or Federal drinking water standards (maximum contaminant levels or MCLs).

A groundwater sample was collected when the borehole was open from 80 feet to 150 feet. The major water producing zone within this interval is interpreted to correspond to the Interflow Aquifer identified in the Hydrogeologic Assessment Report (BVWST, 1990a) and Roza Aquifer Report (BVWST, 1990b). The Interflow Aquifer is interpreted to occur from 127 to 137 feet below ground surface in well 33M1 (Figure 2). The well was purged by airlifting for 40 minutes and sampled with a purge pump. The sample was submitted to National Chem Lab of Ephrata for analysis of VOCs using EPA method 601/602 (Sample NSW-2 (150') - Appendix A). Results indicate low concentrations of tetrachloroethene but no other chlorinated or non-chlorinated VOCs. The fuel constituents encountered in the shallower sample were not detected.

A groundwater sample was collected when the borehole was open from 150 feet to 324 feet below ground surface (Figure 2). The major water producing zone within this interval is interpreted to correspond to the Frenchman Springs Aquifer identified in the Hydrogeologic Assessment Report (BVWST, 1990a) and Roza Aquifer Report (BVWST, 1990b). The Frenchman Springs Aquifer is interpreted to occur from 305 to 338 feet below ground surface in well 33M1 (Figure 2). The well was purged by airlifting for two hours and sampled with a bailer. The sample was submitted to National Chem Lab of Ephrata for analysis of VOCs using EPA method 601/602 (Sample NSW-2 (324') - Appendix A). Results indicate low concentrations of benzene and tetrachloroethene. Methylene chloride and toluene were detected but were also detected in the lab blank. Concentrations of all compounds are below state MCLs.

A groundwater sample was collected from the completed well (640 feet depth) after the end of the constant-rate test. The sample was submitted to National Chem Lab in Ephrata,

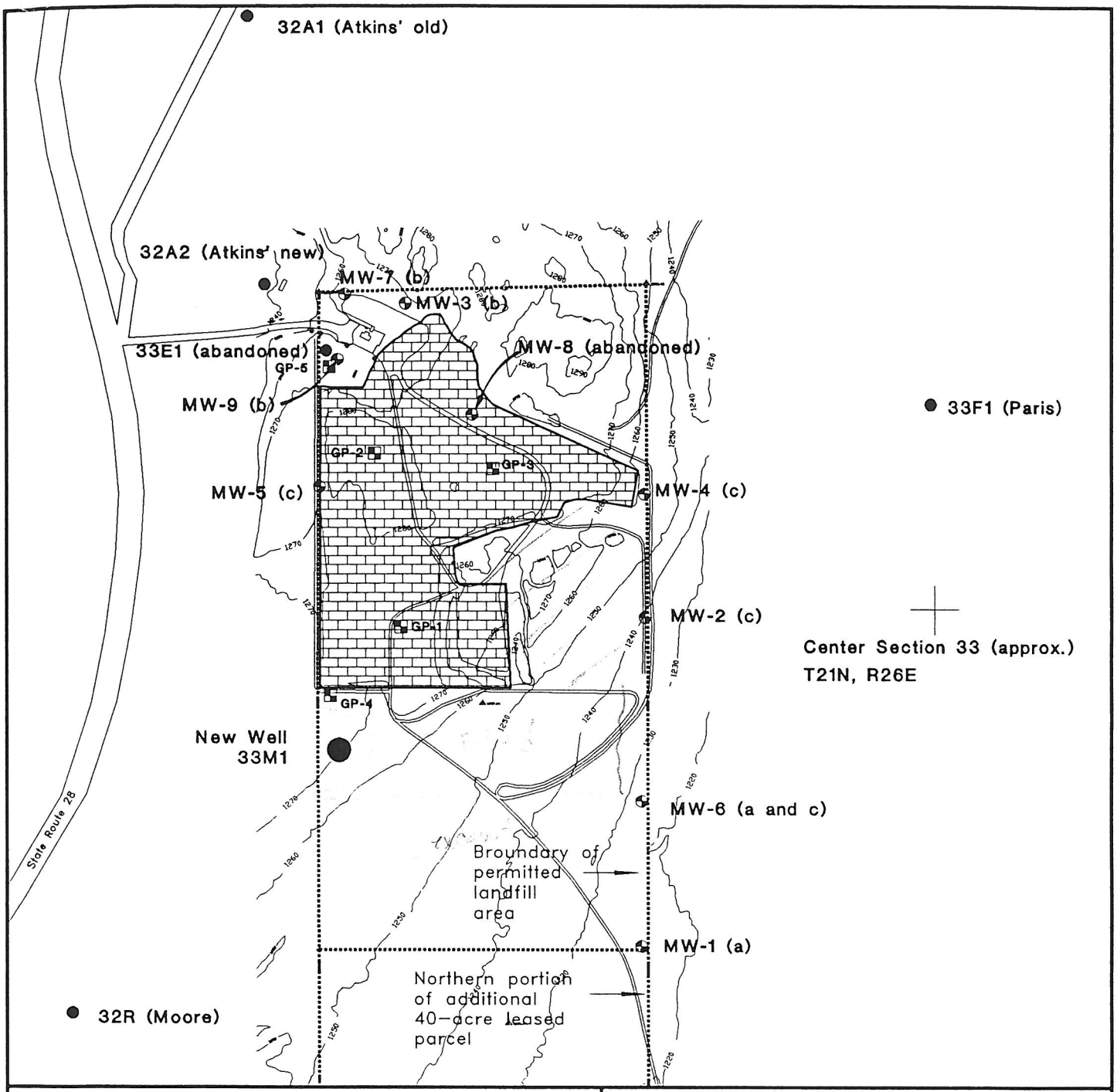
Washington and analyzed for VOCs (EPA method 524.2), metals, hardness, conductivity, turbidity, color, and total dissolved solids. The full list of analytes and analytical results are given in Appendix A. No VOCs were detected. Concentrations in the sample were below Federal and State maximum contaminant levels for all analytes.

7.0 REFERENCES

Walters, K. L., and Grolier, M.J., 1960, Geology and groundwater resources of the Columbia basin project area, Washington, Water Supply Bulletin No. 8, State of Washington Department of Conservation, Division of Water Resources.

Black and Veach Waste Science and Technology Corp., 1990a, Final hydrogeologic assessment report, Grant County Ephrata landfill, Grant County, WA.

Black and Veach Waste Science and Technology Corp., 1990b, Phase 2 investigation, Rosa Aquifer report, Grant County Ephrata landfill, Grant County, WA.



Map Legend

GP-1	Gas Probe
33E1	Water Supply Well
MW-2	Monitoring Well
33M1	New Water Supply Well

Approximate extent of landfill refuse (1990)

0 150 300 600
SCALE IN FEET

FIGURE 1
SITE PLAN

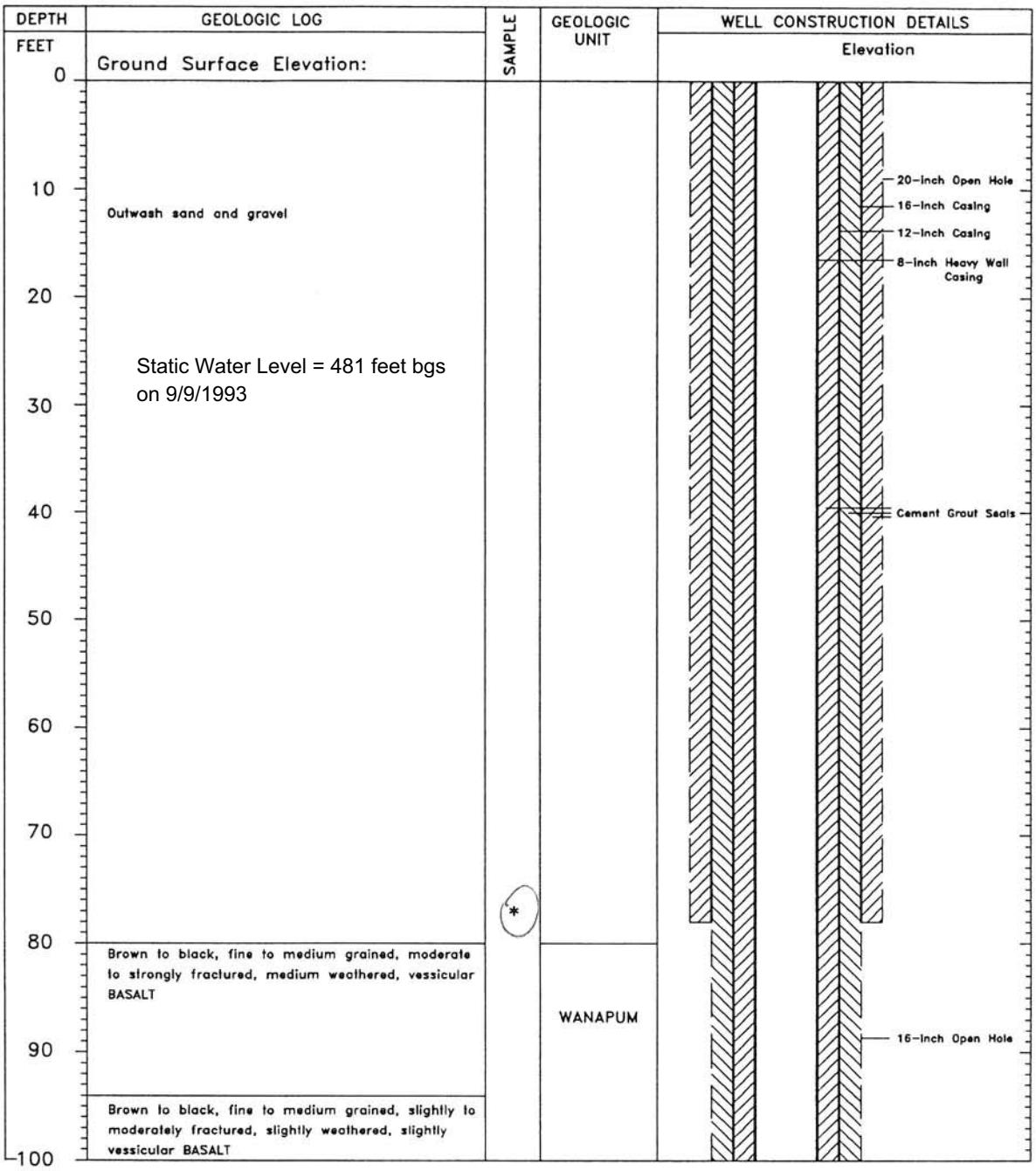
GRANT COUNTY LANDFILL - EPHRATA

Pacific Groundwater Group

new_wel.dwg

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1

EWN 1278



* Water quality sample collected

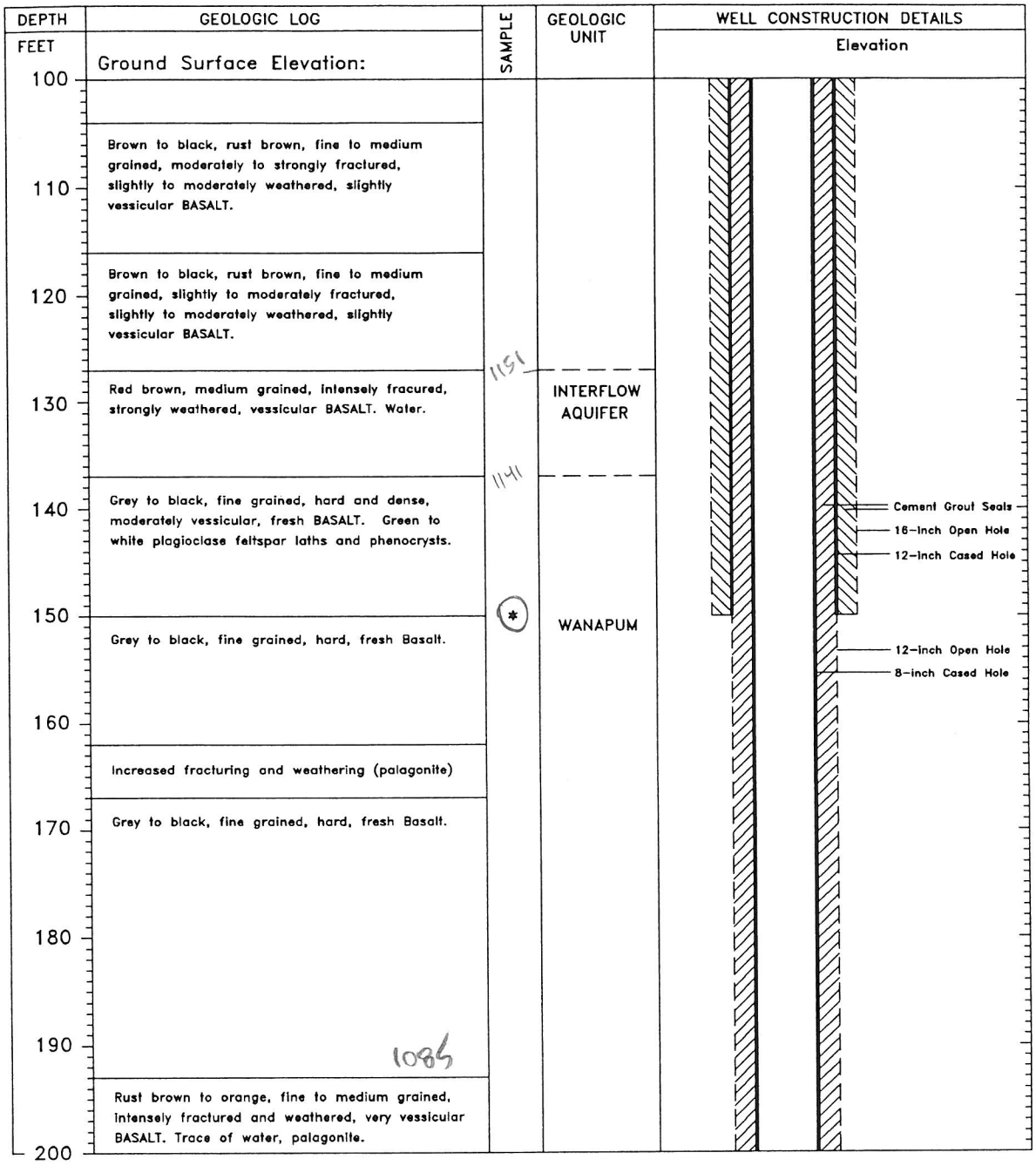
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1

DEPTH FEET	GEOLOGIC LOG	SAMPLE	GEOLOGIC UNIT	WELL CONSTRUCTION DETAILS
	Ground Surface Elevation: 1072			Elevation
200				
210	Grey to Black, fine to medium grained, hard hard, fresh BASALT.			
220				
230				
	Rust brown, fine to medium grained, strongly fractured and weathered vessicular BASALT. Palagonite			
240	Dark grey to black, fine to medium grained, hard and dense, slightly fractured, fresh BASALT. Plagioclase feldspar phenocrysts.			Cement Grout Seal
250			WANAPUM	
260				12-inch Open Hole 8-inch Cased Hole
270				
280				
290				
300				

* Water quality sample collected

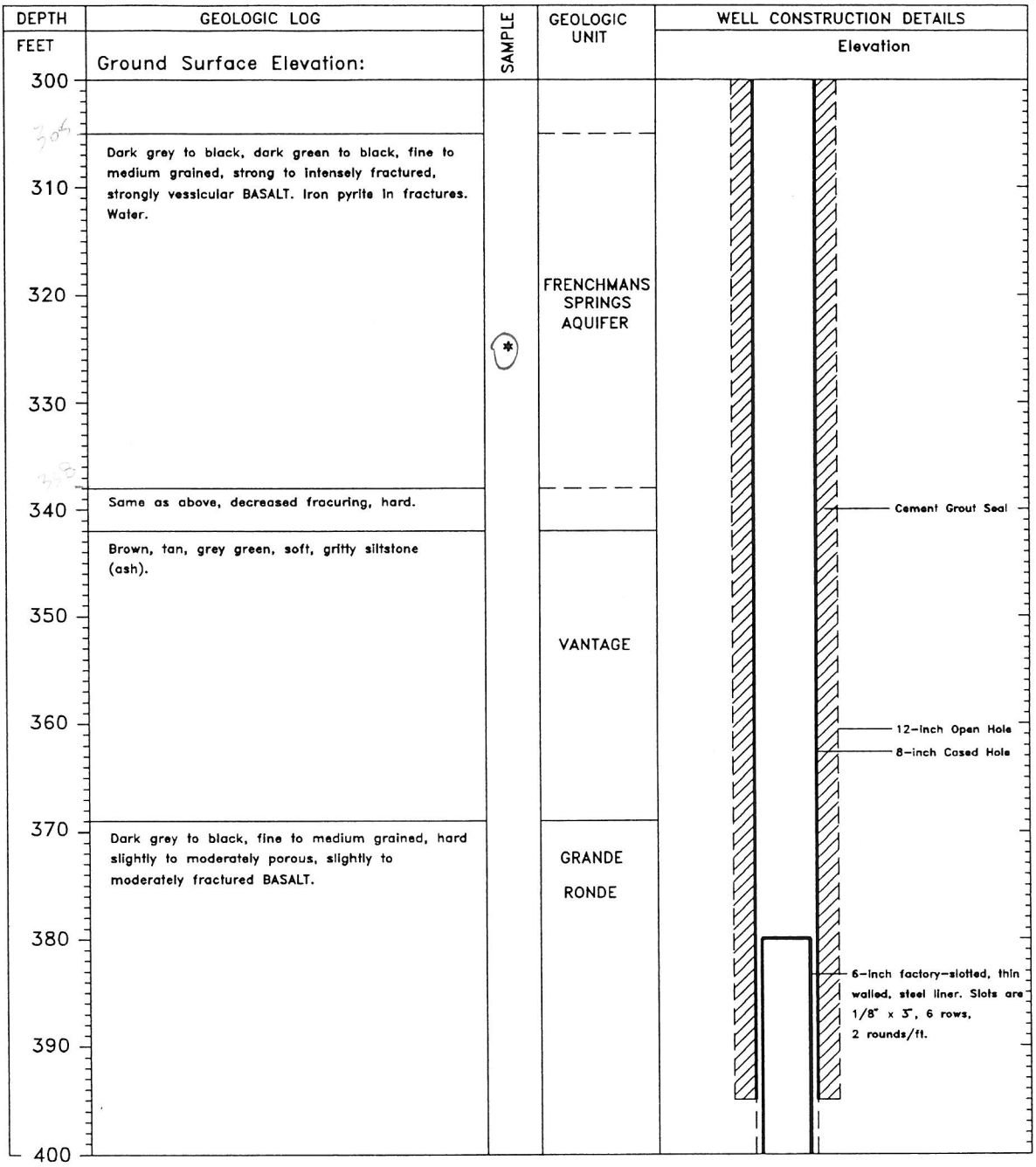
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1



* Water quality sample collected

FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1

DEPTH FEET	GEOLOGIC LOG	SAMPLE	GEOLOGIC UNIT	WELL CONSTRUCTION DETAILS
	Ground Surface Elevation:			Elevation
400	Dark grey to black, fine to medium grained, hard, fresh, slightly to moderately porous and vessicular, slightly to moderately fractured BASALT			
410				
420				
430				
440				
450				
460			GRANDE RONDE	
470				6-inch open hole
480				6-inch factory-slotted, thin walled, steel liner. Slots are 1/8" x 3", 6 rows, 2 rounds/ft.
490				
500				

* Water quality sample collected

FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1

DEPTH FEET	GEOLOGIC LOG	SAMPLE	GEOLOGIC UNIT	WELL CONSTRUCTION DETAILS
	Ground Surface Elevation:			Elevation
500	Dark grey to black, fine to medium grained, hard, fresh, slightly to moderately porous and vessicular, slightly to moderately fractured BASALT			
510				
520	Black to red, fine to medium grained, intensely porous and vessicular, strongly broken and fractured, cindery BASALT. Moderate to strong oxidation and weathering. Traces Fe pyrite.			
530				
540				
550	Dark grey to black, fine to medium grained, moderately to strongly porous and vessicular, moderately broken and fractured BASALT. Traces Fe pyrite.			
560			GRANDE RONDE	
570				6-inch open hole
580				6-inch factory-slotted, thin walled, steel liner. Slots are 1/8" x 3", 6 rows, 2 rounds/ft.
590	Same as above with red oxidation and weathering.			
600				

* Water quality sample collected

FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

GEOLOGIC LOG AND WELL AS-BUILT, EPHRATA LANDFILL SUPPLY WELL 33M1

DEPTH FEET	GEOLOGIC LOG	SAMPLE	GEOLOGIC UNIT	WELL CONSTRUCTION DETAILS
	Ground Surface Elevation:			Elevation
600	Dark grey to black, fine to medium grained, moderately to strongly porous and vessicular, moderately broken and fractured BASALT. Traces Fe pyrite, red oxidation and weathering.			
610	Water production suspected but not confirmed during drilling because of water loss to porous formation above aquifer.		GRANDE RONDE	6-inch open hole
620				6-inch factory-slotted, thin walled, steel liner. Slots are 1/8" x 3", 6 rows, 2 rounds/ft.
630				
640		*		
650				
660				
670				
680				
690				
700				

* Water quality sample collected

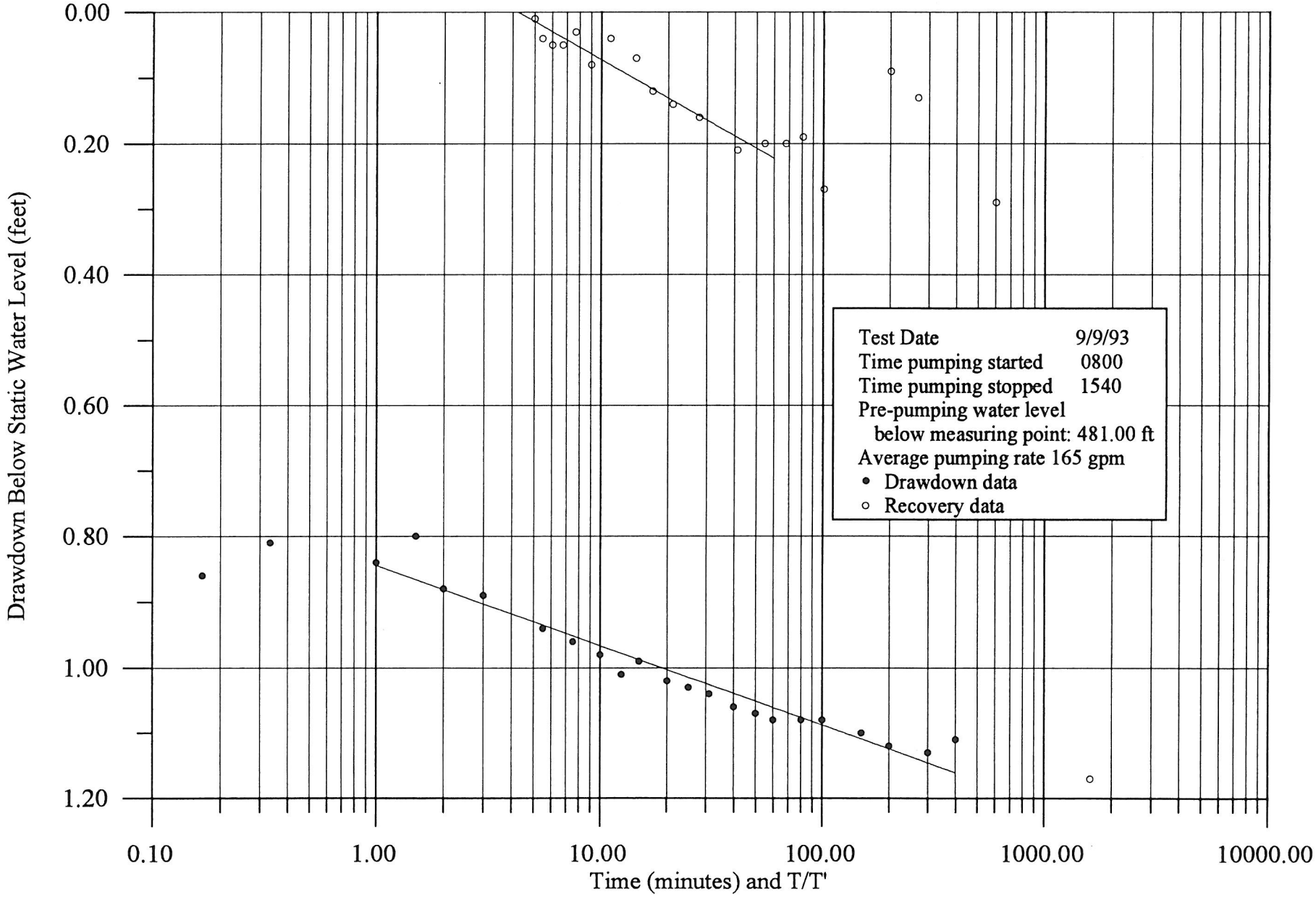
FIGURE 2, GEOLOGIC LOG AND WELL AS-BUILT
EPHRATA LANDFILL SUPPLY WELL 33M1

PACIFIC GROUNDWATER GROUP
JE890204

PROJECT NAME: Grant County Landfill
WELL INDENTIFICATION NUMBER:
DRILLING METHOD: Air Rotary
DRILLER: Robert Stadeli
FIRM: Staco
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Chad Bring

LOCATION: NW¼ SW¼ Sec. 33 T21N R26E
DATUM: NGVD
WATER LEVEL ELEVATION:
INSTALLED: August 22,1993
DEVELOPED: Not Applicable
START CARD NO.: 082647

Figure 3, Drawdown and Recovery Data
From the Pumped Well 33M1
Grant County Ephrata Landfill



APPENDIX A: GROUNDWATER ANALYTICAL RESULTS

NATIONAL CHEM LAB
103 - 12th Avenue SW
PO Box 635
Ephrata, WA 98823
(509)754-5725

VOLATILE ORGANIC CHEMICAL REPORT

Customer:	GRANT CTY PUBLIC WORKS c/o PACIFIC GROUNDWATER GRP.
Customer Sample id#:	NSW-1 (78')
Address:	35 "C" STREET N.W.
City:	EPHRATA
State ZIP:	WASHINGTON 98823

RESULTS OF ANALYSIS BY EPA METHOD 601/602

Measurement of Purgeable Organic Compounds in Water by Capillary Column
Gas Chromatography/ELCD/PID

Analyst : DAVID NELSON
Date of Report : 07-23-93
Data File : WE3072001
Supervisor's Initials :

Compound Name	Concentration (µg/l)
Dichlorodifluoromethane	<0.5
Chloromethane	<0.5
Vinyl Chloride	<0.5
Bromomethane	<0.5
Chloroethane	<0.5
Trichlorofluoromethane	<0.5
1,1-Dichloroethene	<0.5
Methylene Chloride	<0.5
trans-1,2-Dichloroethene	<0.5
1,1-Dichloroethane	<0.5
Chloroform	<0.5
1,1,1-Trichloroethane	<0.5
Carbon Tetrachloride	<0.5
Benzene	1.2
1,2-Dichloroehtane	<0.5
Trichloroethene (TCE)	<0.5
1,2-Dichloropropane	<0.5
Bromodichloromethane	<0.5
trans-1,3-Dichloropropene	<0.5
Toluene	6.1
cis-1,3-Dichloropropene	<0.5
1,1,2-Trichloroethane	<0.5
Tetrachloroethene	<0.5
Dibromochloromethane	<0.5
Chlorobenzene	<0.5
Ethylbenzene	1.6
1,1,1,2-Tetrachloroethane	<0.5
Bromoform	<0.5
1,3-Dichlorobenzene	<0.5
1,4-Dichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5
*TOTAL XYLENES	9.2

*Not 601-602 VOC

NATIONAL CHEM LAB
103 - 12th Avenue SW
PO Box 635
Ephrata, WA 98823
(509)754-5725

VOLATILE ORGANIC CHEMICAL REPORT

Customer:	PACIFIC GROUND WATER GROUP for Grant County Public Works
Customer Sample id#:	NSW-2 (150')
Address:	35 "C"STREET N.W.
City:	EPHRATA
State ZIP:	WASHINGTON 98823

RESULTS OF ANALYSIS BY EPA METHOD 601/602

Measurement of Purgeable Organic Compounds in Water by Capillary Column
Gas Chromatography/ELCD/PID

Analyst : DAVID NELSON
Data File : WE3073005
Date of Report : 08-04-93
Supervisor's Initials :

Compound Name	Concentration (µg/l)
Dichlorodifluoromethane	<0.5
Chloromethane	<0.5
Vinyl Chloride	<0.5
Bromomethane	<0.5
Chloroethane	<0.5
Trichlorofluoromethane	<0.5
1,1-Dichloroethene	<0.5
Methylene Chloride	<0.5
trans-1,2-Dichloroethene	<0.5
1,1-Dichloroethane	<0.5
Chloroform	<0.5
1,1,1-Trichloroethane	<0.5
Carbon Tetrachloride	<0.5
Benzene	<0.5
1,2-Dichloroehtane	<0.5
Trichloroethene (TCE)	<0.5
1,2-Dichloropropane	<0.5
Bromodichloromethane	<0.5
trans-1,3-Dichloropropene	<0.5
Toluene	<0.5
cis-1,3-Dichloropropene	<0.5
1,1,2-Trichloroethane	<0.5
Tetrachloroethene	1.2
Dibromochloromethane	<0.5
Chlorobenzene	<0.5
Ethylbenzene	<0.5
1,1,1,2-Tetrachloroethane	<0.5
Bromoform	<0.5
1,3-Dichlorobenzene	<0.5
1,4-Dichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5
*TOTAL XYLENES	<0.5

*Not 601-602 VOC

NATIONAL CHEM LAB
103 - 12th Avenue SW
PO Box 635
Ephrata, WA 98823
(509)754-5725

VOLATILE ORGANIC CHEMICAL REPORT

Customer:	GRANT COUNTY PUBLIC WORKS
Customer Sample id#:	NSW-3 325' DEEP
Address:	P.O. BOX 37
City:	EPHRATA
State ZIP:	WASHINGTON 98823

RESULTS OF ANALYSIS BY EPA METHOD 601/602

Measurement of Purgeable Organic Compounds in Water by Capillary Column
Gas Chromatography/ELCD/PID

Analyst : DAVID NELSON
Date of Report : 08-25-93
Data File : WE3081301
Supervisor's Initials :

Compound Name	Concentration (µg/l)
Dichlorodifluoromethane	<0.5
Chloromethane	<0.5
Vinyl Chloride	<0.5
Bromomethane	<0.5
Chloroethane	<0.5
Trichlorofluoromethane	<0.5
1,1-Dichloroethene	<0.5
Methylene Chloride	1.4 (B)
trans-1,2-Dichloroethene	<0.5
1,1-Dichloroethane	<0.5
Chloroform	<0.5
1,1,1-Trichloroethane	<0.5
Carbon Tetrachloride	<0.5
Benzene	1.3
1,2-Dichloroehtane	<0.5
Trichloroethene (TCE)	<0.5
1,2-Dichloropropane	<0.5
Bromodichloromethane	<0.5
trans-1,3-Dichloropropene	<0.5
Toluene	2.5 (B)
cis-1,3-Dichloropropene	<0.5
1,1,2-Trichloroethane	<0.5
Tetrachloroethene	1.7
Dibromochloromethane	<0.5
Chlorobenzene	<0.5
Ethylbenzene	<0.5
1,1,1,2-Tetrachloroethane	<0.5
Bromoform	<0.5
1,3-Dichlorobenzene	<0.5
1,4-Dichlorobenzene	<0.5
1,2-Dichlorobenzene	<0.5
*TOTAL XYLENES	<0.5

*Not 601-602 VOC

(B) = Target analyte was detected in the method blank @ following levels: METHYLENE CHLORIDE 0.8 / TOLUENE 1.8

National Chem Lab, Inc.
103 12th Ave. S.W.
Ephrata, WA 98823

VOLATILE ORGANIC CHEMICAL (VOC) REPORT

stomer : GRANT COUNTY PUBLIC WORKS
dress : 35 "C" STREET
ty : EPHRATA
te ZIP : WA 98823

SAMPLE OF COMPLETED WELL WATER

WATER SAMPLE INFORMATION FOR VOLATILE ORGANIC CHEMICAL ANALYSIS

NON COMPOSITED

unty :	GRANT	Lab Number :	10990918
ystem Name :	PENDING	Date Collected :	09-09-93
ystem Id Number :	PENDING	Date Tested :	09-13-93
DH Source Number :	PENDING	EPA Method	524.2
ource Type :	WELL		

RESULTS OF ANALYSIS BY EPA METHOD 524.2

Measurement of Purgeable Organic Compounds in Water by Capillary Column
Gas Chromatography/Mass Spectrometry (GC/MS)

alyst :	Steve Boswell	Date of Report :	09-22-93
ata File :	WE3090918	Supervisors Initials :	

Regulated Compounds

PA Code #	Compound Name	* MCL (µg/L)	Amount (µg/L)
2976	VINYL CHLORIDE	2	0.0
2977	1,1-DICHLOROETHYLENE	7	0.0
2981	1,1,1-TRICHLOROETHANE	200	0.0
2982	CARBON TETRACHLORIDE	5	0.0
2990	BENZENE	5	0.0
2980	1,2-DICHLOROETHANE	5	0.0
2984	TRICHLOROETHYLENE	5	0.0
2969	P-DICHLOROBENZENE	75	0.0

* Maximum Contaminant Level

NOTE: An amount of 0.0 µg/L indicates that the true concentration is less than the method detection imit of 0.5 µg/L.

RESULTS OF ANALYSIS BY EPA METHOD 524.2 (continued)

Lab Number : 10990918
Data File : WE3090918

Unregulated Compounds
Monitoring Required

EPA Code #	Compound Name	*Amount (µg/L)
2210	CHLOROMETHANE	0.0
2214	BROMOMETHANE	0.0
2216	CHLOROETHANE	0.0
2964	METHYLENE CHLORIDE	0.0
2979	T-1,2-DICHLOROETHYLENE	0.0
2978	1,1-DICHLOROETHANE	0.0
2416	2,2-DICHLOROPROPANE	0.0
2380	CIS-1,2-DICHLOROETHYLENE	0.0
2410	1,1-DICHLOROPROPENE	0.0
2983	1,2-DICHLOROPROPANE	0.0
2408	DIBROMOMETHANE	0.0
2991	TOLUENE	0.0
2985	1,1,2-TRICHLOROETHANE	0.0
2987	TETRACHLOROETHYLENE	0.0
2412	1,3-DICHLOROPROPANE	0.0
2989	CHLOROBENZENE	0.0
2986	1,1,1,2-TETRACHLOROETHANE	0.0
2992	ETHYL BENZENE	0.0
2995	M/P-XYLENE	0.0
2997	O-XYLENE	0.0
2996	STYRENE	0.0
2993	BROMOBENZENE	0.0
2414	1,2,3-TRICHLOROPROPANE	0.0
2988	1,1,2,2-TETRACHLOROETHANE	0.0
2965	O-CHLOROTOLUENE	0.0
2966	P-CHLOROTOLUENE	0.0
2967	M-DICHLOROBENZENE	0.0
2968	O-DICHLOROBENZENE	0.0
2224	T-1,3-DICHLOROPROPENE	0.0
2228	CIS-1,3-DICHLOROPROPENE	0.0

NOTE: An amount of 0.0 µg/L indicates that the true concentration is less than the method detection limit of 0.5 µg/L.

RESULTS OF ANALYSIS BY EPA METHOD 524.2 (continued)

Lab Number : 10990918
Data File : WE3090918

Unregulated Compounds
Monitoring Required

EPA Code #	Compound Name	*Amount (µg/L)
2212	DICHLORODIFLUOROMETHANE	0.0
2218	TRICHLOROFLUOROMETHANE	0.0
2430	BROMOCHLOROMETHANE	0.0
2994	ISOPROPYLBENZENE	0.0
2998	N-PROPYLBENZENE	0.0
2424	1,3,5-TRIMETHYLBENZENE	0.0
2426	TERT-BUTYLBENZENE	0.0
2418	1,2,4-TRIMETHYLBENZENE	0.0
2428	SEC-BUTYLBENZENE	0.0
2030	P-ISOPROPYLTOLUENE	0.0
2422	N-BUTYLBENZENE	0.0
2378	1,2,4-TRICHLOROBENZENE	0.0
2248	NAPHTHALENE	0.0
2246	HEXACHLOROBUTADIENE	0.0
2420	1,2,3-TRICHLOROBENZENE	0.0
2946	*ETHYLENE DIBROMIDE (EDB)†*	*0.0*
2931	*1,2-DIBROMO-3-CHLOROPROPANE (DBCP)†*	*0.0*
	Trihalomethanes (THM)	
2941	CHLOROFORM	0.0
2943	BROMODICHLOROMETHANE	0.0
2944	CHLORODIBROMOMETHANE	0.0
2942	BROMOFORM	0.0

NOTE: An amount of 0.0 µg/L indicates that the true concentration is less than the method detection limit of 0.5 µg/L.

† EDB & DBCP included for screening purposes only. Compliance samples must be done by EPA method 504 (microextraction with hexane & GC/ECD) to reach the ultra-trace detection limits.

National Chem Lab

103 12th Ave S.W. , Ephrata, Wa 98823
(509)754-5725

WATER SAMPLE INFORMATION FOR INORGANIC CHEMICAL ANALYSES

Fill out boxes numbered 1 thru 14.

Laboratory Number: 109-90918

Date Received: 09-09-93

1. Date Collected: 09-09-93
2. System Name: PENDING
3. System Id #: PENDING
4. Group(A or B): PENDING
5. County: GRANT
6. Source Type:
   - [ ] Surface
   - [ ] Spring
   - [X] Well
   - [ ] Purchase
7. Sample Taken
   - [X] Before Treatment
   - [ ] After Treatment
8. Source Number: PENDING
9. Source Name: PENDING
10. Collected by: STEVE SWOPE
    Phone 206-329-0141
11. If taken after treatment, list treatment as:
    - [ ] Fluoridation
    - [ ] Chlorination
    - [ ] Filtration
    - [ ] Water Softener
    - [ ] Type:
    - [ ] Other:
12. If taken from distribution, indicate address:
13. Party to pay for testing: GRANT COUNTY PUBLIC WORKS
    Signature:
    Name: MIKE MURRAY
    Address: 35 "C" STREET
    Phone #: 754-2011
14. Remarks:

Laboratory Report

TESTS		MCL[1]	Less Than <	Results	Units	Compeance Yes	Compeance No	Chemist Initials
Antimony	Sb	0.006			mg/l			
Arsenic P	As	0.05	<	0.010	mg/l	X		WO
Barium P	Ba	2.0	<	00.10	mg/l	X		WO
Beryllium	Be	0.004			mg/l			
Cadmium P	Cd	0.01	<	0.002	mg/l	X		WO
Chromium P	Cr	0.1	<	0.010	mg/l	X		WO
Copper	Cu	1.0[2]	<	00.02	mg/l	X		WO
Iron	Fe	0.3	<	00.05	mg/l	X		WO
Lead P	Pb	0.05[2]	<	0.002	mg/l	X		WO
Manganese	Mn	0.05	<	0.010	mg/l	X		WO
Mercury P	Hg	0.002	<	.0005	mg/l	X		WO
Nickel	Ni	0.1			mg/l			
Selenium P	Se	0.05	<	0.005	mg/l	X		WO
Silver P	Ag	0.1	<	0.010	mg/l	X		WO
Sodium P	Na			17.2	mg/l	X		WO
Thallium	Tl	0.002			mg/l			
Zinc	Zn	5.0	<	00.05	mg/l	X		WO
Hardness				88	mg/l as CaCO3	X		DD
Conductivity		700		268	µmhos/cm @25°C	X		DD
Turbidity P		1.0		0.5	NTU	X		DD
Color		15.0	<	5.0	Color Units	X		DD
Chloride	Cl	250	<	20	mg/l	X		DD
Cyanide	CN	0.2			mg/l			
Fluoride P	F	2.0	<	0.5	mg/l	X		DD
Nitrate P	as N	10.0	<	0.5	mg/l	X		DD
Nitrite	as N	1.0			mg/l			
Sulfate	SO_4	250		14	mg/l	X		DD
TDS		500		202	mg/l	X		DD

Laboratory Comments:

Charge:	Laboratory Supervisor:	Date of Report:
$375.00	Gary Miller G.R.M.	09-23-93

[1]MCL = Maximum Contamination Level, [2]This is the State MCL, Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper, P = Primary Standard, TDS = Total Dissolved Solids

APPENDIX D
HYDROGEOLOGIC CONDITIONS AND GROUNDWATER TRAVEL TIMES

APPENDIX D – HYDROGEOLOGIC CONDITIONS

1.0 GEOLOGIC SETTING **1**

2.0 HYDROGEOLOGIC CONDITIONS **2**

2.1 AQUIFERS AND AQUITARDS 2
2.1.1 Outwash Aquifer *2*
2.1.2 Ringold Aquitard and Aquifer *3*
2.1.3 P1 and P2 Zones *3*
2.1.4 Roza Aquifer *3*
2.1.5 Interflow Aquifer *4*
2.1.6 Frenchman Springs Aquifer *4*
2.1.7 Vantage Interbed Aquitard *5*
2.1.8 Grande Ronde Aquifer *5*
2.2 GROUNDWATER TRAVEL TIMES 6
2.2.1 Horizontal Travel Time between Original Landfill and Well *6*
2.2.2 Vertical Travel Time between Original Landfill and Well *7*

3.0 REFERENCES **8**

1.0 GEOLOGIC SETTING

The site is underlain by a thick sequence of relatively flat-lying basalt flows that make up of the Wanapum and Grand Ronde Formations of the Columbia River Basalt Group (CRB). Both formations consist of multiple dense (hard) basalt flows. Sediments, residual soil and weathered basalt between individual basalt flows are referred to as interflow zones. The interflow zones form the permeable horizons within the basalt where aquifers may form.

The Wanapum and Grand Ronde Formations are separated from each other by the Vantage Member of the Ellensburg Formation (an ash-rich intercalated siltstone and claystone). The Vantage occurs at a depth of about 350 feet below the site and is about 25 to 30 feet thick.

The top of the Wanapum outcrops at the northern end of the site but to the south, east, and west, the top of the Wanapum basalt has been eroded into deep channels and troughs. These erosional depressions were later filled with ancestral lake and river sediments that comprise the Ringold Formation and sand-and-gravel deposits that comprise Outwash deposits associated with the Pleistocene floods.

The following section summarizes the hydrogeologic conditions at the site, including a discussion of aquifers, aquitards, groundwater flow direc-

tions, and seepage velocities. The last section provides groundwater travel time calculations between potential contaminant sources and the landfill's water supply well.

2.0 HYDROGEOLOGIC CONDITIONS

This section discusses the physical aspects of aquifers and aquitards present at the site. The aquifers are discussed in the order they occur beneath the surface. On-site groundwater moves through the aquifers starting from the shallowest aquifers at the north end of the site and moving both vertically downward to deeper aquifers and horizontally southward in the direction of regional groundwater flow. The aquifers along this flow path include the P1 and P2 zones, Roza aquifer, Interflow aquifer, and Outwash aquifer. The Ringold, Frenchman Springs, and Grande Ronde aquifers do not occur along this primary flow path.

A north-to-south hydrogeologic cross section is shown in Figure D-1. The cross-section alignment (B to B') is shown in Figure 1 of the main report.

2.1 AQUIFERS AND AQUITARDS

The area aquifers include saturated portions of the Outwash sand-and-gravel, a permeable water bearing sandstone associated with the Ringold Formation and weathered and fractured zones within basalt layers.

Aquitards are low permeability strata that restrict water movement between aquifers. Basalt aquitards are typically dense (hard), non-weathered columnar basalt sections within individual basalt flows. Low permeability sedimentary layers in the Ringold and Vantage also act as aquitards. Aquifer and aquitard thicknesses, depths, and extents vary across the site (Figure D1).

Vertical gradients in the basalt aquifers at the site are downward; however, the great differences in permeability between the basalt aquifers and basalt aquitards promotes the horizontal movement of groundwater and restricts vertical movement.

2.1.1 Outwash Aquifer

The Outwash aquifer is an unconfined aquifer composed of saturated sands and gravels that overlie the basalt bedrock or the Ringold Formation (Figure D1). The aquifer occurs south, east, and west of the site where the top of basalt decreases to less than 1190 feet elevation (about 500 feet south of the landfill's water supply well).

The Outwash aquifer is highly transmissive but the hydraulic gradient is very low and as such seepage velocities are also relatively low (about 8 ft/year). The groundwater flow direction in the Outwash aquifer is generally towards the south.

2.1.2 Ringold Aquitard and Aquifer

The Ringold Formation is composed of partially cemented sediments above basalt that form both aquifers and aquitards near the site. At the south end of the site, the top of the Ringold is characterized by low permeable interbeds of silty sandstone, siltstone, and claystone at least 70 ft thick forming an aquitard below the Outwash aquifer (Figure D1). The full thickness and character of the Ringold at the south end of the site is unknown.

Off-site to the east a number of private wells target a water bearing sandstone above the basalt, interpreted as the Ringold. The Ringold is not present at the location of the landfill's water supply well. Where present, the groundwater flow direction in the Ringold aquifer is thought to be towards the south in the direction of regional groundwater flow; however, direct measurements are not available.

2.1.3 P1 and P2 Zones

The P1 and P2 zones are the shallowest saturated basalt interflow zones that occur at a depth of 45 feet or less of the land's surface. These shallow zones are limited in extent to the north end of the site. Groundwater in these zones may be perched. These discontinuous water-bearing zones have low transmissivity and are not used as water supply aquifers near the site. The P1 and P2 zones are not present at the location of the landfill's water supply well, but they are important zones for contributing groundwater recharge to the underlying Roza aquifer at the north end of the site (Figure D1).

2.1.4 Roza Aquifer

The Roza aquifer occurs below the P2 zone and is generally separated from the P2 by about 20 feet of dense basalt. The Roza is a shallow confined basalt aquifer within an interflow zone also limited to the north end of the site. The Roza is not present at the location of the landfill's water supply well (33M1). The aquifer pinches out approximately 1000 feet north of 33M1.

The Roza is highly heterogeneous and laterally discontinuous and as such variable flow directions and seepage velocities are observed in the Roza. Groundwater seepage velocities in the Roza vary by three orders of magnitude (1 to 500 ft/yr). The overall groundwater flow direction in the Roza

at the north end of the site appears to be north-northeast with discharge towards a depression in the bedrock northeast of the site (near MW-53a in Figure 1 of main report). Limited discharge from the Roza aquifer also occurs downward to the underlying Interflow aquifer under a vertical gradient of 0.9 ft/ft.

The groundwater elevation in the Roza is about 50 feet higher than the groundwater elevation in the Interflow and Outwash aquifers, indicating a poor hydraulic connection with these two aquifers. The poor hydraulic connection is a result of the underlying aquitard (about 50 feet of dense basalt separates the Roza from the underlying Interflow aquifer) and lateral pinch-outs in the aquifer.

2.1.5 Interflow Aquifer

The Interflow aquifer is a confined basalt aquifer that occurs below the Roza but above the Frenchman Springs (Figure D1). It is separated from the Roza by about 50 feet of dense basalt and occurs at a relatively broad range of depths, suggesting this aquifer represents more than on interflow zone.

The Interflow Aquifer is relatively homogenous compared to the overlying Roza and underlies the entire northern part of the site, including the location of the landfill's water supply well (33M1). South of the original landfill, the aquifer sub-crops into the Outwash aquifer (Figure D1). The Interflow aquifer is targeted for water supply by some wells east of the site.

The groundwater flow direction in the Interflow aquifer beneath the site is towards the south with discharge to the Outwash aquifer (Figure D1). The hydraulic gradient is very low (0.0002 to 0.0004 ft/ft), with a seepage velocity of about 10 ft/yr. Limited downward flow into the Frenchman Springs aquifer is also likely and would occur under a vertical gradient of about 0.3 ft/ft; however the dominant direction of groundwater flow is horizontal towards the Outwash aquifer.

2.1.6 Frenchman Springs Aquifer

The Frenchman Springs aquifer is a relatively permeable basalt interflow zone near the bottom of the Wanapum Formation. The Frenchman Springs occurs at a depth of about 300 feet below ground surface and 170 feet below the Interflow aquifer at the location of the landfill's water supply well (Figure D1).

Most groundwater enters the Frenchman Springs from recharge along the Beezley Hills northwest of the site, where the aquifer outcrops. Limited vertical leakage from the overlying Interflow aquifer may also occur.

The landfill's old water supply well (33E1) was originally completed as an open borehole to the Frenchman Springs aquifer until 1986. The old well was eventually decommissioned and replaced by the current well (33M1) in 1993 due to low level VOC detections in the old water supply well. The old supply well was located at the northeast corner of the site (about 1500 feet north of the current well) near sources of shallow groundwater contamination (see Figure 1 main report). The open borehole may have contributed to vertical migration of low level groundwater contaminants to the Frenchman Springs aquifer in the past.

The horizontal groundwater flow direction in the Frenchman Springs has not been measured directly at the site, but it is predicted to be southeast in the direction of regional groundwater flow.

Because the Vantage aquitard underlies the Frenchman Springs aquifer, exchange of groundwater between the Frenchman Springs and Grande Ronde aquifers is highly restricted. The relative lack of vertical groundwater flow causes movement within this aquifer to be mostly horizontal. Discharge from this aquifer likely occurs far away at regional hydrologic sinks such as Moses Lake. Discharge also occurs through pumping wells.

2.1.7 Vantage Interbed Aquitard

The Vantage Interbed forms a laterally extensive regional aquitard between the overlying aquifers in the Wanapum basalt and deeper aquifers in the Grande Ronde basalt (Figure D1). The aquitard is characterized as an ash-rich siltstone and claystone (Vaccaro, 1999). The Vantage aquitard is about 30 feet thick at the site and was encountered at a depth of 342 feet bgs during the drilling of water-supply well 33M1. During drilling of 33M1 the water levels dropped significantly (greater 175 ft) after penetrating the Vantage, indicating the Vantage is a substantial aquitard restricting vertical flow. Groundwater in the overlying Wanapum basalts appears to be perched on top of the Vantage aquitard.

2.1.8 Grande Ronde Aquifer

The Grande Ronde aquifer is a combination of transmissive interflow zones below the Vantage Interbed. The many interflows occur over thousands of feet of layered basalt, but only the upper few hundred feet have been penetrated by wells in the vicinity of the site, including water supply well 33M1.

Because the overlying Vantage interbed restricts downward flow of groundwater into the Grande Ronde aquifer, recharge is concentrated in areas where the aquifer is exposed at ground surface such as the Beezley

Hills northwest of the site. Vertical downward flow through the Vantage interbed may occur, but is extremely slow.

The groundwater flow direction in the Grand Ronde has not been measured directly at the site, but it is predicted to be southeast in the direction of regional groundwater flow.

2.2 GROUNDWATER TRAVEL TIMES

The nearest source of potential groundwater contamination to the landfill's water supply well (33M1) is the original unlined landfill, located about 200 feet northeast of 33M1 and the new lined landfill, located about 1350 feet south of 33M1 (Figure 2 of main report). Long-term groundwater monitoring at the landfill indicates groundwater quality in the shallow aquifers above the Vantage aquitard is contaminated. Contaminants detected in the shallow groundwater include landfill leachate salts and metals and volatile organic compounds (VOCs). Groundwater contaminant concentrations are highest in the shallowest aquifers at the north end of the original landfill and decrease significantly with both lateral distance and vertical depth.

The landfill's water supply well is cased with heavy wall steel below the Vantage aquitard (see Appendix C) and draws water from the Grand Ronde through an opened interval 395 to 640 feet below ground surface (bgs). The Grand Ronde aquifer is protected from groundwater contaminants in the overlying shallow aquifers mainly as a result of the Vantage aquitard.

The following two sections provide the results of calculated groundwater travel times (both horizontal and vertical) between the original landfill and the landfill's water supply well. The new lined landfill is located over 1000 ft downgradient (south) of the landfill's water supply well and is not considered a potential source of contamination to the landfill's water supply well.

2.2.1 Horizontal Travel Time between Original Landfill and Well

The main aquifer above the Vantage aquitard which could transmit contaminants horizontally from the original landfill towards the landfill's water supply well (33M1) is the Interflow aquifer (Figure D1). The calculated horizontal travel time in this aquifer between the original landfill and well 33M1 is:

$$(Dh)/(Vh) = (200\ ft)/(10\ ft/yr) = \underline{20\ Years}$$

where Dh = horizontal distance between landfill and well
Vh = horizontal seepage velocity of Interflow aquifer

Given the vertical separation between the Grand Ronde and the original landfill, vertical travel times presented below provide a better assessment of risk.

2.2.2 Vertical Travel Time between Original Landfill and Well

Vertical groundwater flow between the original landfill and well 33M1 is limited by a number of aquitards that separate multiple overlying aquifers from the Grand Ronde source aquifer, including the overlying regional Vantage aquitard.

Vertical flow along the well bore is not expected to occur given the stringent well construction design. The well was sealed with 12-inch steel casing cement grouted in place to a depth of 150 feet, and with 9-inch extra heavy steel casing cement grouted in place to a depth of 395 feet (see Appendix C). Vertical travel times through overlying aquitards are calculated below.

Vertical gradients across overlying aquitards have been measured at the site; however, aquitard properties (Kv and n) have not been measured directly and are therefore estimated from published values (see Section 3 below). Three aquitards are known to separate the original landfill from well 33M1 (Table D1). The total vertical travel time through all three aquitards is calculated as follows:

Total Vertical Travel Time (Tt) = Σ Tv (1)

Where Tv = vertical travel time through each aquitard

Vertical Travel Time (Tv) = b/Vv (2)

Where b = aquitard thickness
Vv = vertical seepage velocity

Vertical Seepage Velocity (Vv) = Kv*grad/n (3)

Where Kv = vertical hydraulic conductivity
grad = vertical gradient
n = effective porosity

Since vertical hydraulic conductivity values can vary over many orders of magnitude, the above calculations are performed using maximum, average, and minimum estimates of Kv, resulting in minimum, average, and maximum travel time estimates (Table D1).

The above equations assume 100% saturation and therefore can not be used to calculate vertical flow between the bottom of the Vantage and the top of the Grand Ronde aquifer due to the presence of a thick unsaturated zone (over 100 feet) below the Vantage. Instead unsaturated flow is assumed for this zone and calculated travel times are based on 1-D steady-state flow out of the bottom of the Vantage aquitard. Under this assumption the specific discharge out of the bottom of the Vantage aquitard equals the specific discharge through the unsaturated zone and the vertical travel time through the unsaturated zone is calculated as follows:

$$q_v = q_{unsat} \quad (4)$$

Where q_v = Vantage specific discharge = $Vv*n_v$

V_v = vertical seepage velocity through Vantage
n_{unsat} = Effective porosity of Vantage

q_{unsat} = Unsaturated zone specific discharge = $V_{unsat}*n_{unsat}$

V_{unsat} = vertical seepage velocity through unsaturated zone
n_{unsat} = Effective porosity of unsaturated zone

Solving for V_{unsat}:

$$V_{unsat} = V_v*n_v/n_{unsat} \quad (5)$$

$$\text{Vertical Travel Time Unsaturated Zone } (T_{vunsat}) = b/ V_{unsat} \quad (6)$$

Where b = thickness of unsaturated zone

The results of these calculations indicate the total vertical travel time between the original landfill and the landfill's water supply well is at a minimum about <u>100 years</u>, but very likely up to many <u>1000's of years</u> (Table D1).

These findings are consistent with recent groundwater age dating investigations for the Columbia Basin Groundwater Management Area (GWMA), which indicate much of the deeper groundwater in the Grand Ronde is many 1000's of year old (Vlassopoulos et al, 2009).

3.0 REFERENCES

Bauer, H.H. and Hansen, A.J., Jr., 2000. *Hydrology of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho.* U.S. Geological Survey Water Resources Investigation Report 96-4106

Domenico, P.A. and Schwartz, F.W., 1998. *Physical and Chemical Hydrogeology*, second edition. John Wiley & Sons, Inc.

Freeze, A.R. and Cherry, J.A., 1979. *Groundwater*. Prentice-Hall, Inc.

Vaccaro, J.J. 1999. *Summary of the Columbia Plateau Regional Aquifer-System Analysis, Washington, Oregon, Idaho.* U.S. Geological Survey Professional Paper 1413-A.

Vlassopoulos, D., Karanovic, M., Johnson, V., Gazis, C.A., Tolan, T. and Linsey K.A. *Groundwater Recharge and Residence Times in the Columbia River Basalt Aquifer System, Washington.* Geological Society of America, 2009 Annual Meeting. Abstract Paper No. 131-5.

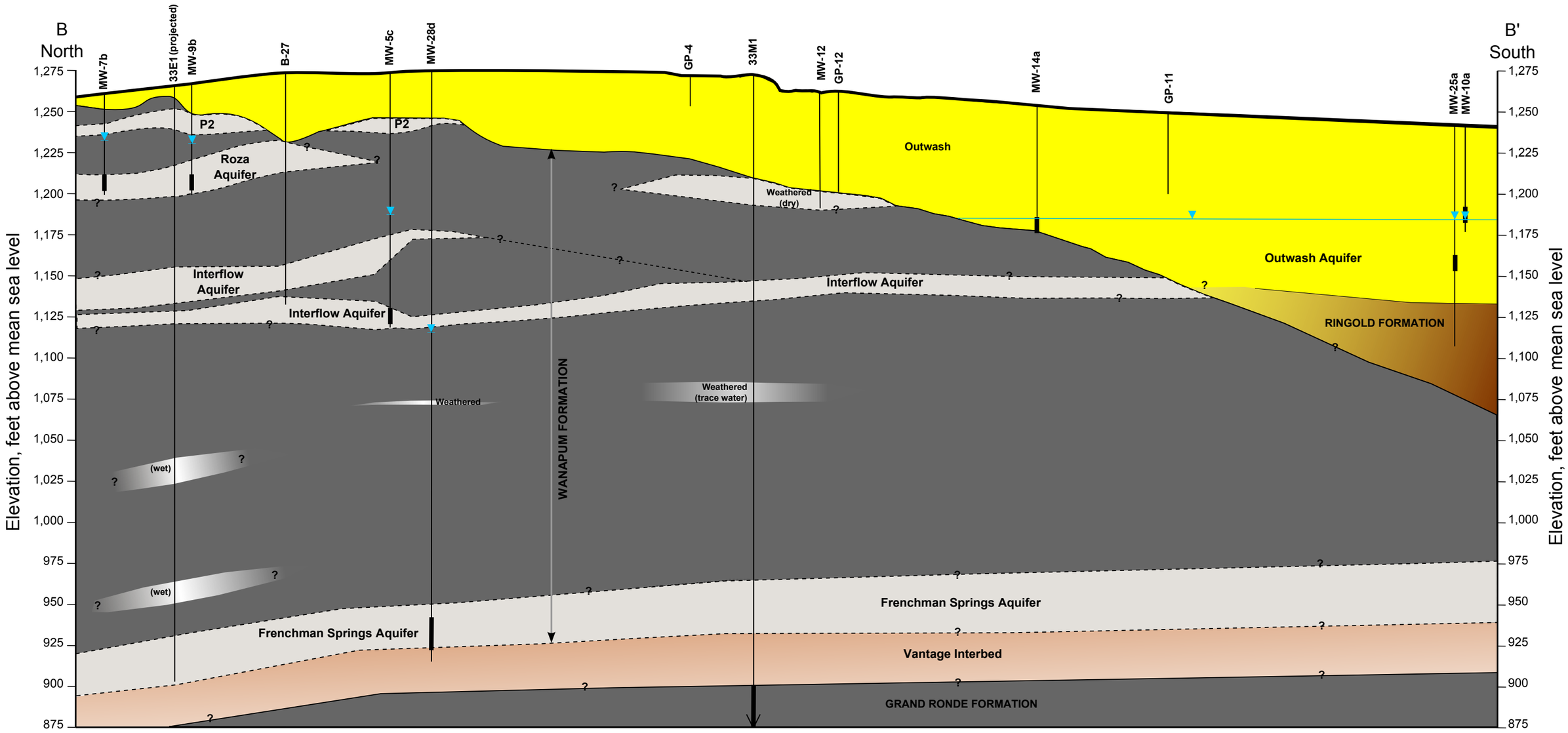
Whiteman, K.J., Vaccaro, J.J., Gonthier, J.B. and Bauer, H.H., 1994. *The Hydrogeologic Framework and Geochemistry of the Columbia Plateau Aquifer System, Washington, Oregon, and Idaho*. U.S. Geological Survey Professional Paper 1413-B.

Table D1. Calculation of Vertical Travel Time between Original Landfill and Landfill's Water Supply Well

PARAMETERS										MIN ESTIMATE		AVG ESTIMATE		MAX ESTIMATE	
Hydrogeologic Unit	Bot Elv[1] (ft)	Groundwater head, h (ft)	Delta head[2], Δh (ft)	Thickness, b (ft)	Vertical Gradient, Δh/b (ft/ft)	Maximum Vertical Hydraulic Conductivity[3], Kv (ft/dy)	Average Vertical Hydraulic Conductivity[3], Kv (ft/dy)	Mimimum Vertical Hydraulic Conductivity[3], Kv (ft/dy)	Effective Porosity[4] (n)	Vertical Seepage Velocity, Vv = Kv*i/n x 365 (ft/yr)	Travel Time[6], T = b/Vv (yr)	Vertical Seepage Velocity, Vv = Kv*i/n x 365 (ft/yr)	Travel Time[6], T = b/Vv (yr)	Vertical Seepage Velocity, Vv = Kv*i/n x 365 (ft/yr)	Travel Time[6], T = b/Vv (yr)
Roza Aquifer	1200	1232		20											
Basalt Aquitard	1135		46	65	0.708	2.30E-03	3.10E-05	4.30E-08	0.02	29.71	2.2	4.00E-01	162	5.55E-04	117,041
Interlfow Aquifer	1118	1186		17											
Basalt Aquitard	967		66	151	0.437	2.30E-03	3.10E-05	4.30E-08	0.02	18.35	8.2	2.47E-01	611	3.43E-04	440,229
Frenchman Springs Aquifer	930	1120		37											
Vantage Aquitard	903		217	27	8.037	3.90E-05	1.04E-06	2.80E-08	0.35	0.33	83	8.76E-03	3,083	2.35E-04	115,050
Unsaturated Zone	791			112					0.02	5.7	19.6	1.5E-01	730.7	4.1E-03	27,271
Grand Ronde Aquifer	Unknown	481		Unknown											
TOTAL VERTICAL TRAVEL TIME, Tt											113		4,586		699,590

Notes

1. Bottom Elevations based on well logs (MW-9b, MW-5c, and 33M1)
2. Delta head is the difference in groundwater head in the aquifer above and below the aquitard.
   Given the unsaturated zone below the Vantage, the Δh across the Vantage is calculated as the difference between the head in overlying Frenchman Springs aquifer and Bottom Elevation of the Vantage
3. An upper and lower bound Kv value for basalt is based on values reported in Vaccaro (1999)
   An upper and lower boound Kv value for the Vantage is based on upper and lower bound Kh values for siltstone in Domenico and Schwartz (1998) and an assumed anisotropy of 100:1
4. Effective porosity values for the basalt aquitards are estimated from values reported in Whiteman (1994).
   Values for the Vantage are based on lower bound estimates of porosity for siltstone in Freeze and Cherry (1979)
5. 1-D pore volume assume 10% moisture content (θ)
6. Travel time between basalt aquitards calculated as thickness/seepage velocity (b/Vv).
   Travel time through unsaturated zone based on 1D vertical steady flow calcualtion out of bottom of Vantage aquitard (see text).



LEGEND

- Outwash
- Ringold Fm
- Basalt
- Vantage Interbed
- Soft, Weathered Basalt

Well ID

Static Water Level

Screen

Vertical Exaggeration = 5x

0 — 1,000 ft

Figure D1
North-South Hydrogeologic Cross Section (B-B')

See Figure 1 for Section Alignment

Ephrata Landfill RI/FS

Filename: X-section B-B' NEW5.svg

PgG

APPENDIX E
WELL HEAD CAPTURE ZONES

APPENDIX E – WELL HEAD PROTECTION AREA

The well head protection area (WHPA) for the Ephrata Landfill water supply well includes four zones:

- Sanitary Control Area (SCA): 100-ft radius buffer with restrictions in landuse that may contribute to potential contamination.
- Zone 1: 1-year horizontal time of travel boundary
- Zone 2: 5-year horizontal time of travel boundary
- Zone 3: 10-year horizontal time of travel boundary

Boundaries for zones 1 through 3 were delineated using the Calculated Fixed Radius (CFR) Method. Given the uncertainty in the Grand Ronde groundwater gradient, a fixed radius method was deemed most appropriate for delineating well head protection areas. Horizontal and Vertical travel times are assessed further in Appendix D.

The results of the CFR are presented in Table E1 and plotted in Figure 2 of the main report. A copy of the CFR method is also attached. GIS coverages of the WHPA will be provided to the DOH in electronic format. Potential contaminant sources within the CFRs are summarized and discussed in Part C of the main report. Potential contaminant sources identified in each zone are:

Sanitary Control Area (SCA): None (area has been cleared)

- The evaporation pond is scheduled to be relocated after completion of the new facility (late 2011 or early 2012).
- Shallow groundwater contamination

Zone 1 (1-year) – Same as SCA plus:

- Original unlined landfill. Closed and capped in 2008.
- Stormwater infiltration structures associated with the non-contact storm water collection system for the capped original landfill.

Zone 2 (5 year) - Same as Zone 1 plus:

- Clay Pond: Runoff collection pond located about 1000 feet northwest of supply well. Collects runoff from limited areas to the north.

Zone 3 (10 year) – Same as Zone 2 plus:

- New lined landfill. Active.
- Current Maintenance Facility and Recycling Center (household hazardous waste collection, above ground fuel tanks, and landfill shop's septic drainfield).

Except for the clay pond, all potential contaminant sources listed above are associated with the Grant County Ephrata Landfill. The clay pond is located on a parcel owned by the U.S. Bureau of Reclamation.

Table E-1 Calculated Fixed Radius Well Head Protection

Time of Travel (yr)	Pumping Rate[1] (gpm)	Pumping Rate (cfy)	Effective Porosity[2] (n)	Open Interval of Aquifer Length[3] (ft)	Radius (ft)
0.5	165	11,600,260	0.15	130	308
1	165	11,600,260	0.15	130	435
5	165	11,600,260	0.15	130	973
10	165	11,600,260	0.15	130	1376

Notes

1. Pumping rate based on source capacity assessment (Section F of main report)
2. Effective porosity is based on estimates for porous basalt flow tops in Table 4 of Whiteman (1994)
3. Based on the well log for 33M1, the open interval of the well to the Grand Ronde water bearing zone is estimated to be from 510 to 640 feet bgs (130 ft)

Whiteman, K.J., Vaccaro, J.J., Gonthier, J.B. and Bauer, H.H., 1994.
The Hydrogeologic Framework and Geochemistry of the Columbia Plateau Aquifer System, Washington, Oregon, and Idaho.
U.S. Geological Survey Professional Paper 1413-B.

APPENDIX F
SOURCE AQUIFER SUSCEPTIBILITY ASSESSMENT

Ground Water Contamination
Susceptibility Assessment Survey Form
Version 2.2

IMPORTANT! Please complete one form for each ground water source (well, wellfield, spring) used in your water system. Photocopy as necessary.

PART I: System Information

Well owner/manager : Grant County Public Works

Water system name : Ephrata Landfill Water Supply Well (33M1)

County: Grant

Water system number: None Source number: None

Well depth: 640 (ft.) (From Well Log) (A WFI Form is included in Appendix I of this application)

Source name: Grand Ronde Aquifer

WA well identification tag number: NONE

X well not tagged

Number of connections: 1 Population served: Landfill activities / 8 employees

Township: 21N Range: 26E

Section: 33 1/4 1/4 Section: NW, SW

Latitude/longitude (if available): 47.2724N / 119.5763W

How was lat./long. determined?

_____ global positioning device _____ survey _____ topographic map
___other: Air Photo

* Please refer to Assistance Packet for details and explanations of all questions in Parts II through V.

PART II: Well Construction and Source Information

1) Date well originally constructed: 8 / 22 / 1993 month/day/year

last reconstruction: 8 / 22 / 1993 month/day/year

_____ information unavailable

2) Well driller: Robert Stadeli of Staco Well Services

__ well driller unknown

3) Type of well:

__Drilled: _X_ rotary __ bored __ cable (percussion) __ Dug

__ Other: __ spring(s) __ lateral collector (Ranney)

__ driven __ jetted __ other:

Additional comments: _____

4) Well report available? _X_ YES (Appendix C) __ NO

If no well log is available, please attach any other records documenting well construction; e.g. boring logs, "as built" sheets, engineering reports, well reconstruction logs.

5) Average pumping rate: 50 to 100 (gallons/min)

Source of information: Pump Specifications

If not documented, how was pumping rate determined? Pump Specifications and head loss

__X__ Pumping rate unknown (estimated)

6) Is this source treated? NO

If so, what type of treatment:

__ disinfection __ filtration __ carbon filter __ air stripper __ other

Purpose of treatment (describe materials to be removed or controlled by treatment):

7) If source is chlorinated, is a chlorine residual maintained: __ YES __ NO (Source Not Chlorinated)

Residual level: _____ (*At the point closest to the source.*)

PART III: Hydrogeologic Information

1) Depth to top of open interval: [check one]

__ < 20 ft __ 20–50 ft __ 50–100 ft __ 100–200 ft _X_ >200 ft

__ information unavailable ('<' *means less than;* '>' *means greater than*)

2) Depth to ground water (static water level):

__ < 20 ft __ 20–50 ft __ 50–100 ft _X_ >100 ft

__ flowing well/spring (artesian)

How was water level determined?

__ well log _X_ other: _____Sounding Tape_____

_ depth to ground water unknown

3) If source is a flowing well or spring, what is the confining pressure:

_____ psi (pounds per square inch)
or
_____ feet above wellhead

4) If source is a flowing well or spring, is there a surface impoundment, reservoir, or catchment associated with this source: __ YES __ NO

5) Wellhead elevation (height above mean sea level): __1272__ (ft)

How was elevation determined? __ topographic map __ Drilling/Well Log __ altimeter

_X_ other: _____Estimated from 2-ft contour land survey of landfill_____

__ information unavailable

6) Confining layers: (This can be completed only for those sources with a drilling log, well log or geologic report describing subsurface conditions. Please refer to assistance package for example.)

_X_ evidence of a confining layer in well log

__ no evidence of a confining layer in well log

If there is evidence of a confining layer, is the depth to ground water more than 20 feet above the **bottom** of the **lowest confining layer**? __ YES _X_ NO (unsaturated zone below confining layer)

__ information unavailable

7) Sanitary setback:

__ < 100 ft* _X_ 100–120 ft __ 120–200 ft __ > 200 ft

* if less than 100 ft describe the site conditions:

_____

_____

_____

_____

8) Wellhead construction:

_X_ wellhead enclosed in a wellhouse

_X_ controlled access (describe): Wellhouse is located on locked gated property and wellhouse door is locked.

__ other uses for wellhouse (describe): None

__ no wellhead control

9) Surface seal:

__ 18 ft

__ < 18 ft (no Department of Ecology approval) ('<' *means less than*)

__ < 18 ft (Approved by Ecology, include documentation)('<' *means less than*)

_X_ > 18 ft Well is sealed with cement grout and cased with heavy wall steel to a depth of 395 ft below ground surface ('>' *means greater than*).

__ depth of seal unknown

__ no surface seal

10) Annual rainfall (inches per year):

_X_ < 10 in/yr __ 10–25 in/yr __ > 25 in/yr

PART IV: Mapping Your Ground Water Resource

1) Annual volume of water pumped: Approximately 470,000 gallons for new building and 3.9 million gallons for irrigation of poplar trees on less than ½ acre (gallons)

How was this determined?

__ meter

__ estimated: __ pumping rate (_____)

__ pump capacity (_____)

__ other: Estimate of required daily production (Section F of main report)

2) "Calculated Fixed Radius" estimate of ground water movement:
(see Instruction Packet)

6 month ground water travel time : 308 (ft)

1 year ground water travel time : 435 (ft)

5 year ground water travel time: 973 (ft)

10 year ground water travel time: 1376 (ft)

Information available on length of screened/open interval?

_X_ YES __ NO

Length of screened/open interval: 130 (ft)

3) Is there a river, lake, pond, stream, or other obvious surface water body within the 6 month time of travel boundary? __ YES _X_ NO (mark and identify on map).

4) Is there a stormwater and/or wastewater facility, treatment lagoon, or holding pond located within the 6 month time of travel boundary? __ YES _X_ NO (mark and identify on map).

Comments: _____

_____

_____

_____

_____

PART V: Assessment of Water Quality

1) Regional sources of risk to ground water:

Please indicate if any of the following are present within a circular area around your water source having a radius up to and including the five year ground water travel time:

	6 month	1 year	5 year	unknown
likely pesticide application	_____	_____	_____	___X__
stormwater ~~injection wells or~~ disposal areas	_____	__ X ___	__ X ___	_____
other injection wells or disposal areas	_____	_____	_____	_____
abandoned ground water well	_____	_____	_____	_____
landfills, dumps, disposal areas	_____	__ X ___	__ X ___	_____
known haz. materials/cleanup site	_____	_____	_____	_____
water system(s) w/known quality problems	_____	_____	_____	_____
population density > 1 house/acre	_____	_____	_____	_____
residences commonly have septic tanks	_____	_____	_____	_____
Wastewater treatment lagoons	_____	_____	_____	_____
sites used for land application of waste	_____	_____	_____	_____

Mark and identify on map any of the risks listed above which are located within the 6 month time of travel boundary? (*Please include a map of the wellhead and time of travel areas with this form. Please locate and mark any of the following.*) **– See Figure 2 of Main Report**

If other recorded or potential sources of ground water contamination exist within the ten year time of travel circular zone around your water supply, please describe:

Shallow groundwater above the Vantage aquitard is contaminated. Contaminants detected in shallow groundwater include landfill leachate salts and metals and volatile organic compounds (VOCs). The landfill's water supply well draws groundwater from the deeper non-impacted Grand Ronde basalt aquifer, beneath the Vantage aquitard. The supply well is cased through multiple aquitards, including the Vantage, with heavy wall steel casing to a depth of 395 feet. Groundwater vertical travel time calculations between intervening aquitards and the Grand Ronde is up to 1000's of years (Appendix D).

2) Source specific water quality records:

Please indicate the occurrence of any test results since 1986 that meet the following conditions: (Unless listed on assessment, MCLs are listed in assistance package.)

A. Nitrate: (Nitrate MCL = 10 mg/l)

Results greater than MCL ..... NO
< 2 mg/liter nitrate ..... YES
2–5 mg/liter nitrate ..... NO
> 5 mg/liter nitrate ..... NO
Nitrate sampling records unavailable ..... NO

B. VOCs: (VOC detection level 0.5 ug/l or 0.0005 mg/l.)

Results greater than MCL or SAL ..... NO
VOCs detected at least once ..... NO
VOCs never detected ..... YES
VOC sampling records unavailable NO

C. EDB/DBCP:

(EDB MCL = 0.05 ug/l or 0.00005 mg/l. DBCP MCL = 0.2 ug/l or 0.0002 mg/l.)

EDB/DBCP detected below MCL at least once ..... NO
EDB/DBCP detected above MCL at least once ..... NO
EDB/DBCP never detected ..... YES
EDB/DBCP tests required but not yet completed ..... NO
EDB/DBCP tests not required..... NO

D. Other SOCs (Pesticides):

Other SOCs detected ..... NO
(pesticides and other synthetic organic chemicals)
Other SOC tests performed but none detected..... YES

(list test methods in comments)

Other SOC tests not performed…… NO

If any SOCs in addition to EDB/DBCP were detected, please identify and date. If other SOC tests were performed, but no SOCs detected, list test methods here: _____

Method 508.1 (Pesticides by 525 Washington State

Method 525.2 (Pesticides by 525 Washington State)

E. Bacterial contamination:

Any bacterial detection(s) in the past 3 years in samples taken from the source (not distribution sampling records) ..... NO

Has source (in past 3 years) had a bacteriological contamination problem found in distribution samples that was attributed to the source. … . NA

Source sampling records for bacteria unavailable……. NO

Part VI: Geographic or Hydrologic Factors Contributing to a Non-Circular Zone of Contribution

The following questions will help identify those ground water systems which may not be accurately represented by the calculated fixed radius (CFR) method described in Part IV. For these sources, the CFR areas should be used as a preliminary delineation of the critical time of travel zones for that source. As a system develops its Wellhead Protection Plan for theses sources, a more detailed delineation method should be considered.

1) Is there evidence of obvious hydrologic boundaries within the 10 year time of travel zone of the CFR? (Does the largest circle extend over a stream, river, lake, up a steep hillside, and/or over a mountain or ridge?)

__ YES _X_ NO

Describe with references to map produced in Part IV:

_____

_____

2) Aquifer Material:

A) Does the drilling log, well log or other geologic/engineering reports identify that the well is located in an area where the underground conditions are identified as fractured rock and/or basalt terrain?

_X_ YES __ NO

B) Does the drilling log, well log or other geologic/engineering reports indicate that the well is located in an area where the underground conditions are primarily identified as coarse sand and gravel?

__ YES _X_ NO

3) Is the source located in an aquifer with a high horizontal flow rate? (These can include sources located on flood plains of large rivers, artesian wells with high water pressure, and/or shallow flowing wells and springs.)

__ YES _X_ NO

4) Are there other high capacity wells (agricultural, municipal and/or industrial) located within the CFRs? NO

a) Presence of ground water extraction wells removing more than approximately 500 gal/min within...

	YES	NO	unknown
< 6 month travel time	___	_X__	____
6 month–1 year travel time	___	_X__	____
1–5 year travel time	___	_X__	____
5–10 year travel time	___	_X__	____

b) Presence of ground water recharge wells (dry wells) or heavy irrigation within...

	YES	NO	unknown
< 1 year travel time	___	_X__	____
1–5 year travel time	___	_X__	____
5–10 year travel time	___	_X__	____

Please identify or describe additional hydrologic or geographic conditions that you believe may affect the shape of the zone of contribution for this source. Where possible, reference them to locations on the map produced in Part IV.

_____

_____

_____

_____

_____

_____

_____

_____

Suggestions and Comments

Did you attend one of the susceptibility workshops? __ YES _X_ NO

Did you find it useful? __ YES __ NO

Did you seek outside assistance to complete the assessment? ___YES _X_ NO
(Completed by Pacific Groundwater Group – Seattle, WA)

- -

This form and instruction packet are still in the process of development. Your comments, suggestions and questions will help us upgrade and improve this assessment form. If you found particular sections confusing or problematic please let us know. How could this susceptibility assessment be improved or made clearer? Did the instruction package help you find the information needed to complete the assessment? How much time did it take you to complete the form? Were you able to complete the assessment without additional/outside expertise? Do you feel the assessment was valuable as a learning experience? Any other comments or constructive criticisms you have would be appreciated.

APPENDIX G
SANITARY CONTROL COVENANTS

Grant County Public Works
Attn: Derek Pohle, Public Works Director
124 Enterprise Street SE
Ephrata, WA 98823

DECLARATION OF COVENANT

I (we) the undersigned, owner(s) in fee simple of the land described herein, hereby declare this covenant and place same on record.

I (we) the grantor(s) herein, am (are) the owner(s) in fee simple of (an interest in) the following described real estate situated in Grant County, State of Washington; to wit:

Grant County Public Works
124 Enterprise Street SE
Ephrata, WA 98823

on which the grantor(s) owns and operates a well and waterworks supplying water for public use located on said real estate, at:

Ephrata Landfill
4002 Road 13 NW
Ephrata, WA 98823

NW 1/4, SW 1/4, Section 33, Township 21N, Range 26E.
47.2724 N Latitude, 119.5763W Longitude
tax parcel no. 160904001

and grantor(s) is (are) required to keep the water supplied from said well free from impurities which might be injurious to the public health.

It is the purpose of these grants and covenants to prevent certain practices hereinafter enumerated in the use of said grantor(s) water supply.

NOW, THEREFORE, the grantor(s) agree(s) and covenant(s) that said grantor(s), his (her) (their) heirs, successors and assigns will not construct, maintain, or suffer to be constructed or maintained upon the said land of the grantor(s) and within 100 (One Hundred) feet of the well herein described (Attachment A) , so long as the same is operated to furnish water for public consumption, any potential source of contamination, such as septic tanks and drainfields, sewerlines, underground storage tanks, roads, railroad tracks, vehicles, structures, barns, feed stations, grazing animals, enclosures for maintaining fowl or animal manure, liquid or dry chemical storage, herbicides, insecticides, hazardous waste, or garbage of any kind or description.

These covenants shall run with the land and shall be binding to all parties having or acquiring any right, title, or interest in the land described herein or any part thereof, and shall inure to the benefit of each owner thereof.

WITNESS hand this 4 day of April, 2011.

Derek Pohle, PE (Seal)

(Seal)

Grantor(s)

State of Washington
County of GRANT.

I, the undersigned, a Notary Public in and for the above named County and State, do hereby certify that on this 4th day of April, 2011, personally appeared before me DEREK Pohle to me known to be the individual described in and who executed the within instrument, and acknowledge that he (they) signed and sealed the same as free and voluntary act and deed, for the uses and purposes therein mentioned.

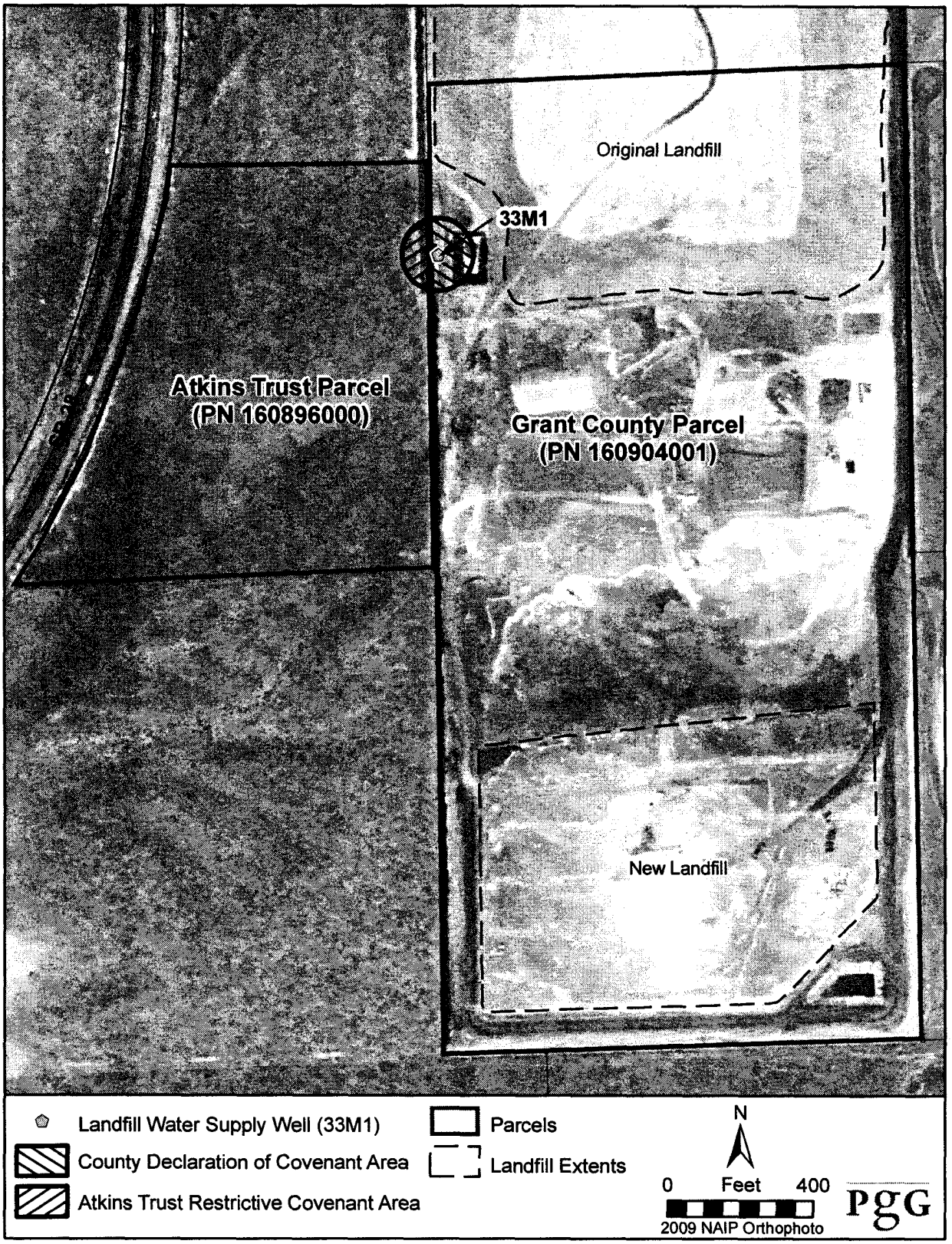
GIVEN under my hand and official seal the day and year last above written.

Anna Sangster
Notary Public in and for the State of Washington, residing at Ephrata
My Commission Expires: 11-4-2014

ANNA SANGSTER
COMMISSION EXPIRES
NOTARY
PUBLIC
NOVEMBER 04, 2014
STATE OF WASHINGTON

1284710 04/04/2011 09:43 AM COV
Page 2 of 2 R 63.00 Grant Co, WA
GRANT COUNTY PUBLIC WORKS

Attachment A
Declaration of Covenant



Grant County
Department of Public Works
124 Enterprise St. S.E.
Ephrata WA 98823

Serial No. 11-131

March 31, 2011

Earl W. and Marvel L. Atkins Trustees
Atkins Family Trust
16865 Alpental Lane SE
Monroe, WA 98272

Re: Sanitary Control Area for Water Supply Well at the Ephrata Landfill

Dear Atkins Trustees:

Grant County Public Works (County) is planning construction of a new maintenance shop and scale house for the Ephrata Landfill. The new facility will be located along the eastern boundary of the Landfill with access off Dodson Road. As part of this project, we plan to use the landfill's existing water supply well (33M1) to provide potable water to the new facility. In order to provide potable water to the new facility, the State Department of Health (DOH) is requiring the County's well (33M1) be approved as a Group B Public Water System.
DOH regulations require that public water supply sources be protected by a 100 foot sanitary control area (SCA) to protect the supply from potential sources of contamination. The 100-foot SCA for well 33M1 is shown on the enclosed map, and includes a small portion of Atkins Family Trust property (parcel 160896000). To obtain approval of the planned public water system, DOH is requesting that the County obtain a restrictive covenant for the portion of the Atkins Family Trust land that is within the well's SCA.

If a restrictive covenant for the land within the SCA is granted to Grant County Public Works by the Atkins Family Trust, future land use within the SCA could not include potential sources of contamination. Potential contaminant sources include septic tanks and drainfields, sewerlines, underground storage tanks, roads, railroad tracks, vehicles, structures, barns, feed stations, grazing animals, enclosures for maintaining fowl or animal manure, liquid or dry chemical storage, herbicides, insecticides, hazardous waste, or garbage. To assist with protection of the 100-foot SCA and potential future activities on your property such as animal grazing, the County is willing to construct a fence around this area on your property.

A copy of a restrictive covenant is included with this letter. In order to be binding, the covenant will need to be signed, notarized, and filed with the County's auditor's office. We will cover all costs associated with this process.

The County would greatly appreciate your cooperation with this matter. If you are in agreement, please contact me directly and we can discuss the process in more detail.

Sincerely,

DEPARTMENT OF PUBLIC WORKS

Derek Pohle, P.E.
Director of Public Works/
County Road Engineer

DP:km

Grant County Public Works
Attn: Derek Pohle, Public Works Director
124 Enterprise Street SE
Ephrata, WA 98823

RESTRICTIVE COVENANT

The grantor(s) herein is (are) the owner(s) of (an interest in) the following described real estate situated in Grant County, State of Washington:

Parcel no. 160896000
E1/2NE; n ½ SE, Section 32, T 21N, R26E
47.2724N, 119.5766

The grantee(s) herein, Grant County Public Works, own(s) and operate(s) a well and waterworks supplying water for public use, located upon the following described real estate situated in Grant County, State of Washington:

Ephrata Landfill
4002 Road 13 NW
Ephrata, WA 98823

NW 1/4, SW 1/4, Section 33, Township 21N, Range 26E.
47.2724 N Latitude, 119.5763W Longitude
tax parcel no. 160904001

which well and waterworks is in close proximity to the land of the grantor(s), and said grantee(s) is (are) required to keep the water supplied from said well free from impurities which might be injurious to the public health.

Name of Grantor:	Earl W. and Marvel L. Atkins Trustees Atkins Family Trust 16865 Alpental Lane LE Monroe, WA 98272	Name of Grantee:	Grant County Public Works 124 Enterprise Street SE Ephrata, WA 98823

It is the purpose of these grants and covenants to prevent certain practices hereinafter enumerated in the use of the said grantor(s) land which might contaminate said water supply.

NOW, THEREFORE, the grantor(s) agree(s) and covenant(s) that said grantee(s), its successors and assigns said covenants to run with the land for the benefit of the land of the grantee(s), that said his (her) grantor(s), (their) heirs, successors and assigns will not construct, maintain, or suffer to be constructed or maintained upon the said land of the grantor(s) and within 100 (One Hundred) feet of the well herein described (Attachment A), so long as the same is operated to furnish water for public consumption, any potential source of contamination, such as septic tanks and drainfields, sewerlines, underground storage tanks, roads, railroad tracks, vehicles, structures, barns, feed stations, grazing animals, enclosures for maintaining fowl or animal manure, liquid or dry chemical storage, herbicides, insecticides, hazardous waste, or garbage of any kind or description.

These covenants shall run with the land and shall be binding to all parties having or acquiring any right, title, or interest in the land described herein or any part thereof, and shall inure to the benefit of each owner thereof.

WITNESS _____ hand _____ this _____ day of _____, 20____.

_____ (Seal)

_____ (Seal)
Grantor(s)

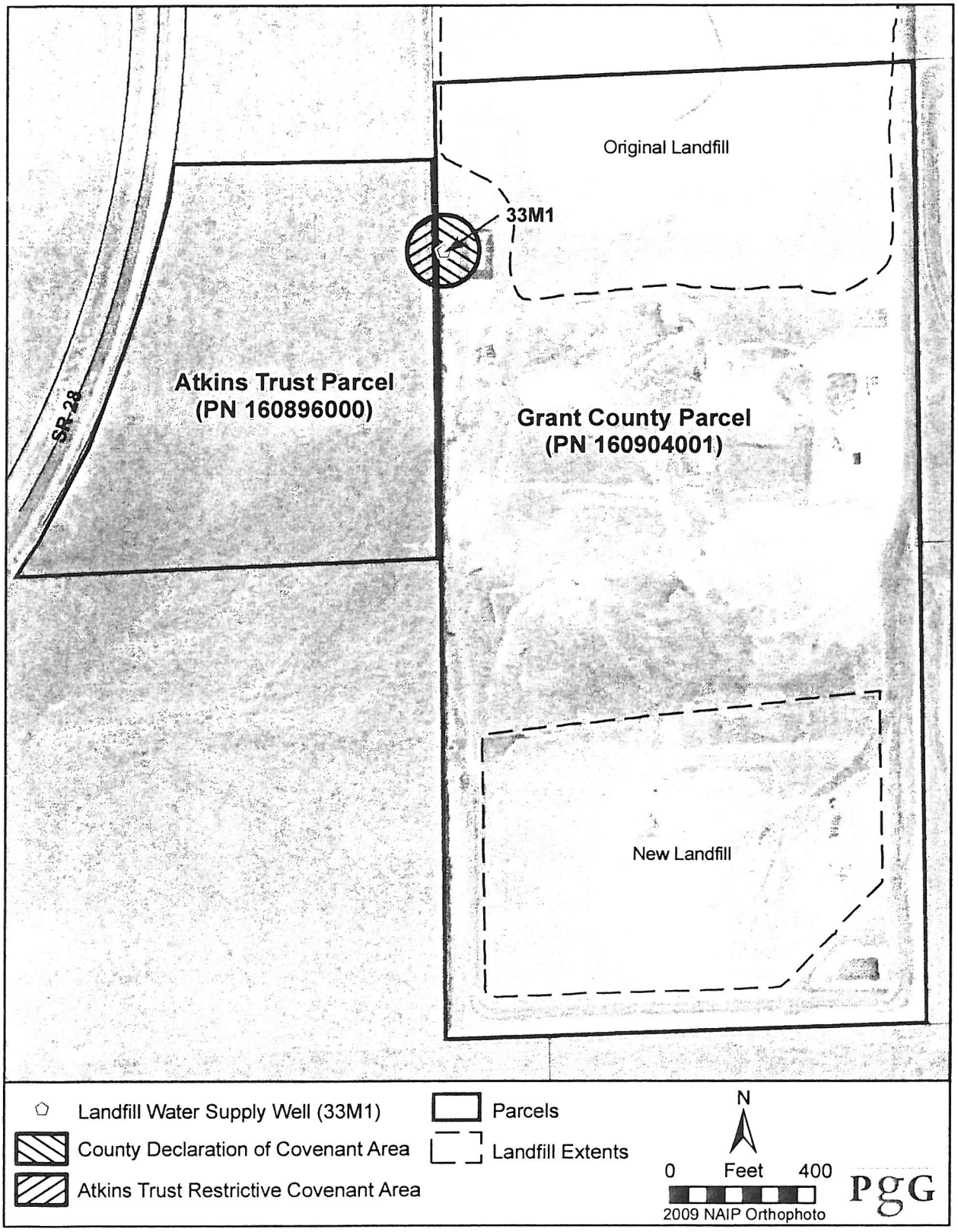
State of Washington
County of GRANT.

I, the undersigned, a Notary Public in and for the above named County and State, do hereby certify that on this _____ day of _____, 20__, personally appeared before me _____ to me known to be the individual described in and who executed the within instrument, and acknowledge that he (they) signed and sealed the same as free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal the day and year last above written.

_____
Notary Public in and for the State of Washington, residing at _____
My Commission Expires: _____

Attachment A
Restrictive Covenant



RECEIVED
APR 0 8 2011
GRANT COUNTY
PUBLIC WORKS

April 5, 2011

Mr. Derek Pohle
Director of Public Works
Department of Public Works
124 Enterprise St. S.E.
Ephrata, WA 98823

RE: Sanitary Control Area for Water Supply Well at the Ephrata Landfill

Dear Mr. Pohle:

I am writing on behalf of my mother, Marvel Atkins, as her Power of Attorney, to respond to your letter dated March 31, 2011. I have discussed this with Marvel Atkins and she does not wish to sign the restrictive covenant as an easement to Grant County Public Works.

Sincerely yours,

Linda Carnahan

Linda Carnahan
Power of Attorney on behalf of Marvel L. Atkins and Atkins Family Trust

APPENDIX H
WATER QUALITY REPORTS

CASCADE ANALYTICAL INC.
1-800-545-4206

(509) 662-1888
Fax: (509) 662-8183
3019 G.S. Center Road
Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

WSDH #10500810

Batch: 149730
Client: Pacific Groundwater Group
Account: 03558
Sampler: Glenn

--- Drinking Water Report ---

Report Date: 1/14/11

Pacific Groundwater Group
2377 Eastlake Ave. E
Seattle, WA 98102

Date Received: 1/13/11
Date Sampled: 1/13/11

Lab Number	Sample Id	Test Requested	Results
11-M000810	Ephrata Landfill	Total Coliform Colilert	Negative

Approved By:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

11-00704

1518

Chain of Custody / Analysis Request (Plea ed sections)

Page_____ of_____

12574

Report to:	Pacific Groundwater Group	Bill to:	
Ship Address:	2377 Eastlake Avenue E	Address:	
City:	Seattle St: WA Zip: 98102	City: St: Zip:	
Attn:	Glennn Mutti-Driscoll	Phone: FAX:	
Phone:	206.329-0141 FAX: 329-6968	P.O.#: Attn:	
Email:	glennmutti@pgwg.com	☐ Visa ☐ M/C ☐ A/E Expires /	
Project	Ephrata Landfill Group B Source Appr	Card#:	

For Lab Use Only
Ref # 11-00704

Check Regulatory Program
- ☐ Safe Drinking Water Act
- ☐ Clean Water Act
- ☐ RCRA / CERCLA
- ☒ Other

EDGE ANALYTICAL LABORATORIES
1620 S. Walnut St.
Burlington, WA 98233
1.800.755.9295

805 W. Orchard Dr. Suite 4
Bellingham, WA 98225

Instructions
1. Use one line per sample Location.
2. Be specific in analysis requests.
3. *(NEW)* **List each metal individually** *(NEW)*
4. Check off analyses to be performed for each sample Loaction.
5. Enter number of containers.

Turn Around Time Required
- ☒ Standard
- ☐ Half-time (50% surcharge)
- ☐ Quickest (100% surcharge) Phone Call Req.
- ☐ Emergency (Phone Call Req.)

Analyses Requested

CO012574

	Field ID	Location	Grab/ Comp.	Sample Matrix*	Date	Time	1613 (Dioxin) 2	504.1(EDB) 3	524(VOC) 3	Bacteria NO LABEL ON BOTTLE	Field Blank (VOCs)	IOCTOT 3	SOC Package - Washington 4		Number of Containers	Special Instructions Conditions on Receipt
1	33M1	Ephrata	Grab	W	1-13-11	1140	X	X	X		X	X	X			
2																
3																
4																
5																
6																
7																
8																
9																
10																

Sampled by: Phone: FAX: Email: Total Containers

Sample Receipt Request (Must include FAX or Email) ☐

* **W** - water **SW** - surface water **WW** - waste water **OL** - oil
DW - drinking water **GW** - Ground water **S** - soil Other_____

Relinquished by	Date	Time	Received by	Date	Time
N. Glenn Mutti-Driscoll	1-14-11	840	Kari Mann	1/14/11	08:39 AM
			HH	1/14/11	1211

	Yes	No	N/A
Custody seals intact Time once			✓
Sample temp 5 C satisfactory	✓		
Samples received intact	✓		
Chain of custody & labels agree	✓		

FORM: COC 01-06-2009

EDGE ANALYTICAL LABORATORIES

Burlington WA Corporate Office | 1620 S Walnut St - 98233
800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA Microbiology | 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1577fax

January 14, 2011

Sample Receipt

Glenn Wallace
Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

FAX Number: 206-206-329-69(

Dear ,

We received the following samples for project "**Ephrata Landfill Group B Source**" on **1/14/2011** at **12:11 pm**. This project is expected to be completed by **January 28, 2011.** The temperature of the sample cooler was **5C**. If you have any questions concerning this project please refer to reference number **11-00704**.

LAB NUMBER	CLIENT SAMPLE ID#	Date Sampled	Sampled By	Status	COMMENTS
1518	Shipping Charge		Unknown	Completed	
1518	33M1/Ephrata	1/13/11 11:40 a	Unknown	Pending	

ADDITIONAL COMMENTS:

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

ORGANICS IN DRINKING WATER

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Lab Number: 01518
Report Date: 2/3/11
Date Analyzed: 01/25/11
Date Extracted: 524_110125
Analyst: HY
Peer Review:
Analytical Method: 524.2
Volatile Organics

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA/State Regulated							
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	ug/L	0.4	0.17	0.2	Screening Only / PQL 0.5 ug/L
106-93-4	ETHYLENE DIBROMIDE (EDB)	**ND**	ug/L	0.4	0.28	0.05	Screening Only / PQL 0.5 ug/L
1330-20-7	TOTAL XYLENES	**ND**	ug/L	0.4	0.36	10000	
156-60-5	T - 1,2 - DICHLOROETHYLENE	**ND**	ug/L	0.4	0.18	100	
156-59-2	CIS - 1,2 - DICHLOROETHYLENE	**ND**	ug/L	0.4	0.12	70	
71-55-6	1,1,1 - TRICHLOROETHANE	**ND**	ug/L	0.4	0.12	200	
56-23-5	CARBON TETRACHLORIDE	**ND**	ug/L	0.4	0.14	5	
71-43-2	BENZENE	**ND**	ug/L	0.4	0.15	5	
107-06-2	1,2 - DICHLOROETHANE	**ND**	ug/L	0.4	0.13	5	
79-01-6	TRICHLOROETHYLENE	**ND**	ug/L	0.4	0.09	5	
78-87-5	1,2 - DICHLOROPROPANE	**ND**	ug/L	0.4	0.15	5	
108-88-3	TOLUENE	**ND**	ug/L	0.4	0.13	1000	
79-00-5	1,1,2 - TRICHLOROETHANE	**ND**	ug/L	0.4	0.17	5	
127-18-4	TETRACHLOROETHYLENE	**ND**	ug/L	0.4	0.17	5	
108-90-7	CHLOROBENZENE	**ND**	ug/L	0.4	0.17	100	
100-41-4	ETHYLBENZENE	**ND**	ug/L	0.4	0.18	700	
1330-20-7	M/P - XYLENE	**ND**	ug/L	0.4	0.36		
75-01-4	VINYL CHLORIDE	**ND**	ug/L	0.4	0.13	2	
95-47-6	O - XYLENE	**ND**	ug/L	0.4	0.2		
100-42-5	STYRENE	**ND**	ug/L	0.4	0.22	100	
106-46-7	P - DICHLOROBENZENE	**ND**	ug/L	0.4	0.12	75	
95-50-1	O - DICHLOROBENZENE	**ND**	ug/L	0.4	0.19	600	
120-82-1	1,2,4, - TRICHLOROBENZENE	**ND**	ug/L	0.4	0.21	70	
75-35-4	1,1 - DICHLOROETHYLENE	**ND**	ug/L	0.4	0.22	7	
75-09-2	tds	**ND**	ug/L	0.4	0.08	5	

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. A blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: VOC_gen.rpt

ORGANICS IN DRINKING WATER

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA/State Unregulated							
75-34-3	1,1 - DICHLOROETHANE	**ND**	ug/L	0.4	0.09		
594-20-7	2,2 - DICHLOROPROPANE	**ND**	ug/L	0.4	0.22		
74-97-5	BROMOCHLOROMETHANE	**ND**	ug/L	0.4	0.2		
563-58-6	1,1 - DICHLOROPROPENE	**ND**	ug/L	0.4	0.14		
75-71-8	DICHLORODIFLUOROMETHANE	**ND**	ug/L	0.4	0.14		
74-95-3	DIBROMOMETHANE	**ND**	ug/L	0.4	0.17		
10061-01-5	CIS - 1,3 - DICHLOROPROPENE	**ND**	ug/L	0.4	0.17		
10061-02-6	TRANS- 1,3 - DICHLOROPROPENE	**ND**	ug/L	0.4	0.21		
74-87-3	CHLOROMETHANE	**ND**	ug/L	0.4	0.17		
142-28-9	1,3 - DICHLOROPROPANE	**ND**	ug/L	0.4	0.18		
630-20-6	1,1,1,2 - TETRACHLOROETHANE	**ND**	ug/L	0.4	0.24		
98-82-8	ISOPROPYLBENZENE	**ND**	ug/L	0.4	0.19		
96-18-4	1,2,3 - TRICHLOROPROPANE	**ND**	ug/L	0.4	0.11		
108-86-1	BROMOBENZENE	**ND**	ug/L	0.4	0.1		
79-34-5	1,1,2,2 - TETRACHLOROETHANE	**ND**	ug/L	0.4	0.19		
95-49-8	O - CHLOROTOLUENE	**ND**	ug/L	0.4	0.14		
103-65-1	N - PROPYLBENZENE	**ND**	ug/L	0.4	0.19		
108-67-8	1,3,5 - TRIMETHYLBENZENE	**ND**	ug/L	0.4	0.18		
74-83-9	BROMOMETHANE	**ND**	ug/L	0.4	0.12		
106-43-4	P - CHLOROTOLUENE	**ND**	ug/L	0.4	0.12		
98-06-6	TERT - BUTYLBENZENE	**ND**	ug/L	0.4	0.24		
95-63-6	1,2,4 - TRIMETHYLBENZENE	**ND**	ug/L	0.4	0.25		
135-98-8	SEC - BUTYLBENZENE	**ND**	ug/L	0.4	0.19		
541-73-1	M - DICHLOROBENZENE	**ND**	ug/L	0.4	0.09		
99-87-6	P - ISOPROPYLTOLUENE	**ND**	ug/L	0.4	0.26		
104-51-8	N - BUTYLBENZENE	**ND**	ug/L	0.4	0.21		
75-00-3	CHLOROETHANE	**ND**	ug/L	0.4	0.14		
87-68-3	HEXACHLOROBUTADIENE	**ND**	ug/L	0.4	0.17		
91-20-3	NAPHTHALENE	**ND**	ug/L	0.4	0.2		
87-61-6	1,2,3 - TRICHLOROBENZENE	**ND**	ug/L	0.4	0.29		
75-69-4	TRICHLOROFLUOROMETHANE	**ND**	ug/L	0.4	0.18		
EPA Regulated - Under Trihalomethanes Program							
E-14471	TOTAL TRIHALOMETHANE	**ND**	ug/L	0.4		80	
67-66-3	CHLOROFORM	**ND**	ug/L	0.4	0.18		
75-27-4	BROMODICHLOROMETHANE	**ND**	ug/L	0.4	0.14		
124-48-1	CHLORODIBROMOMETHANE	**ND**	ug/L	0.4	0.21		
75-25-2	BROMOFORM	**ND**	ug/L	0.4	0.11		
State Unregulated - Other							
1634-04-4	METHYL TERT-BUTYL ETHER	**ND**	ug/L	1.0	0.18		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. A blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: VOC_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

ORGANICS IN DRINKING WATER

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Lab Number: 01518
Report Date: 1/28/11
Date Analyzed: 01/24/11
Date Extracted: 504_110124
Analyst: EM
Peer Review:
Analytical Method: 504.1
EDB/DBCP

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA Regulated Monitoring Required							
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	**ND**	ug/L	0.02	0.009	0.2	
106-93-4	ETHYLENE DIBROMIDE (EDB)	**ND**	ug/L	0.02	0.01	0.05	
State Unregulated - Other							
96-18-4	1,2,3 - TRICHLOROPROPANE	**ND**	ug/L	0.25	0.14		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA. A blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: VOC_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 $ 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: **11-00704**

Project: Ephrata Landfill Group B Source
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11 11:40

Lab Number: 046-01518
Report Date: 2/7/11
Date Received: 1/14/11
Sampler Phone:

Released By:

CAS	Compound	RESULT	UNITS	PQL	MDL	MCL	Analyst	METHOD	Analyze	COMMENT
EPA Regulated										
7440-41-7	BERYLLIUM	**ND**	mg/L	0.001	1.17E-05	**0.004**	mvp	200.8	01/21/11	
7440-43-9	CADMIUM	**ND**	mg/L	0.001	1.89E-05	**0.005**	mvp	200.8	01/21/11	
7440-38-2	ARSENIC	**ND**	mg/L	0.001	0.00022	**0.010**	mvp	200.8	01/21/11	
7440-39-3	BARIUM	**0.022**	mg/L	0.001	2.58E-05	**2**	mvp	200.8	01/21/11	
7440-47-3	CHROMIUM	**0.0006**	mg/L	0.0006	0.00012	**0.1**	mvp	200.8	01/21/11	
7440-02-0	NICKEL	**ND**	mg/L	0.005	3.77E-05	**0.1**	mvp	200.8	01/21/11	
7440-36-0	ANTIMONY	**ND**	mg/L	0.001	3.19E-05	**0.006**	mvp	200.8	01/21/11	
7782-49-2	SELENIUM	**ND**	mg/L	0.005	9.70E-05	**0.05**	mvp	200.8	01/21/11	
7440-28-0	THALLIUM	**ND**	mg/L	0.001	2.04E-05	**0.002**	mvp	200.8	01/21/11	
7439-97-6	MERCURY	**ND**	mg/L	0.0002	0.000008	**0.002**	kdw	245.1	01/21/11	
14797-65-0	NITRITE-N	**ND**	mg/L	0.10	0.012	**1**	bj	300.0	01/14/11 16:52	
16984-48-8	FLUORIDE	**0.38**	mg/L	0.10	0.013	**4**	bj	300.0	01/14/11	
E-10128	TOTAL NITRATE/NITRITE	**ND**	mg/L	0.10	0.013	**10**	bj	300.0	01/14/11 16:52	
14797-55-8	NITRATE-N	**ND**	mg/L	0.10	0.009	**10**	bj	300.0	01/14/11 16:52	
57-12-5	CYANIDE, FREE	**ND**	mg/L	0.040	0.005	**0.2**	kdw	SM4500-CN F	01/24/11	
EPA Regulated (Secondary)										
7439-89-6	IRON	**ND**	mg/L	0.050	0.004	**0.3**	bj	200.7	01/17/11	
7440-22-4	SILVER	**ND**	mg/L	0.010	1.78E-05	**0.05**	mvp	200.8	01/21/11	
7440-66-6	ZINC	**0.023**	mg/L	0.005	0.00014	**5**	mvp	200.8	01/21/11	
7439-96-5	MANGANESE	**0.004**	mg/L	0.001	2.22E-05	**0.05**	mvp	200.8	01/21/11	
16887-00-6	CHLORIDE	**4.4**	mg/L	0.1	0.015	**250**	bj	300.0	01/14/11	
14808-79-8	SULFATE	**20.8**	mg/L	0.2	0.017	**250**	bj	300.0	01/14/11	
State Regulated										
E-10617	TURBIDITY	**0.12**	NTU	0.10		**1.0**	kdw	180.1	01/14/11 17:32	
E-11778	HARDNESS as Calcium Carbonate	**89.1**	mg/L	3.30	0.055		bj	200.7	01/17/11	
7440-23-5	SODIUM	**18.0**	mg/L	1.0	0.03		bj	200.7	01/17/11	
E-11712	COLOR	**ND**	Color Units	5		**15**	kdw	SM2120 B	01/14/11 17:22	
E-10184	ELECTRICAL CONDUCTIVITY	**259**	uS/cm	10		**700**	srf	SM2510 B	01/17/11	
State Unregulated										
7440-50-8	COPPER	**ND**	mg/L	0.005	5.44E-05	**1.3**	mvp	200.8	01/21/11	
7439-92-1	LEAD	**ND**	mg/L	0.001	4.19E-05	**0.015**	mvp	200.8	01/21/11	

NOTES:

PQL Practical Quantitation Limit indicates the lower level of quantitation at which an analyte can be determined with a confidence of plus or minus 20%.

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

MDL Method Detection Limit is a theoretical detection limit at which there is a 99% certainty that the analyte concentration is greater than zero.

ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.

If you have any questions concerning this report contact us at the above phone number.

FORM: cloc_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

CARBAMATES IN DRINKING WATER

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Lab Number: 01518
Report Date: 2/7/11
Date Analyzed: 02/01/11
Date Extracted: 531_110201
Analyst: HY
Peer Review:
Analytical Method: 531.2
Carbamates

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA Regulated							
23135-22-0	OXYMAL	**ND**	ug/L	1.0	0.32	200	
1563-66-2	CARBOFURAN	**ND**	ug/L	1.0	0.4	40	
EPA Unregulated							
1646-87-3	ALDICARB SULFOXIDE	**ND**	ug/L	1.0	0.54		
1646-88-4	ALDICARB SULFONE	**ND**	ug/L	1.0	0.45		
16752-77-5	METHOMYL	**ND**	ug/L	1.0	0.52		
16655-82-6	3-HYDROXYCARBOFURAN	**ND**	ug/L	1.0	0.56		
116-06-3	ALDICARB	**ND**	ug/L	1.0	0.31		
63-25-2	CARBARYL	**ND**	ug/L	1.0	0.29		
State Unregulated - Other							
114-26-1	PROPOXUR (BAYGON)	**ND**	ug/L	1.0	0.6		
2032-65-7	METHIOCARB	**ND**	ug/L	1.0	0.31		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Lab Number: 01518
Report Date: 2/4/11
Date Analyzed: 01/31/11
Date Extracted: 508_110131
Analyst: BCV
Peer Review:
Analytical Method: 508.1
Pesticides by 525 - Washington Stat

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
PCBs/Toxaphene							
1336-36-3	PCBS (Total Aroclors)	**ND**	ug/L			0.5	
11104-28-2	AROCLOR 1221	**ND**	ug/L		0.1^		
11141-16-5	AROCLOR 1232	**ND**	ug/L		0.1^		
53469-21-9	AROCLOR 1242	**ND**	ug/L		0.1^		
12672-29-6	AROCLOR 1248	**ND**	ug/L		0.1^		
11097-69-1	AROCLOR 1254	**ND**	ug/L		0.1^		
11096-82-5	AROCLOR 1260	**ND**	ug/L		0.08		
12674-11-2	AROCLOR 1016	**ND**	ug/L		0.1		
8001-35-2	TOXAPHENE	**ND**	ug/L		0.5	3	

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Lab Number: 01518
Report Date: 2/2/11
Date Analyzed: 01/24/11
Date Extracted: 525_110124
Analyst: CO
Peer Review:
Analytical Method: 525.2
Pesticides by 525 - Washington Stat

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA Regulated							
72-20-8	ENDRIN	**ND**	ug/L	0.1	0.02	2	
58-89-9	LINDANE (BHC - GAMMA)	**ND**	ug/L	0.1	0.028	0.2	
72-43-5	METHOXYCHLOR	**ND**	ug/L	0.1	0.015	40	
15972-60-8	ALACHLOR	**ND**	ug/L	0.1	0.044	2	
1912-24-9	ATRAZINE	**ND**	ug/L	0.1	0.030	3	
50-32-8	BENZO(A)PYRENE	**ND**	ug/L	0.1	0.012	0.2	
57-74-9	CHLORDANE, TECHNICAL	**ND**	ug/L	0.1	0.3	2	
103-23-1	DI(ETHYLHEXYL)-ADIPATE	**ND**	ug/L	0.1	0.022	400	
117-81-7	DI(ETHYLHEXYL)-PHTHALATE	**ND**	ug/L	0.1	0.063	6	
76-44-8	HEPTACHLOR	**ND**	ug/L	0.1	0.022	0.4	
1024-57-3	HEPTACHLOR EPOXIDE	**ND**	ug/L	0.1	0.02	0.2	
118-74-1	HEXACHLOROBENZENE	**ND**	ug/L	0.1	0.025	1	
77-47-4	HEXACHLOROCYCLO-PENTADIENE	**ND**	ug/L	0.1	0.024	50	
122-34-9	SIMAZINE	**ND**	ug/L	0.1	0.030	4	
87-86-5	PENTACHLOROPHENOL	**ND**	ug/L	0.4	0.08	1	screening only / compliance by 515.4
EPA Unregulated							
309-00-2	ALDRIN	**ND**	ug/L	0.1	0.022		
23184-66-9	BUTACHLOR	**ND**	ug/L	0.1	0.024		
60-57-1	DIELDRIN	**ND**	ug/L	0.1	0.031		
51218-45-2	METOLACHLOR	**ND**	ug/L	0.1	0.024		
21087-64-9	METRIBUZIN	**ND**	ug/L	0.1	0.030		
1918-16-7	PROPACHLOR	**ND**	ug/L	0.1	0.031		
72-55-9	4,4-DDE	**ND**	ug/L	0.1	0.04		
34256-82-1	ACETOCHLOR	**ND**	ug/L	0.1	0.5		
759-94-4	EPTC	**ND**	ug/L	0.1	0.1		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
2212-67-1	MOLINATE	**ND**	ug/L	0.1	0.1		
5902-51-2	TERBACIL	**ND**	ug/L	0.1	0.09		
State Unregulated - Other							
314-40-9	BROMACIL	**ND**	ug/L	0.1	0.031		
86-73-7	FLUORENE	**ND**	ug/L	0.1	0.026		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Lab Number: 01518
Report Date: 3/11/11
Date Analyzed: 01/24/11
Date Extracted: 525_110124
Analyst: CO
Peer Review:
Analytical Method: 525.2
Pesticides by 525 - Washington Stat

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA Regulated							
72-20-8	ENDRIN	**ND**	ug/L	0.1	0.02	2	
58-89-9	LINDANE (BHC - GAMMA)	**ND**	ug/L	0.1	0.028	0.2	
72-43-5	METHOXYCHLOR	**ND**	ug/L	0.1	0.015	40	
15972-60-8	ALACHLOR	**ND**	ug/L	0.1	0.044	2	
1912-24-9	ATRAZINE	**ND**	ug/L	0.1	0.030	3	
50-32-8	BENZO(A)PYRENE	**ND**	ug/L	0.1	0.012	0.2	
57-74-9	CHLORDANE, TECHNICAL	**ND**	ug/L	0.1	0.3	2	
103-23-1	DI(ETHYLHEXYL)-ADIPATE	**ND**	ug/L	0.1	0.022	400	
117-81-7	DI(ETHYLHEXYL)-PHTHALATE	**ND**	ug/L	0.1	0.063	6	
76-44-8	HEPTACHLOR	**ND**	ug/L	0.1	0.022	0.4	
1024-57-3	HEPTACHLOR EPOXIDE	**ND**	ug/L	0.1	0.02	0.2	
118-74-1	HEXACHLOROBENZENE	**ND**	ug/L	0.1	0.025	1	
77-47-4	HEXACHLOROCYCLO-PENTADIENE	**ND**	ug/L	0.1	0.024	50	
122-34-9	SIMAZINE	**ND**	ug/L	0.1	0.030	4	
87-86-5	PENTACHLOROPHENOL	**ND**	ug/L	0.4	0.08	1	screening only / compliance by 515.4
EPA Unregulated							
309-00-2	ALDRIN	**ND**	ug/L	0.1	0.022		
23184-66-9	BUTACHLOR	**ND**	ug/L	0.1	0.024		
60-57-1	DIELDRIN	**ND**	ug/L	0.1	0.031		
51218-45-2	METOLACHLOR	**ND**	ug/L	0.1	0.024		
21087-64-9	METRIBUZIN	**ND**	ug/L	0.1	0.030		
1918-16-7	PROPACHLOR	**ND**	ug/L	0.1	0.031		
72-55-9	4,4-DDE	**ND**	ug/L	0.1	0.04		
34256-82-1	ACETOCHLOR	**ND**	ug/L	0.1	0.5		
759-94-4	EPTC	**ND**	ug/L	0.1	0.1		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
2212-67-1	MOLINATE	**ND**	ug/L	0.1	0.1		
5902-51-2	TERBACIL	**ND**	ug/L	0.1	0.09		
State Unregulated - Other							
314-40-9	BROMACIL	**ND**	ug/L	0.1	0.031		
86-73-7	FLUORENE	**ND**	ug/L	0.1	0.026		
- PAHs							
56-55-3	BENZO(A)ANTHRACENE	**ND**	ug/L	0.1	0.012		
205-99-2	BENZO(B)FLUORANTHENE	**ND**	ug/L	0.1	0.025		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

HERBICIDES IN DRINKING WATER

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Lab Number: 01518
Report Date: 1/20/11
Date Analyzed: 01/19/11
Date Extracted: 515.4_110118
Analyst: BCV
Peer Review:
Analytical Method: 515.4
Herbicides in Drinking Water

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
EPA Regulated							
94-75-7	2,4 - D	**ND**	ug/L	0.13	0.06	70	
93-72-1	2,4,5 - TP (SILVEX)	**ND**	ug/L	0.13	0.03	50	
87-86-5	PENTACHLOROPHENOL	**ND**	ug/L	0.13	0.03	1	
75-99-0	DALAPON	**ND**	ug/L	0.5	0.4	200	
88-85-7	DINOSEB	**ND**	ug/L	0.13	0.1	7	
1918-02-1	PICLORAM	**ND**	ug/L	0.13	0.06	500	
Other							
E-14028	DCPA (ACID METABOLITES)	**ND**	ug/L	0.13	0.1		
1918-00-9	DICAMBA	**ND**	ug/L	0.13	0.07		
94-82-6	2,4 DB	**ND**	ug/L	0.5	0.5		
93-76-5	2,4,5 T	**ND**	ug/L	0.13	0.03		
25057-89-0	BENTAZON	**ND**	ug/L	0.5	0.09		
120-36-5	DICHLORPROP	**ND**	ug/L	0.13	0.3		
50594-66-6	ACIFLUORFEN	**ND**	ug/L	0.13	0.1		
51-36-5	3,5 - DICHLOROBENZOIC ACID	**ND**	ug/L	0.13	0.1		

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

ORGANICS IN DRINKING WATER

Client Name: Pacific Groundwater Group
2377 Eastlake Avenue E
Seattle, WA 98102

Reference Number: 11-00704
Project: Ephrata Landfill Group B Source

Project::
Field ID: 33M1
Sample Description: Ephrata
Sampled By: Unknown
Sample Date: 1/13/11
Source Type:
Sampler Phone:

Lab Number: 01518
Report Date: 2/1/11
Date Analyzed: 01/28/11
Date Extracted: PACE_110128
Analyst: AE
Peer Review:
Analytical Method: 1613
Dioxin

CAS	COMPOUND	RESULTS	UNITS	PQL	MDL	MCL	COMMENT
41903-57-5	2,3,7,8-TCDD(DIOXIN)	**ND**	pg/L		5.0	30	Analyzed by Pace

NOTES:
ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; a blank MCL value indicates a level is not currently established.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.

FORM: SOC_gen.rpt

Qualifier Definitions

Reference Number: 11-00704
Report Date: 02/07/11

Qualifier	Definition
BQ	Indicates that an analyte has been detected in the laboratory method blank. This flag denotes possible contribution of laboratory background.
HQ	High QCS recovery due to increased detector response of the sample extract. The continuing calibration checks are within acceptance limits.
IM	Matrix induced bias assumed

Note: Some qualifier definitions found on this page may pertain to results or QC data which are not printed with this report.

QUALITY CONTROL REPORT
SURROGATE REPORT

Reference Number: 11-00704
Report Date: 02/07/11

Lab No	Analyte	Result	Qualifier	Units	Method	Limit
515.4_110118						
1518	2,4 - DCAA (SURR)	106		%	515.4	Acceptance Range is 70 - 130%
508_110131						
1518	TETRACHLORO-M-XYLENE (SURR)	93		%	508.1	Acceptance Limits 70%-130%
525_110124						
1518	1,3-DIMETHYL-2-NITROBENZENE (Surr)	97		%	525.2	Acceptance Range is 70% to 130%
	PYRENE-D10 (Surr)	102		%		Acceptance Range is 70% to 130%
	PERYLENE-D12 (Surr)	99		%		Acceptance Range is 70% to 130%
	TRIPHENYLPHOSPHATE (Surr)	121		%		Acceptance Range is 70% to 130%
531_110201						
1518	BDMC (SURR)	102		%	531.2	Acceptance Range is 70%-130%

*Notation:

A surrogate is a pure compound added to a sample in the laboratory just before processing so that the overall efficiency of a method can be determined.

The Acceptance Limits (or Control Limits) approximate a 99% confidence interval around the mean recovery.

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE DEPENDENT QUALITY CONTROL REPORT

Duplicate, Matrix Spike/Matrix Spike Duplicate and Confirmation Result Report

Reference Number: 11-00704
Report Date: 2/7/2011

Duplicate

Batch	Sample	Analyte	Result	Duplicate Result	Units	%RPD	Limits	QC Qualifier	Type	Comments
200.7-110117A										
	951	SODIUM	4.99	4.94	mg/L	**1.0**	0-20		DUP	
	951	HARDNESS as Calcium Carbonate	54.5	53.9	mg/L	**1.1**	0-20		DUP	
	1312	SODIUM	1.03	1.06	mg/L	**2.9**	0-20		DUP	
	1312	HARDNESS as Calcium Carbonate	108	107	mg/L	**0.9**	0-20		DUP	
200.8_110121										
	1273	BARIUM	0.007	0.007	mg/L	**0.0**	0-20		DUP	
	1273	MANGANESE	0.007	0.007	mg/L	**0.0**	0-20		DUP	
	1273	LEAD	0.003	0.003	mg/L	**0.0**	0-20		DUP	
	1273	COPPER	0.071	0.071	mg/L	**0.0**	0-20		DUP	
	1518	BARIUM	0.022	0.022	mg/L	**0.0**	0-20		DUP	
	1518	CHROMIUM	0.0006	0.00051	mg/L	**16.2**	0-20		DUP	
	1518	MANGANESE	0.004	0.004	mg/L	**0.0**	0-20		DUP	
	1518	ZINC	0.023	0.024	mg/L	**4.3**	0-20		DUP	
245.1_110121										
524_110125										
531_110201										
	2270	OXYMAL	98.6	88.6	ug/L	**10.7**	0-45		DUP	
	2270	CARBOFURAN	51.2	47.0	ug/L	**8.6**	0-45		DUP	
	2270	METHOMYL	86.2	80.5	ug/L	**6.8**	0-45		DUP	
	2270	BDMC (SURR)	83	82	%	**1.2**	0-45		DUP	
color_110114										
EC_110117										
	1575	ELECTRICAL CONDUCTIVITY	55.3	56.4	uS/cm	**2.0**	0-20		DUP	
I110114A										
	1518	FLUORIDE	0.38	0.37	mg/L	**2.7**	0-20		DUP	
	1518	CHLORIDE	4.4	4.4	mg/L	**0.0**	0-20		DUP	

%RPD = Relative Percent Difference

NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

Reference Number: 11-00704
Report Date: 2/7/2011

Duplicate

Batch	Sample	Analyte	Result	Duplicate Result	Units	%RPD	Limits	QC Qualifier	Type	Comments
	1518	SULFATE	20.8	20.8	mg/L	**0.0**	0-20		DUP	
TURB_110114										
	1518	TURBIDITY	0.12	0.11	NTU	**8.7**	0-20		DUP	

%RPD = Relative Percent Difference

NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

Matrix Spike

Batch	Sample	Analyte	Result	Spike Result	Duplicate Spike Result	Spike Conc	Units	Percent Recovery MS	Percent Recovery MSD	Limits	%RPD	Limits	QC Qualifier	Type	Comments
200.7-110117A															
	951	IRON	ND	0.52	0.52	0.50	mg/L	**104**	**104**	70-130	**0.0**	0-60		LFM	
	951	SODIUM	4.99	14.7	14.8	10.5	mg/L	**92**	**93**	70-130	**1.0**	0-60		LFM	
	951	HARDNESS as Calcium Carbonate	54.5	119	120	69.5	mg/L	**93**	**94**	70-130	**1.5**	0-60		LFM	
	1312	IRON	ND	0.49	0.49	0.50	mg/L	**98**	**98**	70-130	**0.0**	0-60		LFM	
	1312	SODIUM	1.03	11.2	11.1	10.5	mg/L	**97**	**96**	70-130	**1.0**	0-60		LFM	
	1312	HARDNESS as Calcium Carbonate	108	173	171	69.5	mg/L	**94**	**91**	70-130	**3.1**	0-60		LFM	
	1528	SODIUM	ND	10.1	10.1	10.5	mg/L	**96**	**96**	70-130	**0.0**	0-60		LFM	
200.8_110121															
	451	ARSENIC	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	BARIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	CADMIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	CHROMIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	SELENIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	BERYLLIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	NICKEL	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	ANTIMONY	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	THALLIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	MANGANESE	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	SILVER	ND	0.0099		0.010	mg/L	**99**		70-130	**NA**	0-60		LFM	
	451	ZINC	0.003	0.013		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	LEAD	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	451	COPPER	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1273	ARSENIC	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1273	BARIUM	0.007	0.016		0.010	mg/L	**90**		70-130	**NA**	0-60		LFM	
	1273	CADMIUM	ND	0.0098		0.010	mg/L	**98**		70-130	**NA**	0-60		LFM	
	1273	CHROMIUM	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1273	SELENIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1273	BERYLLIUM	ND	0.0095		0.010	mg/L	**95**		70-130	**NA**	0-60		LFM	
	1273	NICKEL	ND	0.0098		0.010	mg/L	**98**		70-130	**NA**	0-60		LFM	
	1273	ANTIMONY	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1273	THALLIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1273	MANGANESE	0.007	0.016		0.010	mg/L	**90**		70-130	**NA**	0-60		LFM	
	1273	SILVER	ND	0.0096		0.010	mg/L	**96**		70-130	**NA**	0-60		LFM	
	1273	LEAD	0.003	0.013		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1273	COPPER	0.071	0.081		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	

%RPD = Relative Percent Difference

NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

Matrix Spike

Batch	Sample	Analyte	Result	Spike Result	Duplicate Spike Result	Spike Conc	Units	Percent Recovery MS	MSD	Limits	%RPD	Limits	QC Qualifier	Type	Comments
	1518	ARSENIC	ND	0.012		0.010	mg/L	**120**		70-130	**NA**	0-60		LFM	
	1518	BARIUM	0.022	0.032		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1518	CADMIUM	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1518	CHROMIUM	0.0006	0.0109		0.010	mg/L	**103**		70-130	**NA**	0-60		LFM	
	1518	SELENIUM	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1518	BERYLLIUM	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1518	NICKEL	ND	0.009		0.010	mg/L	**90**		70-130	**NA**	0-60		LFM	
	1518	ANTIMONY	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1518	THALLIUM	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1518	MANGANESE	0.004	0.0125		0.010	mg/L	**85**		70-130	**NA**	0-60		LFM	
	1518	SILVER	ND	0.009		0.010	mg/L	**90**		70-130	**NA**	0-60		LFM	
	1518	ZINC	0.023	0.033		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
	1518	LEAD	ND	0.011		0.010	mg/L	**110**		70-130	**NA**	0-60		LFM	
	1518	COPPER	ND	0.010		0.010	mg/L	**100**		70-130	**NA**	0-60		LFM	
245.1_110121															
	1817	MERCURY	ND	0.00161	0.00162	0.00167	mg/L	**96**	**97**	70-130	**0.6**	0-60		LFM	
	2169	MERCURY	ND	0.00162	0.00163	0.00167	mg/L	**97**	**98**	70-130	**0.6**	0-60		LFM	
504_110124															
	1312	1,2-DIBROMO-3-CHLOROPROPANE	ND	0.29		0.25	mg/L	**116**	**NA**	65-135	**NA**	0-50		LFM	
	1312	ETHYLENE DIBROMIDE (EDB)	ND	0.24		0.25	mg/L	**96**	**NA**	65-135	**NA**	0-50		LFM	
	1312	1,2,3 - TRICHLOROPROPANE	ND	0.26		0.25	ug/L	**104**	**NA**	65-135	**NA**	0-50		LFM	
515.4_110118															
	1250	2,4 - D	ND	2.83	3.18	2.5	ug/L	**113**	**127**	70-130	**11.6**	0-30		LFM	
	1250	2,4,5 - TP (SILVEX)	ND	2.86	3.03	2.5	ug/L	**114**	**121**	70-130	**5.8**	0-30		LFM	
	1250	PENTACHLOROPHENOL	ND	2.94	3.03	2.5	ug/L	**118**	**121**	70-130	**3.0**	0-30		LFM	
	1250	DALAPON	ND	3.1	3.1	2.5	ug/L	**124**	**124**	70-130	**0.0**	0-30		LFM	
	1250	DINOSEB	ND	2.73	2.76	2.5	ug/L	**109**	**110**	70-130	**1.1**	0-30		LFM	
	1250	PICLORAM	ND	2.85	3.11	2.5	ug/L	**114**	**124**	70-130	**8.7**	0-30		LFM	
	1250	DICAMBA	ND	2.53	2.74	2.5	ug/L	**101**	**110**	70-130	**8.0**	0-30		LFM	
	1250	DCPA (ACID METABOLITES)	ND	2.03	2.91	2.5	ug/L	**81**	**116**	70-130	**35.6**	0-30		LFM	
	1250	2,4 DB	ND	2.67	2.97	2.5	ug/L	**107**	**119**	70-130	**10.6**	0-30		LFM	
	1250	2,4,5 T	ND	2.9	3.04	2.5	ug/L	**116**	**122**	70-130	**4.7**	0-30		LFM	
	1250	BENTAZON	ND	3.12	3.59	2.5	ug/L	**125**	**144**	70-130	**14.0**	0-30		LFM	
	1250	DICHLORPROP	ND	2.68	2.83	2.5	ug/L	**107**	**113**	70-130	**5.4**	0-30		LFM	
	1250	ACIFLUORFEN	ND	2.53	2.65	2.5	ug/L	**101**	**106**	70-130	**4.6**	0-30		LFM	
	1250	3,5 - DICHLOROBENZOIC ACID	ND	2.73	2.87	2.5	ug/L	**109**	**115**	70-130	**5.0**	0-30		LFM	

%RPD = Relative Percent Difference

NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

Matrix Spike

Batch	Sample	Analyte	Result	Spike Result	Duplicate Spike Result	Spike Conc	Units	Percent Recovery MS	MSD	Limits	%RPD	Limits	QC Qualifier	Type	Comments
	1250	2,4 - DCAA (SURR)		106	107		%		**NA**	70-130	**NA**	0-30		LFM	
525_110124															
	2221	ENDRIN	ND	1.18		1	ug/L	**118**	**NA**	70-130	**NA**	0-60		LFM	
	2221	LINDANE (BHC - GAMMA)	ND	1.02		1	ug/L	**102**	**NA**	70-130	**NA**	0-60		LFM	
	2221	METHOXYCHLOR	ND	1.21		1	ug/L	**121**	**NA**	70-130	**NA**	0-60		LFM	
	2221	ALACHLOR	ND	2.18		2	ug/L	**109**	**NA**	70-130	**NA**	0-60		LFM	
	2221	ATRAZINE	ND	2.4		2	ug/L	**120**	**NA**	70-130	**NA**	0-60		LFM	
	2221	BENZO(A)PYRENE	ND	1.08		1	ug/L	**108**	**NA**	70-130	**NA**	0-60		LFM	
	2221	CHLORDANE, TECHNICAL	ND	1.11		1	ug/L	**111**	**NA**	70-130	**NA**	0-60		LFM	
	2221	DI(ETHYLHEXYL)-ADIPATE	ND	1.17		1	ug/L	**117**	**NA**	70-130	**NA**	0-60		LFM	
	2221	DI(ETHYLHEXYL)-PHTHALATE	ND	1.35		1	ug/L	**135**	**NA**	70-130	**NA**	0-60	BQ	LFM	
	2221	HEPTACHLOR	ND	1.11		1	ug/L	**111**	**NA**	70-130	**NA**	0-60		LFM	
	2221	HEPTACHLOR EPOXIDE	ND	0.92		1	ug/L	**92**	**NA**	70-130	**NA**	0-50		LFM	
	2221	HEXACHLOROBENZENE	ND	1.07		1	ug/L	**107**	**NA**	70-130	**NA**	0-60		LFM	
	2221	HEXACHLOROCYCLO-PENTADIENE	ND	1.07		1	ug/L	**107**	**NA**	70-130	**NA**	0-60		LFM	
	2221	SIMAZINE	ND	1.15		1	ug/L	**115**	**NA**	70-130	**NA**	0-60		LFM	
	2221	PENTACHLOROPHENOL	ND	5.2		4	ug/L	**130**	**NA**	70-130	**NA**	0-50		LFM	
	2221	ALDRIN	ND	0.77		1	ug/L	**77**	**NA**	70-130	**NA**	0-60		LFM	
	2221	BUTACHLOR	ND	1.16		1	ug/L	**116**	**NA**	70-130	**NA**	0-60		LFM	
	2221	DIELDRIN	ND	0.96		1	ug/L	**96**	**NA**	70-130	**NA**	0-60		LFM	
	2221	METOLACHLOR	ND	1.17		1	ug/L	**117**	**NA**	70-130	**NA**	0-60		LFM	
	2221	METRIBUZIN	ND	1.23		1	ug/L	**123**	**NA**	70-130	**NA**	0-60		LFM	
	2221	PROPACHLOR	ND	1.06		1	ug/L	**106**	**NA**	70-130	**NA**	0-60		LFM	
	2221	4,4-DDE	ND	1.13		1	ug/L	**113**	**NA**	70-130	**NA**	0-60		LFM	
	2221	ACETOCHLOR	ND	0.83		1	ug/L	**83**	**NA**	70-130	**NA**	0-60		LFM	
	2221	EPTC	ND	1.03		1	ug/L	**103**	**NA**	70-130	**NA**	0-60		LFM	
	2221	MOLINATE	ND	1.01		1	ug/L	**101**	**NA**	70-130	**NA**	0-60		LFM	
	2221	TERBACIL	ND	1.14		1	ug/L	**114**	**NA**	70-130	**NA**	0-60		LFM	
	2221	BROMACIL	ND	1.14		1	ug/L	**114**	**NA**	70-130	**NA**	0-60		LFM	
	2221	FLUORENE	ND	1.08		1	ug/L	**108**	**NA**	70-130	**NA**	0-60		LFM	
	2221	1,3-DIMETHYL-2-NITROBENZENE (Surr	99	96			%		**NA**	70-130	**NA**	0-60		LFM	
	2221	PYRENE-D10 (Surr)	102	101			%		**NA**	70-130	**NA**	0-60		LFM	
	2221	PERYLENE-D12 (Surr)	99	100			%		**NA**	70-130	**NA**	0-60		LFM	
	2221	TRIPHENYLPHOSPHATE (Surr)	119	112			%		**NA**	70-130	**NA**	0-60		LFM	
531_110201															
	2223	OXYMAL	ND	16.5	15.8	20	ug/L	**83**	**79**	70-130	**4.3**	0-50		LFM	

%RPD = Relative Percent Difference

NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

Matrix Spike

Batch	Sample	Analyte	Result	Spike Result	Duplicate Spike Result	Spike Conc	Units	Percent Recovery MS	MSD	Limits	%RPD	Limits	QC Qualifier	Type	Comments
	2223	CARBOFURAN	ND	15.4	16.0	20	ug/L	**77**	**80**	70-130	**3.8**	0-50		LFM	
	2223	ALDICARB SULFOXIDE	ND	15.9	15.8	20	ug/L	**80**	**79**	70-130	**0.6**	0-50		LFM	
	2223	ALDICARB SULFONE	ND	16.1	16.1	20	ug/L	**81**	**81**	70-130	**0.0**	0-50		LFM	
	2223	METHOMYL	ND	16.5	16.2	20	ug/L	**83**	**81**	70-130	**1.8**	0-50		LFM	
	2223	3-HYDROXYCARBOFURAN	ND	16.1	15.7	20	ug/L	**81**	**79**	70-130	**2.5**	0-50		LFM	
	2223	ALDICARB	ND	16.2	15.8	20	ug/L	**81**	**79**	70-130	**2.5**	0-50		LFM	
	2223	CARBARYL	ND	17.9	18.1	20	ug/L	**90**	**91**	70-130	**1.1**	0-50		LFM	
	2223	PROPOXUR (BAYGON)	ND	18.9	15.6	20	ug/L	**95**	**78**	70-130	**19.1**	0-50		LFM	
	2223	METHIOCARB	ND	19.1	19.1	20	ug/L	**96**	**96**	70-130	**0.0**	0-50		LFM	
	2223	BDMC (SURR)	103	95	93		%		**NA**	70-130	**NA**	0-50		LFM	
CNISE_110124															
	2223	CYANIDE, FREE	ND	0.046	0.053	0.050	mg/L	**92**	**106**	80-120	**14.1**	0-60		LFM	
	2224	CYANIDE, FREE	ND	0.049	0.051	0.050	mg/L	**98**	**102**	80-120	**4.0**	0-60		LFM	
I110114A															
	1518	FLUORIDE	0.38	1.31		1.00	mg/L	**93**	**NA**	80-120	**NA**	0-60		LFM	
	1518	NITRITE-N	ND	1.05		1.00	mg/L	**105**	**NA**	70-130	**NA**	0-50		LFM	
	1518	NITRATE-N	ND	1.05		1.00	mg/L	**105**	**NA**	80-120	**NA**	0-60		LFM	
	1518	TOTAL NITRATE/NITRITE	ND	2.1		2.00	mg/L	**105**	**NA**	80-120	**NA**	0-60		LFM	
	1518	CHLORIDE	4.4	5.4		1.00	mg/L	**100**	**NA**	80-120	**NA**	0-60		LFM	
	1518	SULFATE	20.8	22.9		2.00	mg/L	**105**	**NA**	80-120	**NA**	0-60		LFM	

%RPD = Relative Percent Difference

NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
200.7-110117A	HARDNESS as Calcium Carbonate	68.1	69.5	mg/L	200.7	98	85-115		LFB	
	IRON	0.48	0.5	mg/L	200.7	96	85-115			
	SODIUM	10	10.5	mg/L	200.7	95	85-115			
245.1_110121	MERCURY	0.00168	0.00167	mg/L	245.1	101	85-115		LFB	
504_110124	1,2,3 - TRICHLOROPROPANE	0.25	0.25	ug/L	504.1	100	70-130		LFB	
	1,2-DIBROMO-3-CHLOROPROPANE	0.29	0.25	ug/L	504.1	116	70-130			
	ETHYLENE DIBROMIDE (EDB)	0.26	0.25	ug/L	504.1	104	70-130			
508_110131	TETRACHLORO-M-XYLENE (SURR)	89		%	508.1		70-130		LFB	
515.4_110118	2,4 - D	0.445	0.5	ug/L	515.4	89	70-130		LFB	
	2,4 - DCAA (SURR)	111		%	515.4		70-130			
	2,4 DB	0.39	0.5	ug/L	515.4	78	70-130			
	2,4,5 - TP (SILVEX)	0.43	0.5	ug/L	515.4	86	70-130			
	2,4,5 T	0.55	0.5	ug/L	515.4	110	70-130			
	ACIFLUORFEN	0.62	0.5	ug/L	515.4	124	70-130			
	BENTAZON	0.59	0.5	ug/L	515.4	118	70-130			
	DALAPON	0.54	0.5	ug/L	515.4	108	70-130			
	DCPA (ACID METABOLITES)	0.48	0.5	ug/L	515.4	96	70-130			
	DICAMBA	0.46	0.5	ug/L	515.4	92	70-130			
	DICHLORPROP	0.54	0.5	ug/L	515.4	108	70-130			
	DINOSEB	0.51	0.5	ug/L	515.4	102	70-130			
	PENTACHLOROPHENOL	0.6	0.5	ug/L	515.4	120	70-130			
	PICLORAM	0.51	0.5	ug/L	515.4	102	70-130			
515.4_110118	2,4 - D	2.7	2.5	ug/L	515.4	108	70-130		LFB	
	2,4 - DCAA (SURR)	110		%	515.4		70-130			
	2,4 DB	2.24	2.5	ug/L	515.4	90	70-130			
	2,4,5 - TP (SILVEX)	2.82	2.5	ug/L	515.4	113	70-130			
	2,4,5 T	2.62	2.5	ug/L	515.4	105	70-130			
	ACIFLUORFEN	2.73	2.5	ug/L	515.4	109	70-130			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
515.4_110118	BENTAZON	2.36	2.5	ug/L	515.4	94	70-130		LFB	
	DALAPON	3.64	5	ug/L	515.4	73	70-130			
	DCPA (ACID METABOLITES)	2.42	2.5	ug/L	515.4	97	70-130			
	DICAMBA	2.56	2.5	ug/L	515.4	102	70-130			
	DICHLORPROP	2.77	2.5	ug/L	515.4	111	70-130			
	DINOSEB	2.38	2.5	ug/L	515.4	95	70-130			
	PENTACHLOROPHENOL	2.98	2.5	ug/L	515.4	119	70-130			
	PICLORAM	2.81	2.5	ug/L	515.4	112	70-130			
524_110125	1,1 - DICHLOROETHANE	3.0	4	ug/L	524.2	75	70-130		LFB	
	1,1 - DICHLOROETHYLENE	3.0	4	ug/L	524.2	75	70-130			
	1,1 - DICHLOROPROPENE	3.4	4	ug/L	524.2	85	70-130			
	1,1,1 - TRICHLOROETHANE	3.2	4	ug/L	524.2	80	70-130			
	1,1,1,2 - TETRACHLOROETHANE	3.7	4	ug/L	524.2	93	70-130			
	1,1,2 - TRICHLOROETHANE	3.4	4	ug/L	524.2	85	70-130			
	1,1,2,2 - TETRACHLOROETHANE	3.1	4	ug/L	524.2	78	70-130			
	1,2 - DICHLOROETHANE	3.1	4	ug/L	524.2	78	70-130			
	1,2 - DICHLOROPROPANE	3.2	4	ug/L	524.2	80	70-130			
	1,2,3 - TRICHLOROBENZENE	3.9	4	ug/L	524.2	98	70-130			
	1,2,3 - TRICHLOROPROPANE	2.9	4	ug/L	524.2	73	70-130			
	1,2,4 - TRIMETHYLBENZENE	3.9	4	ug/L	524.2	98	70-130			
	1,2,4, - TRICHLOROBENZENE	4.0	4	ug/L	524.2	100	70-130			
	1,2-DIBROMO-3-CHLOROPROPANE	3.1	4	ug/L	524.2	78	70-130			
	1,3 - DICHLOROPROPANE	3.6	4	ug/L	524.2	90	70-130			
	1,3,5 - TRIMETHYLBENZENE	3.9	4	ug/L	524.2	98	70-130			
	2,2 - DICHLOROPROPANE	3.4	4	ug/L	524.2	85	70-130			
	BENZENE	3.5	4	ug/L	524.2	88	70-130			
	BROMOBENZENE	3.8	4	ug/L	524.2	95	70-130			
	BROMOCHLOROMETHANE	3.7	4	ug/L	524.2	93	70-130			
	BROMODICHLOROMETHANE	3.4	4	ug/L	524.2	85	70-130			
	BROMOFORM	3.5	4	ug/L	524.2	88	70-130			
	BROMOMETHANE	3.1	4	ug/L	524.2	78	70-130			
	CARBON TETRACHLORIDE	3.0	4	ug/L	524.2	75	70-130			
	CHLOROBENZENE	3.6	4	ug/L	524.2	90	70-130			
	CHLORODIBROMOMETHANE	3.9	4	ug/L	524.2	98	70-130			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
524_110125	CHLOROETHANE	2.8	4	ug/L	524.2	70	70-130		LFB	
	CHLOROFORM	3.3	4	ug/L	524.2	83	70-130			
	CHLOROMETHANE	2.8	4	ug/L	524.2	70	70-130			
	CIS - 1,2 - DICHLOROETHYLENE	3.5	4	ug/L	524.2	88	70-130			
	CIS - 1,3 - DICHLOROPROPENE	4.1	4	ug/L	524.2	103	70-130			
	DIBROMOMETHANE	3.3	4	ug/L	524.2	83	70-130			
	DICHLORODIFLUOROMETHANE	2.9	4	ug/L	524.2	73	70-130			
	ETHYLBENZENE	3.5	4	ug/L	524.2	88	70-130			
	ETHYLENE DIBROMIDE (EDB)	3.8	4	ug/L	524.2	95	70-130			
	HEXACHLOROBUTADIENE	3.7	4	ug/L	524.2	93	70-130			
	ISOPROPYLBENZENE	3.8	4	ug/L	524.2	95	70-130			
	M - DICHLOROBENZENE	3.7	4	ug/L	524.2	93	70-130			
	M/P - XYLENE	7.0	8	ug/L	524.2	88	70-130			
	METHYL TERT-BUTYL ETHER	3.6	4	ug/L	524.2	90	70-130			
	N - BUTYLBENZENE	3.7	4	ug/L	524.2	93	70-130			
	N - PROPYLBENZENE	3.7	4	ug/L	524.2	93	70-130			
	NAPHTHALENE	4.8	4	ug/L	524.2	120	70-130			
	O - CHLOROTOLUENE	3.6	4	ug/L	524.2	90	70-130			
	O - DICHLOROBENZENE	3.8	4	ug/L	524.2	95	70-130			
	O - XYLENE	3.8	4	ug/L	524.2	95	70-130			
	P - CHLOROTOLUENE	3.6	4	ug/L	524.2	90	70-130			
	P - DICHLOROBENZENE	3.5	4	ug/L	524.2	88	70-130			
	P - ISOPROPYLTOLUENE	3.9	4	ug/L	524.2	98	70-130			
	SEC - BUTYLBENZENE	3.7	4	ug/L	524.2	93	70-130			
	STYRENE	3.7	4	ug/L	524.2	93	70-130			
	T - 1,2 - DICHLOROETHYLENE	3.2	4	ug/L	524.2	80	70-130			
	tds	3.0	4	ug/L	524.2	75	70-130			
	TERT - BUTYLBENZENE	3.8	4	ug/L	524.2	95	70-130			
	TETRACHLOROETHYLENE	3.7	4	ug/L	524.2	93	70-130			
	TOLUENE	3.8	4	ug/L	524.2	95	70-130			
	TRANS- 1,3 - DICHLOROPROPENE	4.2	4	ug/L	524.2	105	70-130			
	TRICHLOROETHYLENE	3.4	4	ug/L	524.2	85	70-130			
	TRICHLOROFLUOROMETHANE	2.8	4	ug/L	524.2	70	70-130			
	VINYL CHLORIDE	3.1	4	ug/L	524.2	78	70-130			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
525_110124	1,3-DIMETHYL-2-NITROBENZENE (Surr)	95		%	525.2		70-130		LFB	
	4,4-DDE	0.96	1	ug/L	525.2	96	70-130			
	ACETOCHLOR	0.79	1	ug/L	525.2	79	70-130			
	ALACHLOR	2.06	2	ug/L	525.2	103	70-130			
	ALDRIN	0.75	1	ug/L	525.2	75	70-130			
	ATRAZINE	2.27	2	ug/L	525.2	114	70-130			
	BENZO(A)PYRENE	1.03	1	ug/L	525.2	103	70-130			
	BROMACIL	0.97	1	ug/L	525.2	97	70-130			
	BUTACHLOR	1.07	1	ug/L	525.2	107	70-130			
	CHLORDANE, TECHNICAL	1.1	1	ug/L	525.2	110	70-130			
	DI(ETHYLHEXYL)-ADIPATE	1	1	ug/L	525.2	100	70-130			
	DI(ETHYLHEXYL)-PHTHALATE	1.05	1	ug/L	525.2	105	70-130			
	DIELDRIN	0.9	1	ug/L	525.2	90	70-130			
	ENDRIN	1.06	1	ug/L	525.2	106	70-130			
	EPTC	1.05	1	ug/L	525.2	105	70-130			
	FLUORENE	1.04	1	ug/L	525.2	104	70-130			
	HEPTACHLOR	1.04	1	ug/L	525.2	104	70-130			
	HEPTACHLOR EPOXIDE	0.85	1	ug/L	525.2	85	70-130			
	HEXACHLOROBENZENE	1.01	1	ug/L	525.2	101	70-130			
	HEXACHLOROCYCLO-PENTADIENE	0.94	1	ug/L	525.2	94	70-130			
	LINDANE (BHC - GAMMA)	1.02	1	ug/L	525.2	102	70-130			
	METHOXYCHLOR	1.44	1	ug/L	525.2	144	70-130	HQ		
	METOLACHLOR	1.06	1	ug/L	525.2	106	70-130			
	METRIBUZIN	1.09	1	ug/L	525.2	109	70-130			
	MOLINATE	1.02	1	ug/L	525.2	102	70-130			
	PENTACHLOROPHENOL	4.68	4	ug/L	525.2	117	70-130			
	PERYLENE-D12 (Surr)	92		%	525.2		70-130			
	PROPACHLOR	1.06	1	ug/L	525.2	106	70-130			
	PYRENE-D10 (Surr)	98		%	525.2		70-130			
	SIMAZINE	1.1	1	ug/L	525.2	110	70-130			
	TERBACIL	1.07	1	ug/L	525.2	107	70-130			
	TRIPHENYLPHOSPHATE (Surr)	108		%	525.2		70-130			
531_110201	3-HYDROXYCARBOFURAN	31.9	40	ug/L	531.2	80	70-130		LFB	
	ALDICARB	32.1	40	ug/L	531.2	80	70-130			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
531_110201	ALDICARB SULFONE	32.4	40	ug/L	531.2	81	70-130		LFB	
	ALDICARB SULFOXIDE	31.8	40	ug/L	531.2	80	70-130			
	BDMC (SURR)	80		%	531.2		70-130			
	CARBARYL	36.3	40	ug/L	531.2	91	70-130			
	CARBOFURAN	30.7	40	ug/L	531.2	77	70-130			
	METHIOCARB	36.6	40	ug/L	531.2	92	70-130			
	METHOMYL	32.7	40	ug/L	531.2	82	70-130			
	OXYMAL	31.9	40	ug/L	531.2	80	70-130			
	PROPOXUR (BAYGON)	31.5	40	ug/L	531.2	79	70-130			
531_110201	3-HYDROXYCARBOFURAN	7.2	10	ug/L	531.2	72	70-130		LFB	
	ALDICARB	7.6	10	ug/L	531.2	76	70-130			
	ALDICARB SULFONE	7.4	10	ug/L	531.2	74	70-130			
	ALDICARB SULFOXIDE	7.2	10	ug/L	531.2	72	70-130			
	BDMC (SURR)	78		%	531.2		70-130			
	CARBARYL	8.5	10	ug/L	531.2	85	70-130			
	CARBOFURAN	7.4	10	ug/L	531.2	74	70-130			
	METHIOCARB	7.6	10	ug/L	531.2	76	70-130			
	METHOMYL	7.6	10	ug/L	531.2	76	70-130			
	OXYMAL	7.1	10	ug/L	531.2	71	70-130			
	PROPOXUR (BAYGON)	7.6	10	ug/L	531.2	76	70-130			
CNISE_110124	CYANIDE, FREE	0.054	0.050	mg/L	SM4500-CN F	108	80-120		LFB	
CNISE_110124	CYANIDE, FREE	0.050	0.050	mg/L	SM4500-CN F	100	80-120		LFB	

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Low Level Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
504_110124	1,2,3 - TRICHLOROPROPANE	0.024	0.02	ug/L	504.1	120	60-140		LFBD	
	1,2-DIBROMO-3-CHLOROPROPANE	0.024	0.02	ug/L	504.1	120	60-140			
	ETHYLENE DIBROMIDE (EDB)	0.026	0.02	ug/L	504.1	130	60-140			
515.4_110118	2,4 - D	0.09	0.125	ug/L	515.4	72	50-150		LFBD	
	2,4 - DCAA (SURR)	112		%	515.4		70-130			
	2,4,5 - TP (SILVEX)	0.14	0.125	ug/L	515.4	112	50-150			
	2,4,5 T	0.14	0.125	ug/L	515.4	112	50-150			
	ACIFLUORFEN	0.15	0.125	ug/L	515.4	120	50-150			
	DALAPON	0.13	0.125	ug/L	515.4	104	50-150			
	DCPA (ACID METABOLITES)	0.11	0.125	ug/L	515.4	88	50-150			
	DICAMBA	0.09	0.125	ug/L	515.4	72	50-150			
	DICHLORPROP	0.14	0.125	ug/L	515.4	112	50-150			
	DINOSEB	0.12	0.125	ug/L	515.4	96	50-150			
	PENTACHLOROPHENOL	0.12	0.125	ug/L	515.4	96	50-150			
	PICLORAM	0.12	0.125	ug/L	515.4	96	50-150			
525_110124	1,3-DIMETHYL-2-NITROBENZENE (Surr)	94		%	525.2		70-130		LFBD	
	4,4-DDE	0.11	0.1	ug/L	525.2	110	50-150			
	ACETOCHLOR	0.11	0.1	ug/L	525.2	110	50-150			
	ALACHLOR	0.16	0.2	ug/L	525.2	80	50-150			
	ALDRIN	0.115	0.1	ug/L	525.2	115	50-150			
	ATRAZINE	0.2	0.2	ug/L	525.2	100	50-150			
	BENZO(A)PYRENE	0.09	0.1	ug/L	525.2	90	50-150			
	BROMACIL	0.076	0.1	ug/L	525.2	76	50-150			
	BUTACHLOR	0.081	0.1	ug/L	525.2	81	50-150			
	CHLORDANE, TECHNICAL	0.13	0.1	ug/L	525.2	130	50-150			
	DI(ETHYLHEXYL)-ADIPATE	0.22	0.1	ug/L	525.2	220	50-150			
	DI(ETHYLHEXYL)-PHTHALATE	0.15	0.1	ug/L	525.2	150	50-150			
	DIELDRIN	0.11	0.1	ug/L	525.2	110	50-150			
	ENDRIN	0.1	0.1	ug/L	525.2	100	50-150			
	EPTC	0.11	0.1	ug/L	525.2	110	50-150			
	FLUORENE	0.11	0.1	ug/L	525.2	110	50-150			
	HEPTACHLOR	0.091	0.1	ug/L	525.2	91	50-150			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Low Level Laboratory Fortified Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
525_110124	HEPTACHLOR EPOXIDE	0.096	0.1	ug/L	525.2	96	50-150		LFBD	
	HEXACHLOROBENZENE	0.11	0.1	ug/L	525.2	110	50-150			
	HEXACHLOROCYCLO-PENTADIENE	0.086	0.1	ug/L	525.2	86	50-150			
	LINDANE (BHC - GAMMA)	0.11	0.1	ug/L	525.2	110	50-150			
	METHOXYCHLOR	0.079	0.1	ug/L	525.2	79	50-150			
	METOLACHLOR	0.096	0.1	ug/L	525.2	96	50-150			
	METRIBUZIN	0.071	0.1	ug/L	525.2	71	50-150			
	MOLINATE	0.11	0.1	ug/L	525.2	110	50-150			
	PENTACHLOROPHENOL	0.35	0.4	ug/L	525.2	88	50-150			
	PERYLENE-D12 (Surr)	79		%	525.2		70-130			
	PROPACHLOR	0.11	0.1	ug/L	525.2	110	50-150			
	PYRENE-D10 (Surr)	98		%	525.2		70-130			
	SIMAZINE	0.12	0.1	ug/L	525.2	120	50-150			
	TERBACIL	0.09	0.1	ug/L	525.2	90	50-150			
	TRIPHENYLPHOSPHATE (Surr)	101		%	525.2		70-130			
531_110201	3-HYDROXYCARBOFURAN	0.98	1	ug/L	531.2	98	50-150		LFBD	
	ALDICARB	0.94	1	ug/L	531.2	94	50-150			
	ALDICARB SULFONE	0.93	1	ug/L	531.2	93	50-150			
	ALDICARB SULFOXIDE	0.75	1	ug/L	531.2	75	50-150			
	BDMC (SURR)	91		%	531.2		70-130			
	CARBARYL	0.88	1	ug/L	531.2	88	50-150			
	CARBOFURAN	1.21	1	ug/L	531.2	121	50-150			
	METHIOCARB	4.0	4	ug/L	531.2	100	50-150			
	METHOMYL	0.85	1	ug/L	531.2	85	50-150			
	OXYMAL	1.04	1	ug/L	531.2	104	50-150			
	PROPOXUR (BAYGON)	0.75	1	ug/L	531.2	75	50-150			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Laboratory Reagent Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
200.7-110117A	HARDNESS as Calcium Carbonate	ND		mg/L	200.7		10.00000		LRB	
	IRON	ND		mg/L	200.7		0.05000			
	SODIUM	ND		mg/L	200.7		1.00000			
200.8_110121	ANTIMONY	ND		mg/L	200.8		0.00100		LRB	
	ARSENIC	ND		mg/L	200.8		0.00500			
	BARIUM	ND		mg/L	200.8		0.01000			
	BERYLLIUM	ND		mg/L	200.8		0.00100			
	CADMIUM	ND		mg/L	200.8		0.00100			
	CHROMIUM	ND		mg/L	200.8		0.00100			
	COPPER	ND		mg/L	200.8		0.01000			
	LEAD	ND		mg/L	200.8		0.00100			
	MANGANESE	ND		mg/L	200.8		0.00100			
	NICKEL	ND		mg/L	200.8		0.00100			
	SELENIUM	ND		mg/L	200.8		0.00100			
	SILVER	ND		mg/L	200.8		0.00100			
	THALLIUM	ND		mg/L	200.8		0.00100			
	ZINC	ND		mg/L	200.8		0.02000			
I110114A	CHLORIDE	ND		mg/L	300.0		0.10000		LRB	
	FLUORIDE	ND		mg/L	300.0		0.10000			
	NITRATE-N	ND		mg/L	300.0		0.10000			
	NITRITE-N	ND		mg/L	300.0		0.00000			
	SULFATE	ND		mg/L	300.0		0.10000			
	TOTAL NITRATE/NITRITE	ND		mg/L	300.0		0.10000			
TURB_110114	TURBIDITY	ND		NTU	180.1		0.02000		LRB	

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Method Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
200.7-110117A	HARDNESS as Calcium Carbonate	ND		mg/L	200.7		0.82000		MB	
	IRON	ND		mg/L	200.7		0.01000			
	SODIUM	ND		mg/L	200.7		0.25000			
245.1_110121	MERCURY	ND		mg/L	245.1		0.00013		MB	
504_110124	1,2,3 - TRICHLOROPROPANE	ND		ug/L	504.1		0.12000		MB	
	1,2-DIBROMO-3-CHLOROPROPANE	ND		ug/L	504.1		0.01000			
	ETHYLENE DIBROMIDE (EDB)	ND		ug/L	504.1		0.00500			
508_110131	AROCLOR 1016	ND		ug/L	508.1		0.03000		MB	
	AROCLOR 1221	ND		ug/L	508.1		0.03000			
	AROCLOR 1232	ND		ug/L	508.1		0.03000			
	AROCLOR 1242	ND		ug/L	508.1		0.03000			
	AROCLOR 1248	ND		ug/L	508.1		0.03000			
	AROCLOR 1254	ND		ug/L	508.1		0.03000			
	AROCLOR 1260	ND		ug/L	508.1		0.03000			
	PCBS (Total Aroclors)	ND		ug/L	508.1		0.03000			
	TETRACHLORO-M-XYLENE (SURR)	96		%	508.1		0.00000			
	TOXAPHENE	ND		ug/L	508.1		0.03000			
515.4_110118	2,4 - D	ND		ug/L	515.4		0.03000		MB	
	2,4 - DCAA (SURR)	123		%	515.4					
	2,4 DB	ND		ug/L	515.4		0.03000			
	2,4,5 - TP (SILVEX)	ND		ug/L	515.4		0.03000			
	2,4,5 T	ND		ug/L	515.4		0.03000			
	ACIFLUORFEN	ND		ug/L	515.4		0.03000			
	BENTAZON	ND		ug/L	515.4		0.06000			
	DALAPON	ND		ug/L	515.4		0.50000			
	DCPA (ACID METABOLITES)	ND		ug/L	515.4		0.03000			
	DICAMBA	ND		ug/L	515.4		0.03000			
	DICHLORPROP	ND		ug/L	515.4		0.10000			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Method Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
515.4_110118	DINOSEB	ND		ug/L	515.4		0.06000		MB	
	PENTACHLOROPHENOL	ND		ug/L	515.4		0.03000			
	PICLORAM	ND		ug/L	515.4		0.03000			
524_110125	1,1 - DICHLOROETHANE	ND		ug/L	524.2		0.12000		MB	TB 11-00704
	1,1 - DICHLOROETHYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,1 - DICHLOROPROPENE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,1,1 - TRICHLOROETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,1,1,2 - TETRACHLOROETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,1,2 - TRICHLOROETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,1,2,2 - TETRACHLOROETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2 - DICHLOROETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2 - DICHLOROPROPANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2,3 - TRICHLOROBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2,3 - TRICHLOROPROPANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2,4 - TRIMETHYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2,4, - TRICHLOROBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,2-DIBROMO-3-CHLOROPROPANE	ND		ug/L	524.2		0.00000			TB 11-00704
	1,3 - DICHLOROPROPANE	ND		ug/L	524.2		0.12000			TB 11-00704
	1,3,5 - TRIMETHYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	2,2 - DICHLOROPROPANE	ND		ug/L	524.2		0.12000			TB 11-00704
	BENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	BROMOBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	BROMOCHLOROMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	BROMODICHLOROMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	BROMOFORM	ND		ug/L	524.2		0.12000			TB 11-00704
	BROMOMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	CARBON TETRACHLORIDE	ND		ug/L	524.2		0.12000			TB 11-00704
	CHLOROBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	CHLORODIBROMOMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	CHLOROETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	CHLOROFORM	ND		ug/L	524.2		0.12000			TB 11-00704
	CHLOROMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	CIS - 1,2 - DICHLOROETHYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	CIS - 1,3 - DICHLOROPROPENE	ND		ug/L	524.2		0.12000			TB 11-00704

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Method Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
524_110125	DIBROMOMETHANE	ND		ug/L	524.2		0.12000		MB	TB 11-00704
	DICHLORODIFLUOROMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	ETHYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	ETHYLENE DIBROMIDE (EDB)	ND		ug/L	524.2		0.00000			TB 11-00704
	HEXACHLOROBUTADIENE	ND		ug/L	524.2		0.12000			TB 11-00704
	ISOPROPYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	M - DICHLOROBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	M/P - XYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	METHYL TERT-BUTYL ETHER	ND		ug/L	524.2		0.25000			TB 11-00704
	N - BUTYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	N - PROPYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	NAPHTHALENE	ND		ug/L	524.2		0.12000			TB 11-00704
	O - CHLOROTOLUENE	ND		ug/L	524.2		0.12000			TB 11-00704
	O - DICHLOROBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	O - XYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	P - CHLOROTOLUENE	ND		ug/L	524.2		0.12000			TB 11-00704
	P - DICHLOROBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	P - ISOPROPYLTOLUENE	ND		ug/L	524.2		0.12000			TB 11-00704
	SEC - BUTYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	STYRENE	ND		ug/L	524.2		0.12000			TB 11-00704
	T - 1,2 - DICHLOROETHYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	tds	ND		ug/L	524.2		0.50000			TB 11-00704
	TERT - BUTYLBENZENE	ND		ug/L	524.2		0.12000			TB 11-00704
	TETRACHLOROETHYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	TOLUENE	ND		ug/L	524.2		0.12000			TB 11-00704
	TRANS- 1,3 - DICHLOROPROPENE	ND		ug/L	524.2		0.12000			TB 11-00704
	TRICHLOROETHYLENE	ND		ug/L	524.2		0.12000			TB 11-00704
	TRICHLOROFLUOROMETHANE	ND		ug/L	524.2		0.12000			TB 11-00704
	VINYL CHLORIDE	ND		ug/L	524.2		0.12000			TB 11-00704
525_110124	1,3-DIMETHYL-2-NITROBENZENE (Surr)	102		%	525.2				MB	
	4,4-DDE	ND		ug/L	525.2		0.03000			
	ACETOCHLOR	ND		ug/L	525.2		0.03000			
	ALACHLOR	ND		ug/L	525.2		0.03000			
	ALDRIN	ND		ug/L	525.2		0.03000			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Method Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
525_110124	ATRAZINE	ND		ug/L	525.2		0.03000		MB	
	BENZO(A)PYRENE	ND		ug/L	525.2		0.03000			
	BROMACIL	ND		ug/L	525.2		0.03000			
	BUTACHLOR	ND		ug/L	525.2		0.03000			
	CHLORDANE, TECHNICAL	ND		ug/L	525.2		0.03000			
	DI(ETHYLHEXYL)-ADIPATE	ND		ug/L	525.2		0.03000			
	DI(ETHYLHEXYL)-PHTHALATE	0.5		ug/L	525.2		0.40000			
	DIELDRIN	ND		ug/L	525.2		0.03000			
	ENDRIN	ND		ug/L	525.2		0.03000			
	EPTC	ND		ug/L	525.2		0.03000			
	FLUORENE	ND		ug/L	525.2		0.03000			
	HEPTACHLOR	ND		ug/L	525.2		0.03000			
	HEPTACHLOR EPOXIDE	ND		ug/L	525.2		0.03000			
	HEXACHLOROBENZENE	ND		ug/L	525.2		0.03000			
	HEXACHLOROCYCLO-PENTADIENE	ND		ug/L	525.2		0.03000			
	LINDANE (BHC - GAMMA)	ND		ug/L	525.2		0.03000			
	METHOXYCHLOR	ND		ug/L	525.2		0.03000			
	METOLACHLOR	ND		ug/L	525.2		0.03000			
	METRIBUZIN	ND		ug/L	525.2		0.03000			
	MOLINATE	ND		ug/L	525.2		0.03000			
	PENTACHLOROPHENOL	ND		ug/L	525.2		0.03000			
	PERYLENE-D12 (Surr)	97		%	525.2					
	PROPACHLOR	ND		ug/L	525.2		0.03000			
	PYRENE-D10 (Surr)	103		%	525.2					
	SIMAZINE	ND		ug/L	525.2		0.03000			
	TERBACIL	ND		ug/L	525.2		0.03000			
	TRIPHENYLPHOSPHATE (Surr)	109		%	525.2					
531_110201	3-HYDROXYCARBOFURAN	ND		ug/L	531.2		0.50000		MB	
	ALDICARB	ND		ug/L	531.2		0.25000			
	ALDICARB SULFONE	ND		ug/L	531.2		0.40000			
	ALDICARB SULFOXIDE	ND		ug/L	531.2		0.25000			
	BDMC (SURR)	86		%	531.2		0.00000			
	CARBARYL	ND		ug/L	531.2		0.50000			
	CARBOFURAN	ND		ug/L	531.2		0.45000			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Method Blank

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
531_110201	METHIOCARB	ND		ug/L	531.2		1.00000		MB	
	METHOMYL	ND		ug/L	531.2		0.25000			
	OXYMAL	ND		ug/L	531.2		1.00000			
	PROPOXUR (BAYGON)	ND		ug/L	531.2		0.25000			
CNISE_110124	CYANIDE, FREE	ND		mg/L	SM4500-CN F		0.01000		MB	
color_110114	COLOR	ND		CU	SM2120 B		1.25000		MB	
ec_110117	ELECTRICAL CONDUCTIVITY	ND		uS/cm	SM2510 B		2.50000		MB	
ec_110117	ELECTRICAL CONDUCTIVITY	ND		uS/cm	SM2510 B		2.50000		MB	

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

EDGE ANALYTICAL LABORATORIES

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Quality Control Sample

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
200.7-110117A	IRON	1	1	mg/L	200.7	100	85-115		QCS	
200.7-110117A	HARDNESS as Calcium Carbonate	130	132.3	mg/L	200.7	98	85-115		QCS	
	SODIUM	19.4	20	mg/L	200.7	97	85-115			
200.8_110121	ANTIMONY	0.042	0.040	mg/L	200.8	105	85-115		QCS	
	ARSENIC	0.042	0.040	mg/L	200.8	105	85-115			
	BARIUM	0.040	0.040	mg/L	200.8	100	85-115			
	BERYLLIUM	0.040	0.040	mg/L	200.8	100	85-115			
	CADMIUM	0.040	0.040	mg/L	200.8	100	85-115			
	CHROMIUM	0.039	0.040	mg/L	200.8	98	85-115			
	COPPER	0.041	0.040	mg/L	200.8	103	85-115			
	LEAD	0.040	0.040	mg/L	200.8	100	85-115			
	MANGANESE	0.041	0.040	mg/L	200.8	103	85-115			
	NICKEL	0.040	0.040	mg/L	200.8	100	85-115			
	SELENIUM	0.040	0.040	mg/L	200.8	100	85-115			
	SILVER	0.039	0.040	mg/L	200.8	98	85-115			
	THALLIUM	0.039	0.040	mg/L	200.8	98	85-115			
	ZINC	0.040	0.040	mg/L	200.8	100	85-115			
245.1_110121	MERCURY	0.00325	0.00314	mg/L	245.1	104	85-115		QCS	
504_110124	1,2,3 - TRICHLOROPROPANE	1.45	1.33	ug/L	504.1	109	70-130		QCS	
	1,2-DIBROMO-3-CHLOROPROPANE	1.09	0.999	ug/L	504.1	109	70-130			
	ETHYLENE DIBROMIDE (EDB)	0.67	0.73	ug/L	504.1	92	70-130			
531_110201	3-HYDROXYCARBOFURAN	18.5	21.4	ug/L	531.2	86	70-130		QCS	
	ALDICARB	15.5	18.1	ug/L	531.2	86	70-130			
	ALDICARB SULFONE	29	32.5	ug/L	531.2	89	70-130			
	ALDICARB SULFOXIDE	25.7	33.6	ug/L	531.2	76	70-130			
	BDMC (SURR)	84		%	531.2		70-130			
	CARBARYL	82.4	88.2	ug/L	531.2	93	70-130			
	CARBOFURAN	12.1	17.8	ug/L	531.2	68	70-130			Within acceptance limits

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Quality Control Sample

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
531_110201	METHIOCARB	49.7	53.7	ug/L	531.2	93	70-130		QCS	
	METHOMYL	38.4	43.2	ug/L	531.2	89	70-130			
	OXYMAL	28.8	32	ug/L	531.2	90	70-130			
	PROPOXUR (BAYGON)	47.9	54.7	ug/L	531.2	88	70-130			
531_110201	3-HYDROXYCARBOFURAN	ND	ND	ug/L	531.2		70-130		QCS	
	ALDICARB	ND	ND	ug/L	531.2		70-130			
	ALDICARB SULFONE	107	107	ug/L	531.2	100	70-130			
	ALDICARB SULFOXIDE	ND	ND	ug/L	531.2		70-130			
	BDMC (SURR)	85		%	531.2		70-130			
	CARBARYL	ND	ND	ug/L	531.2		70-130			
	CARBOFURAN	115	123	ug/L	531.2	93	70-130			
	METHIOCARB	ND	ND	ug/L	531.2		70-130			
	METHOMYL	ND	ND	ug/L	531.2		70-130			
	OXYMAL	31.1	ND	ug/L	531.2		70-130			
	PROPOXUR (BAYGON)	ND	ND	ug/L	531.2		70-130			
CNISE_110124	CYANIDE, FREE	0.138	0.138	mg/L	SM4500-CN F	100	80-120		QCS	
color_110114	COLOR	10	10	CU	SM2120 B	100	80-120		QCS	
ec_110117	ELECTRICAL CONDUCTIVITY	145.4	150.0	uS/cm	SM2510 B	97	80-120		QCS	
ec_110117	ELECTRICAL CONDUCTIVITY	145.1	150.0	uS/cm	SM2510 B	97	80-120		QCS	
I110114A	CHLORIDE	29.3	30.0	mg/L	300.0	98	80-120		QCS	
	FLUORIDE	2.4	2.50	mg/L	300.0	96	80-120			
	NITRATE-N	2.45	2.50	mg/L	300.0	98	80-120			
	NITRITE-N	2.41	2.50	mg/L	300.0	96	70-130			
	SULFATE	29.8	30.0	mg/L	300.0	99	80-120			
	TOTAL NITRATE/NITRITE	4.86	5.00	mg/L	300.0	97	80-120			

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Burlington WA
Corporate Office
1620 S Walnut St - 98233
800.755.9295 • 360.757.1400

Bellingham WA
Microbiology
805 Orchard Dr Ste 4 - 98225
360.671.0688

Portland OR
Microbiology/Chemistry
9150 SW Pioneer Ct Ste W- 97070
503.682.7802

SAMPLE INDEPENDENT QUALITY CONTROL REPORT

Quality Control Sample

Reference Number: 11-00704
Report Date: 02/07/11

Batch	Analyte	Result	True Value	Units	Method	% Recovery	Limits	QC Qualifier	Type*	Comment
TURB_110114	TURBIDITY	1.02	1.00	NTU	180.1	102	80-120		QCS	

*Notation:

% Recovery = (Result of Analysis)/(True Value) * 100

NA = Indicates % Recovery could not be calculated.

QCS: Quality Control Sample, a solution containing known concentrations of method analytes which is used to fortify an aliquot of reagent matrix. The QCS is obtained from an external source and is used to check lab performance.

LFB: Laboratory Fortified Blank, an aliquot of reagent matrix to which known quantities of method analytes are added in the lab. The LFB is analyzed exactly like a sample, and its purpose is to determine whether method performance is within accepted control limits.

MB or LRB: Method Blank or Laboratory Reagent Blank, an aliquot of reagent matrix is analyzed exactly like a sample, and its purpose is to determine if there is background contamination.

Analytical Data Package Prepared For

Pacific Groundwater Group, Sea

EPHRATA LANDFILL

Radiochemical Analysis By

TestAmerica

2800 G.W. Way, Richland Wa, 99354, (509)-375-3131.

Assigned Laboratory Code: TARL

Data Package Contains 14 *Pages*

Report No.: 46019

Results in this report relate only to the sample(s) analyzed.

SDG No.	Order No.	Client Sample ID (List Order)	Lot-Sa No.	Work Order	Report DB ID	Batch No.
42837		PACIFIC GROUND WATER	J1C020439-1	ME3FE1AD	9ME3FE10	1062268
		PACIFIC GROUND WATER	J1C020439-1	ME3FE1AC	9ME3FE10	1062269

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Certificate of Analysis

TestAmerica Laboratories, Inc.

March 21, 2011

Pacific Groundwater Group
2377 Eastlake Ave E Suite 200
Seattle, WA 98102

Attention: Glenn Mutti-Driscoll

Date Received	:	February 18, 2011
Sample Number/Matrix	:	One (1) Water
SDG Number	:	42837
Project Name	:	Ephrata Landfill
COC Number	:	186301

CASE NARRATIVE

I. Introduction

On February 18, 2011, one water sample was received at the TestAmerica Richland laboratory for radiochemical analysis. Upon receipt, the sample was assigned the TestAmerica identification number as described on the cover page of the Analytical Data Package. The sample was assigned to Lot Number J1C020439.

II. Sample Receipt

The sample was received in good condition and no anomalies were noted during sample check-in.

III. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information; analytical results and the appropriate associated statistical uncertainties.

The analysis requested was:

Gas Proportional Counting
Gross Alpha by method RL-GPC-001
Radium-228 by method RL-RA-001

IV. Quality Control

The analytical result for each analysis performed includes a minimum of one laboratory control sample (LCS), and one reagent blank sample analysis. Any exceptions have been noted in the "Comments" section.

V. Comments

Gross Alpha by method RL-GPC-001 (RICH-RC-5014):
The LCS, batch blank, sample and sample duplicate results are within acceptance limits.

Radium-228 by method RL-RA-001:
The LCS, batch blank, sample duplicate and sample results are within acceptance limits.

I certify that this Certificate of Analysis is in compliance with the SOW and/or NELAC, both technically and for completeness, for other than the conditions detailed above. The Laboratory Manager or a designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.

Reviewed and approved:

Christi Hayes
Project Manager

Drinking Water Method Cross References

	DRINKING WATER ASTM METHOD CROSS REFERENCES	
Referenced Method	**Isotope(s)**	**TestAmerica Richland's SOP No.**
EPA 901.1	Cs-134, I-131	RL-GAM-001
EPA 900.0	Alpha & Beta	RL-GPC-001
EPA 00-02	Gross Alpha (Coprecipitation)	RL-GPC-002
EPA 903.0	Total Alpha Radium (Ra-226)	RL-RA-002
EPA 903.1	Ra-226	RL-RA-001
EPA 904.0	Ra-228	RL-RA-001
EPA 905.0	Sr-89/90	RL-GPC-003
ASTM D5174	Uranium	RL-KPA-003
EPA 906.0	Tritium	RL-LSC-005

Results in this report relate only to the sample(s) analyzed.

Uncertainty Estimation

TestAmerica Richland has adopted the internationally accepted approach to estimating uncertainties described in "NIST Technical Note 1297, 1994 Edition". The approach, "Law of Propagation of Errors", involves the identification of all variables in an analytical method which are used to derive a result. These variables are related to the analytical result (R) by some functional relationship, R = constants * f(x,y,z,...). The components (x,y,z) are evaluated to determine their contribution to the overall method uncertainty. The individual component uncertainties (u_i) are then combined using a statistical model that provides the most probable overall uncertainty value. All component uncertainties are categorized as type A, evaluated by statistical methods, or type B, evaluated by other means. Uncertainties not included in the components, such as sample homogeneity, are combined with the component uncertainty as the square root of the sum-of-the-squares of the individual uncertainties. The uncertainty associated with the derived result is the combined uncertainty (u_c) multiplied by the coverage factor (1,2, or 3).

When three or more sample replicates are used to derive the analytical result, the type A uncertainty is the standard deviation of the mean value (S/?n), where S is the standard deviation of the derived results. The type B uncertainties are all other random or non-random components that are not included in the standard deviation.

The derivation of the general "Law of Propagation of Errors" equations and specific example are available on request.

Sample Results Summary

TestAmerica TARL

Ordered by Method, Batch No., Client Sample ID.

Date: 21-Mar-11

Report No. : 46019

SDG No: 42837

Batch	Client Id Work Order	Parameter	Result +- Uncertainty (2s)	Qual	Units	Tracer Yield	MDC or MDA	CRDL	RER2
1062268	RL-RA-001								
	PACIFIC GROUND WATER								
	ME3FE1AD	RA-228	3.78E-02 +- 3.1E-01	U	pCi/L	93%	7.25E-01	3.00E+00	
	PACIFIC GROUND WATER DUP								
	ME3FE1AE	RA-228	4.57E-02 +- 3.1E-01	U	pCi/L	95%	7.06E-01	3.00E+00	0.0
1062269	RL-GPC-001								
	PACIFIC GROUND WATER								
	ME3FE1AC	ALPHA	-4.82E-02 +- 7.5E-01	U	pCi/L	100%	2.14E+00	3.00E+00	
	PACIFIC GROUND WATER DUP								
	ME3FE1AG	ALPHA	-1.68E-01 +- 4.1E-01	U	pCi/L	100%	1.56E+00	3.00E+00	0.3

No. of Results: 4

TestAmerica

rptSTLRchSaSummary2 V5.2.12
A2002

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda/Mdl, Total Uncert, CRDL, RDL or not identified by gamma scan software.

QC Results Summary

Date: 21-Mar-11

TestAmerica TARL

Ordered by Method, Batch No, QC Type,.

Report No. : 46019 **SDG No.:** 42837

Batch Work Order	Parameter	Result +- Uncertainty (2s)	Qual	Units	Tracer Yield	LCS Recovery	Bias	MDC|MDA
RL-RA-001								
1062268 BLANK QC,								
ME5291AA	RA-228	2.66E-01 +- 3.0E-01	U	pCi/L	85%			6.50E-01
1062268 LCS,								
ME5291AC	RA-228	5.97E+00 +- 9.6E-01		pCi/L	66%	119%	0.2	9.41E-01
RL-GPC-001								
1062269 BLANK QC,								
ME53A1AA	ALPHA	3.33E-01 +- 5.2E-01	U	pCi/L	100%			1.03E+00
1062269 LCS,								
ME53A1AC	ALPHA	3.63E+01 +- 8.4E+00		pCi/L	100%	88%	-0.1	1.15E+00
1062269 MATRIX SPIKE, PACIFIC GROUND WATER								
ME3FE1AF	ALPHA	3.09E+01 +- 7.7E+00		pCi/L	100%	76%	-0.2	1.49E+00

No. of Results: 5

TestAmerica

rptSTLRchQcSummary V5.2.12
A2002

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda/Mdl, Total Uncert, CRDL, RDL or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 21-Mar-11

Lab Name:	TestAmerica	SDG:	42837	Collection Date:	2/17/2011
Lot-Sample No.:	J1C020439-1	Report No. :	46019	Received Date:	2/18/2011 10:00:00 AM
Client Sample ID:	PACIFIC GROUND WATER	COC No. :	186301	Matrix:	WATER

EPHRATA LANDFILL

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 1062268	RL-RA-001			Work Order:	ME3FE1AD		Report DB ID:	9ME3FE10				
RA-228	**3.78E-02**	U	3.1E-01	3.1E-01	7.25E-01	pCi/L	93%	*0.05*	3/11/11 02:15 p		1.0015	GPC6A
						3.40E-01	3.00E+00	*0.24*			L	
Batch: 1062269	RL-GPC-001			Work Order:	ME3FE1AC		Report DB ID:	9ME3FE10				
ALPHA	**-4.82E-02**	U	7.5E-01	7.5E-01	2.14E+00	pCi/L	100%	*-0.02*	3/16/11 05:38 a		0.1997	GPC10C
						8.09E-01	3.00E+00	*-0.13*			L	

No. of Results: 2 Comments:

TestAmerica
rptSTLRchSample
V5.2.12 A2002

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda/Mdl, Total Uncert, CRDL, RDL or not identified by gamma scan software.

FORM II

Date: 21-Mar-11

DUPLICATE RESULTS

Lab Name:	TestAmerica	SDG:	42837	Collection Date:	2/17/2011
Lot-Sample No.:	J1C020439-1	Report No. :	46019	Received Date:	2/18/2011 10:00:00 AM
Client Sample ID:	PACIFIC GROUND WATER DUP	COC No. :	186301	Matrix:	WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 1062268	RL-RA-001			Work Order:	ME3FE1AE	Report DB ID:	ME3FE1ER		Orig Sa DB ID:	9ME3FE10		
RA-228	4.57E-02	U	3.1E-01	3.1E-01	7.06E-01	pCi/L	95%	0.06	3/11/11 02:15 p		1.0015	GPC6B
	3.78E-02	U	RER2 0.0			3.00E+00		0.3			L	
Batch: 1062269	RL-GPC-001			Work Order:	ME3FE1AG	Report DB ID:	ME3FE1GR		Orig Sa DB ID:	9ME3FE10		
ALPHA	-1.68E-01	U	4.1E-01	4.1E-01	1.56E+00	pCi/L	100%	-0.11	3/18/11 10:14 a		0.2003	GPC10C
	-4.82E-02	U	RER2 0.3			3.00E+00		-0.81			L	

No. of Results: 2 Comments:

TestAmerica
rptSTLRchDupV5.2
.12 A2002

RER2 - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.
MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda/Mdl, Total Uncert, CRDL, RDL or not identified by gamma scan software.

FORM II

BLANK RESULTS

Date: 21-Mar-11

Lab Name: TestAmerica

Matrix: WATER

SDG: 42837

Report No. : 46019

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA, Lc	Rpt Unit, CRDL	Yield	Rst/MDC, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 1062269	RL-GPC-001			**Work Order:**	ME53A1AA		**Report DB ID:**	ME53A1AB				
ALPHA	3.33E-01	U	5.2E-01	5.2E-01	1.03E+00	pCi/L	100%	0.32	3/18/11 10:14 a		0.1997	GPC10D
					3.65E-01	3.00E+00		(1.3)			L	
Batch: 1062268	RL-RA-001			**Work Order:**	ME5291AA		**Report DB ID:**	ME5291AB				
RA-228	2.66E-01	U	3.0E-01	3.0E-01	6.50E-01	pCi/L	85%	0.41	3/11/11 02:15 p		1.0016	GPC6C
					3.01E-01	3.00E+00		(1.8)			L	

No. of Results: 2 Comments:

TestAmerica

rptSTLRchBlank
V5.2.12 A2002

MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria. Limit criteria is less than the Mdc/Mda/Mdl, Total Uncert, CRDL, RDL or not identified by gamma scan software.

FORM II

LCS RESULTS

Date: 21-Mar-11

Lab Name: TestAmerica

Matrix: WATER

SDG: 42837

Report No. : 46019

Parameter	Result	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 1062269	RL-GPC-001			**Work Order:**	ME53A1AC		**Report DB ID:**	ME53A1CS					
ALPHA	3.63E+01		4.0E+00	8.4E+00	1.15E+00	pCi/L	100%	4.14E+01	4.28E-01	88%	3/18/11 09:35 p	0.2015	GPC10A
							Rec Limits:	70	130	-0.1		L	
Batch: 1062268	RL-RA-001			**Work Order:**	ME5291AC		**Report DB ID:**	ME5291CS					
RA-228	5.97E+00		7.0E-01	9.6E-01	9.41E-01	pCi/L	66%	5.00E+00	1.65E-01	119%	3/11/11 02:15 p	1.0009	GPC6D
							Rec Limits:	70	130	0.2		L	

No. of Results: 2 **Comments:**

TestAmerica Bias - (Result/Expected)-1 as defined by ANSI N13.30.

rptSTLRchLcs
V5.2.12 A2002

FORM II

MATRIX SPIKE RESULTS

Date: 21-Mar-11

Lab Name: TestAmerica SDG: 42837

Lot-Sample No.: J1C020439-1, PACIFIC GROUND WATER Report No. : 46019 Matrix: WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	Total Uncert(2 s)	MDC|MDA	Rpt Unit, CRDL	Yield	Rec-overy	Expected, Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 1062269	Work Order:	ME3FE1AF		Report DB ID:	ME3FE1FW		Orig Sa DB ID:	9ME3FE10				
ALPHA	3.09E+01		4.7E+00	7.7E+00	1.49E+00	pCi/L	100%	76.02%	4.06E+01	3/16/11 05:38 a	0.1999	RL-GPC-001
	-4.82E-02								4.20E-01		L	GPC10D

Number of Results: 1

Comments:

TestAmerica
rptSTLRchMs
V5.2.12 A2002

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.
Bias - (Result/Expected)-1 as defined by ANSI N13.30.

Chain of Custody Record

Temperature on Receipt N/A

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

J1C020439

TAL-4124 (1007) Glenn Mutti-Driscoll

Client	Project Manager	Date	Chain of Custody Number
Pacific Groundwater Group			186301
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page ____ of ____**
2377 Eastlake Ave E. Suite 200			

City	State	Zip Code	Site Contact	Lab Contact
Seattle	WA	98102	T. Langley	

Project Name and Location (State)	Carrier/Waybill Number
Ephrata Landfill	

Contract/Purchase Order/Quote No.
(3 bottles)

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Analysis (Attach list if more space is needed): Gross Alpha	Radium 226									Special Instructions/ Conditions of Receipt
Pacific Ground water				X				X							X	X		ME3FE							PGW GW# 81251 J1C020439 SDG42837 Due-3.17.11

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☒ Other 28 days

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
			Angelica TMK	2.18.11	10 am
2. Relinquished By	**Date**	**Time**	**2. Received By**	**Date**	**Time**
3. Relinquished By	**Date**	**Time**	**3. Received By**	**Date**	**Time**

N: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Sample Check-in List

TLR

Date/Time Received: 2.18.11 @ 10AM GM Screen Result (out) .3 (in) .3 Initials [✓]

Client: PGGW SDG #: 42837 NA [ ] SAF #: _____ NA [✓]

Work Order Number: J1C020439 Chain of Custody #: 186301

Shipping Container ID: _____ NA [✓] Air Bill # _____ NA [✓]

Item 1 through 5 for shipping container only. Initial appropriate response.

1. Custody Seals on shipping container intact? Yes [ ] No [ ] No Custody Seal [✓]
2. Custody Seals dated and signed? Yes [ ] No [ ] No Custody Seal [✓]
3. Chain of Custody record present? Yes [✓] No [ ]
4. Cooler temperature: _____ NA [✓] 5. Vermiculite/packing materials is NA [ ] Wet [ ] Dry [✓]

Item 6 through 10 for samples. Initial appropriate response.

6. Number of samples in shipping container (Each sample may contain multiple bottles): 1 @ 3 bottles (peach)
7. Sample holding times exceeded? NA [ ] Yes [ ] No [✓]
8. Samples have:
   _____ tape
   _____ custody seals
   ✓ hazard labels
   ✓ appropriate sample labels J1C020439
9. Samples:
   ✓ are in good condition
   _____ are broken
   _____ are leaking
   _____ have air bubbles (Only for samples requiring no head space)
10. Sample pH appropriate for analysis requested Yes [ ] No [✓] N/A [ ] (Note discrepancies in #13)
    (If acidification necessary, then document sample ID, initial pH, amount of HNO_3 added and pH after addition)

    RPL ID # of preservative used : S-10-00326
11. Sample Location, Sample Collector Listed? * Yes [✓] No [ ]
    *For documentation only. No corrective action needed.
12. Were any anomalies identified in sample receipt? Yes [ ] No [✓]
13. Description of anomalies (include sample numbers): NA [ ] _____

See other side for additional comments

Sample Custodian: [signature] Date: 2.18.11 @ 10AM TLR

Client Informed on _____ by _____ Person contacted _____

[X] No action necessary, process as is

Project Manager Christa Hayes Date 3/3/11

Report Definitions

Action Lev	An agreed upon activity level used to trigger some action when the final result is greater than or equal to the Action Level. Often the Action Level is related to the Decision Limit.
Batch	The QC preparation batch number that relates laboratory samples to QC samples that were prepared and analyzed together.
Bias	Defined by the equation (Result/Expected)-1 as defined by ANSI N13.30.
COC No	Chain of Custody Number assigned by the Client or TestAmerica.
Count Error (#s)	Poisson counting statistics of the gross sample count and background. The uncertainty is absolute and in the same units as the result. For Liquid Scintillation Counting (LSC) the batch blank count is the background.
Total Uncert (#s) u_c - *Combined Uncertainty.*	All known uncertainties associated with the preparation and analysis of the sample are propagated to give a measure of the uncertainty associated with the result, u_c *the combined uncertainty*. The uncertainty is absolute and in the same units as the result.
(#s), Coverage Factor	The coverage factor defines the width of the confidence interval, 1, 2 or 3 standard deviations.
CRDL (RL)	Contractual Required Detection Limit as defined in the Client's Statement Of Work or TestAmerica "default" nominal detection limit. Often referred to the reporting level (RL)
Lc	Decision Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume associated with the sample. The Type I error probability is approximately 5%. Lc=(1.645 * Sqrt(2*(BkgrndCnt/BkgrndCntMin)/SCntMin)) * (ConvFct/(Eff*Yld*Abn*Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability. Lc cannot be calculated when the background count is zero.
Lot-Sample No	The number assigned by the LIMS software to track samples received on the same day for a given client. The sample number is a sequential number assigned to each sample in the Lot.
MDC|MDA	Detection Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume with a Type I and II error probability of approximately 5%. MDC = (4.65 * Sqrt((BkgrndCnt/BkgrndCntMin)/SCntMin) + 2.71/SCntMin) * (ConvFct/(Eff * Yld * Abn * Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability.
Primary Detector	The instrument identifier associated with the analysis of the sample aliquot.
Ratio U-234/U-238	The U-234 result divided by the U-238 result. The U-234/U-238 ratio for natural uranium in NIST SRM 4321C is 1.038.
Rst/MDC	Ratio of the Result to the MDC. A value greater than 1 may indicate activity above background at a high level of confidence. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Rst/TotUcert	Ratio of the Result to the Total Uncertainty. If the uncertainty has a coverage factor of 2 a value greater than 1 may indicate activity above background at approximately the 95% level of confidence assuming a two-sided confidence interval. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Report DB No	Sample Identifier used by the report system. The number is based upon the first five digits of the Work Order Number.
RER	The equation Replicate Error Ratio = (S-D)/[sqrt($TPUs^2$ + $TPUd^2$)] as defined by ICPT BOA where S is the original sample result, D is the result of the duplicate, TPUs is the total uncertainty of the original sample and TPUd is the total uncertainty of the duplicate sample.
SDG	Sample Delivery Group Number assigned by the Client or assigned by TestAmerica upon sample receipt.
Sum Rpt Alpha Spec Rst(s)	The sum of the reported alpha spec results for tests derived from the same sample excluding duplicate result where the results are in the same units.
Work Order	The LIMS software assign test specific identifier.
Yield	The recovery of the tracer added to the sample such as Pu-242 used to trace a Pu-239/40 method.

APPENDIX I
WATER FACILITY INVENTORY
(WFI) FORM

APPENDIX I – WATER FACILITIES INVENTORY (WFI)

A completed WFI form is included in this appendix. Note that a source meter, at or near the wellhead, will be installed with completion of conveyance pipe to the landfill's new facility. Additionally, a service meter will be installed at the landfill's new facility for metering potable water uses. All other uses (landscape irrigation and filling of water trucks) will be determined by subtracting the facility's service meter's usage from the source meter.

Washington State Department of Health
Environmental Health Programs
Division of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

RETURN TO: Eastern Regional Office, 16201 E. Indiana Ave, Suite 1500, Spokane Valley, WA 99216

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
	Grant County – Ephrata Landfill Water Supply (33M1)	Grant		

6. PRIMARY CONTACT NAME & MAILING ADDRESS	7. OWNER NAME & MAILING ADDRESS	8. Owner Number:
TITLE: Public Works Director		
Derek Pohle	TITLE:	
Grant County Public Works	SAME AS PRIMARY CONTACT (No. 6)	
124 Enterprise Street SE		
Ephrata, WA 98823		
STREET ADDRESS IF DIFFERENT FROM ABOVE	STREET ADDRESS IF DIFFERENT FROM ABOVE	
ATTN SAME AS PRIMARY CONTACT (No. 6)	ATTN SAME AS PRIMARY CONTACT (No. 6)	
ADDRESS	ADDRESS	
CITY STATE ZIP	CITY STATE ZIP	

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone: 509-754-6082		Owner Daytime Phone: 509-754-6082	
Primary Contact Mobile/Cell Phone		Owner Mobile/Cell Phone	
Primary Contact Evening Phone		Owner Evening Phone	
Fax: 509-754-6087	E-mail dpohle@co.grant.wa.us	Fax	E-Mail: E-mail dpohle@co.grant.wa.us

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY – SMA (check only one)

- [X] Not applicable (Skip to #12)
- [ ] Owned and Managed — SMA NAME:_____ SMA Number:_____
- [ ] Managed Only
- [ ] Owned Only

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

[ ] Agricultural	[ ] Hospital/Clinic	[ ] Residential
[ ] Commercial / Business	[ ] Industrial	[ ] School
[ ] Day Care	[ ] Licensed Residential Facility	[ ] Temporary Farm Worker
[ ] Food Service/Food Permit	[ ] Lodging	[X] Other (church, fire station, etc.):
[ ] 1,000 or more person event for 2 or more days per year	Recreational / RV Park	COUNTY LANDFILL

13. WATER SYSTEM OWNERSHIP (mark only one)

[ ] Association	[X] County	[ ] Investor	[ ] Special District
[ ] City / Town	[ ] Federal	[ ] Private	[ ] State

14. STORAGE CAPACITY (gallons)

NONE

15.	16	17.	18.										19.			20	21.						22.	23.	24.			
	SOURCE NAME	INTERTIE	SOURCE CATEGORY										USE				TREATMENT						DEPTH		SOURCE LOCATION			
SOURCE NUMBER	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELLFIELD	SPRING	SPRING FIELD	SPRING IN SPRING FIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	¼, ¼ SECTION	SECTION NUMBER	TOWNSHIP	RANGE
NA	Well 33M1	NA	X										X										395	>165	NW,SW	33	21N	26E

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)			
A. Full Time Single Family Residences (Occupied 180 days *or more* per year)	0		
B. Part Time Single Family Residences (Occupied *less than* 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	0		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180 days/year	0		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *less than* 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV Sites, hotel/motel/overnight units)	0		
B. LANDFILL MAINTENANCE SHOP and IRRIGATION (single connection for each)	2		
28. TOTAL SERVICE CONNECTIONS	2		

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 *or more* days per year? 0

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?	0	0	0	0	0	0	0	0	0	0	0	0
B. How many days per month are they present?	0	0	0	0	0	0	0	0	0	0	0	0

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many *total* visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	0	0	0	0	0	0	0	0	0	0	0	0
B. How many days per month is water accessible by the public ?	0	0	0	0	0	0	0	0	0	0	0	0

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students, daycare children and/or employees are present each month? Landfill Employees	8	8	8	8	8	8	8	8	8	8	8	8
B. How many days per month are they present? (MON-SAT)	26	26	26	26	26	26	26	26	26	26	26	26

CURRENT SCHEDULE LISTED (FUTURE SCHEDULE TO BE REVISED BASED ON DOH RECOMMENDATIONS):

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
33. ROUTINE COLIFORM SCHEDULE (EVERY 3 YEARS)												

34. NITRATE SCHEDULE	QUARTERLY	ANNUALLY	ONCE EVERY 3 YEARS
			1

35. Reason for Submitting WFI:

☐ Update-Change ☐ Update-No Change ☐ Inactivate ☐ Re-Activate ☐ Name change ☐ New System ☐ **Other_DOH Request**

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: Derek Pohle, PE DATE: 5/2/11

PRINT NAME: Derek Pohle TITLE: Public Works Director

APPENDIX J
DESIGN NARRATIVE FOR PARTS F THROUGH J
PUMP CURVE FOR PROPOSED PUMP

TD&H Engineering

DESIGN NARRATIVE FOR THE EPHRATA LANDFILL SITE'S PUBLIC WATER SYSTEM APPROVAL APPLICATION

The following information describes the technical data included in Parts F through J of the Application Checklist.

Part F: Pump and Pumphouse Information

1. Source Capacity:

   The proposed system will have a peak demand of 103 gallons per minute (gpm) and 34,000 gallons per day (gpd). 103 gpm is based on the proposed building demand of 80 gpm and an irrigation demand of 23 gpm. The building's maximum expected daily demand is 1,500 gallons and the maximum irrigation daily demand is 32,328 gallons, creating a total daily demand of 33,828 gallons. Building demand is based 1,000 gpd used to fill water trucks and an additional 500 gpd for day-to-day building demands such as sinks, toilets, drinking fountains, and showers.

   A well drawdown test was performed on September 8, 1993. This test was performed with an older pump that is not currently in use. This well drawdown test ran the pump at a maximum capacity of 165 gpm for 8 hours with only 1.11 feet of drawdown. While the aquifer and well are capable of producing much more water, the pump ultimately limits the output of the well. The proposed improvements and demands are not expected to exceed 165 gpm, therefore a value of 165 gpm was used.

2. Source Pump:

   The existing pump is capable of providing the required irrigation flows given the total dynamic head of the irrigation system. Because the existing well uses pressure tanks to maintain a constant pressure, it's known that the pump is capable of providing a residual pressure of at least 65 pounds per square inch (psi) at the location of the pressure tanks. This 65 psi equates to 150 feet of head. Add 150 feet to the length of the well's drop pipe (a length of 483 feet) and it can be concluded that the existing pump operates with at least 633 feet of total dynamic head. Given the pump curve for the existing pump, when operating with 633 feet of head, the pump is only capable of producing a flow of 65 gpm.

   The above information can be compared to the proposed site improvements. The proposed building improvements require a flow of 80 gpm with a residual pressure of 45 psi. The 80 gpm flow considers filling a water truck while

simultaneously experiencing all the building uses (sink, bath, shower, etc.). This flow does not consider washing vehicles or irrigating the building landscaping. Should either of these two events occur during a peak demand scenario, a drop in pressure would occur. When maintaining a residual building pressure of 45 psi, the proposed improvements create a total dynamic head of 560 feet. If the residual pressure is preferred to meet the pressure tank pressure of 65 psi then the total dynamic head for the system would be 606 feet. Given the second scenario of 65 psi, the TDH of 606 feet is less than the existing system head of 633 feet. Therefore, the system is already capable of meeting the total dynamic head demands for proposed improvements. Ultimately, the proposed improvements do not increase the system's total dynamic head.

While proposed improvements do not increase total dynamic head, the total flow capacity of the pump does increase. For an irrigation demand of 23 gpm and a proposed building demand of 80 gpm, the pump needs to be able to provide 103 gpm during peak demand. Based on inspections by Pacific Groundwater Group's irrigation calculations, the trees require a flow of 23 gpm or 32,328 gpd. This is based on half the site trees being watered at a rate of 2 gpd during the peak season.

Given the existing pump running at a proposed flow of 103 gpm, the existing pump would only be able to overcome approximately 360 feet of head. This does not meet the peak demand requirements for the proposed improvements and a new pump is required in order to provide 103 gpm.

3. Required Pump:

   The required pump rate to meet the peak demand is 103 gpm. The minimum total dynamic head (TDH) required for the system in order to maintain a minimum residual pressure at the building of 45psi is 560 feet. If the pump is to operate at 103 gpm at the current residual pressure of 65 psi, a TDH of 606 feet is required.

4. Pump Specifications:

   The existing pump is a Franklin submersible pump, model 75FA15S6. This is a 15 horsepower (hp) pump that is equipped with a 20 hp motor. In order to meet the proposed peak demands, this pump needs to be upsized to a minimum 25 hp pump, Franklin submersible pump model 100FA25S6 or approved equivalent.

5. Booster Pump:

   Not Applicable

6. Pumphouse:

   Information is representative of current conditions.

Part G: Pressure Tank/Storage Facilities

1. Pressure Tank:
   Two identical PRO-FLO pressure tanks are provided, model number PF-86. Information is representative of current conditions.

2. Storage Tank:
   Not Applicable

Part H: Treatment
Not Applicable

Part I: Distribution System:
1. System Diagram:
   The attached map shows the water system in relation to the site. The only connections to the system are the existing irrigation system and the proposed building.

Part J: Reliability:
No provisions have been taken to ensure system reliability.

If any portion of the above narrative is unclear or if you have questions about the data included please feel free to contact me at 509-622-2888.

Regards,

Adam Jackson, E.I.T.
TD&H Engineering

1. **Source Capacity:** (See Appendix II, Part F)
   a. Number of connections 1, Maximum required peak flow 103 (gpm) from pg 5, Appendix II
   b. Required daily production 103 (gpm), 34,000 (gpd)
   c. Source Capacity (gpm): 165

2. **Source Pump**
   a. Pump rate 103 gpm (must be no less than required peak instantaneous demand)
   b. Required Pump Head. First determine the headloss that will be associated with the water system by using Table A below.

TABLE A - Headloss

From:	To:	Connection:	Peak Hourly Design Flow	Diameter	Headloss per 100'	Length	Total Headloss
well pump	well head		103 gpm	3"	1.8'	625'	11.14'
well head	new bldg.		80	6"	0.07'	2700'	1.9'
well head	irr.		23	1 1/4"	varies	varies	negligible

If using Option A see either Tables 1 or 3, if using Option B refer to Tables 2 or 4 , Appendix II for values.
Headloss per 100 feet = See Table 3, Appendix II for values.

** Select the single largest total headloss of pipe to a connection and use this value where it asks for the headloss in Table B on the following page.

TABLE B - Required Pump Head

	WELL PUMP	PUMP #2 (BOOSTER PUMP IF NEEDED) o
DISTANCE FROM PUMPING LEVEL IN WELL TO GROUND SURFACE (WELL HEAD)*♦	Drop pipe L = 483 FEET	___ FEET
ELEVATION DIFFERENCE FROM WELL HEAD TO POINT OF DELIVERY	To NEW Bldg: 40' ± Irr: 0 ± 40 FEET	___ FEET
GREATEST HEADLOSS (Note: This number from hydraulic analysis-Table A)	13 FEET	___ FEET
PRESSURE RESIDUAL HEAD (30 PSI = 70 FEET OF HEAD)**	45 psi = Bldg min: 104' 65 psi = tanks = 150 150 FEET	___ FEET
TOTAL REQUIRED PUMP HEAD	606 FEET	___ FEET

483-40+13+150

* Provide headloss if riser pipe length is greater than 100 feet. Also provide diameter of pipe, length and type of pipe used.

♦ Distance from pumping level in well to ground surface (Static water level + Drawdown)

** If pumping to nonpressurized storage, then the residual would be zero.

Also use this method if the source pump delivers to a storage tank where repumping is necessary; then a residual of 0 or close to 0 may be considered in pump sizing.

o **For Booster pumps a licensed Professional Engineer is required.**

NOTE: For more than one source, repeat above calculations.

3. **Required Pump**
   Total required pump head 606 ft.
   Pump Rate 103 gpm
   Select pump from pump catalog for 103 head and pump rate of 606 gpm.

4. **Pump Specifications:**
   a. Type Submersible b. Manufacturer Franklin Model # 100FA2556
   c. Model - d. RPM 3450 e. Horsepower 25
   f. Pump Rate (gpm) 103 g. Single phase/Three phase? 3
   (Attach Pump Curve or Performance Chart)

5. **Booster Pump: (NOTE: If system design requires booster pumping, the system must be designed by a professional engineer.)**

   N/A

   i. Pump rate _____ gpm.
   ii. Required pump head _____
   iii. Select pump from catalog for ____ head and well pump rate of ____ gpm.
   a. Type _____ b. Manufacturer _____
   c. Model ____ d. RPM ____ e. Horsepower _____
   f. Pump Rate (gpm) ___ g. Single phase/Three phase? _____
   (Attach Pump Curve or Performance Chart)

6. **Pumphouse** (Complete this section if applicable. Note: The pumphouse shall be adequately designed to allow access, removal and service of equipment.)

Well located: ✓ in pumphouse
___ in pit
___ outside pump house

If pitless adapter used, please note make and model #: _____
(**Note:** Pitless unit must comply with NSF or DOH standards.)

Additional information:

a. Sanitary Seal on Well Casing? Yes ✓ No ___
b. Pressure Gauge? Yes ✓ No ___
c. Does Well Casing extend a minimum 6 inches above finished floor surface?
Yes ✓ No ___ (extends a minimum 6 inches above finished floor surface)
d. Screened Casing Vent? Yes ✓ No ___
e. Insulation? Yes ___ No ✓
f. Heating? Yes ___ No ✓
(heater should be wall mounted and thermostat controlled)
g. Approved Wiring? Yes ✓ No ___
(**NOTE:** Wiring must be inspected by Washington Department of Labor and Industries)
h. Concrete Flooring? Yes ___ No ✓
(minimum 4 inches thick and sloped away from well toward floor drain)
I. Floor Drain? Yes ___ No ✓
(Piping for floor drains should be daylighted away from building)
j. Sample Tap Prior To Pressure Tank? Yes ✓ No ___
k. Pumphouse Ventilation? Yes ✓ No___
l. Locks For Doors? Yes ✓ No ___
m. Rodent Proof? Yes ✓ No ___

PART G: Pressure Tank/Storage Facilities

1. **Pressure Tank:** 2 Provided

a. Manufacturer ProFlo Model PF-86
b. ASME _____ or equivalent ✓ (Attach specifications) NSF Std 61 Listed
c. Is Pressure tank for Pump protection? Yes ✓ No ___, Other purpose ____, or both uses _____.
d. Is Pressure tank used for other purposes? Yes ✓ No ___
If yes, what purpose? To Control System Pressure
e. Pressure Tank Is Horizontal ___ Vertical ✓
Bladder Type ✓ Other ___
If *Other,* Answer:
Air Makeup By: Snifter Valve ___ Compressor ✓
Other _____
f. Capacity: 2x86 Gallons 172 gal
g. ASME Pressure Relief Valve Installed? Yes ✓ No ___
h. Pressure Range Settings: Minimum 60 Maximum 80

N|A

2. **Storage Tank***:

(NOTE: If system design requires nonpressurized storage, the system must be designed by a professional engineer.)

a. Manufacturer _____ Model _____
b. Capacity (In Gallons) _____
c. Dimensions: __ L x __ W x __ H
d. Material: _____
e. Screened Venting Provided? Yes __ No __
f. Tightly Sealed Access Provided? Yes __ No __
g. Drain Provided? Yes __ No __

* **Note:** Tanks must be approved for drinking water contact by NSF or ANSI or equivalent. In addition, if different multiple tanks are utilized, the same information for each tank must be provided.

PART H: Treatment

N|A

1. Chlorination for: Precaution ____ Bacteriological Quality ____

   For Hypochlorinators, please attach a completed Hypochlorination Facilities For Small Systems Submittal Checklist

2. Additional Treatment: If treatment is required, please indicate what is to be treated and the treatment device that you have selected.

Note: All treatment systems other than simple chlorination must be designed by a licensed professional engineer in the State of Washington and must comply with NSF standards. For Iron/Manganese treatment, all the items on Iron and Manganese Submittal Checklist available from DOH must be addressed. For other types of treatment include all calculations, design criteria, and pilot study data with this workbook. The treatment system must be inspected by the engineer after installation and a completion of construction report signed by him/her prior to final approval.

PART I: Distribution System

1. **System Diagram:** ***Attach a detailed map or diagram including all of the following information:***
   a. Property Lines, Individual Lot Lines, and Easement Locations
   b. **Well Site** (*clearly marked*)
   c. Utility Location (electrical)
   d. Customer Services or Connections (Include parcel number and address)
   e. Distribution Lines (including pipe lengths, pipe diameters, materials, valves, blow-offs, age and condition)
   f. Elevation Differences (Provide topographic map when greater than 40 ft.)
   g. Cross Connection Control Devices (location and type)
   h. Home Irrigation/ Private wells
   I. Size Of Lots Served (usually in acres or square feet)
   j. Roads
   k. Individual Service Meter Locations (required per I.C.C. 13.03A)

PART J: Reliability

What provisions, if any, have been made to ensure system reliability during power outages, pump failures, or other system component failures (Check appropriate items below).

✓ None

___ Intertie with another system (**Note**: May require revised water right)

___ Backup power source

___ Generator Disconnect (Transfer Switch)

___ Parallel Pumps

___ Stand-by storage with gravity feed

___ Other (Please List)

_____

_____

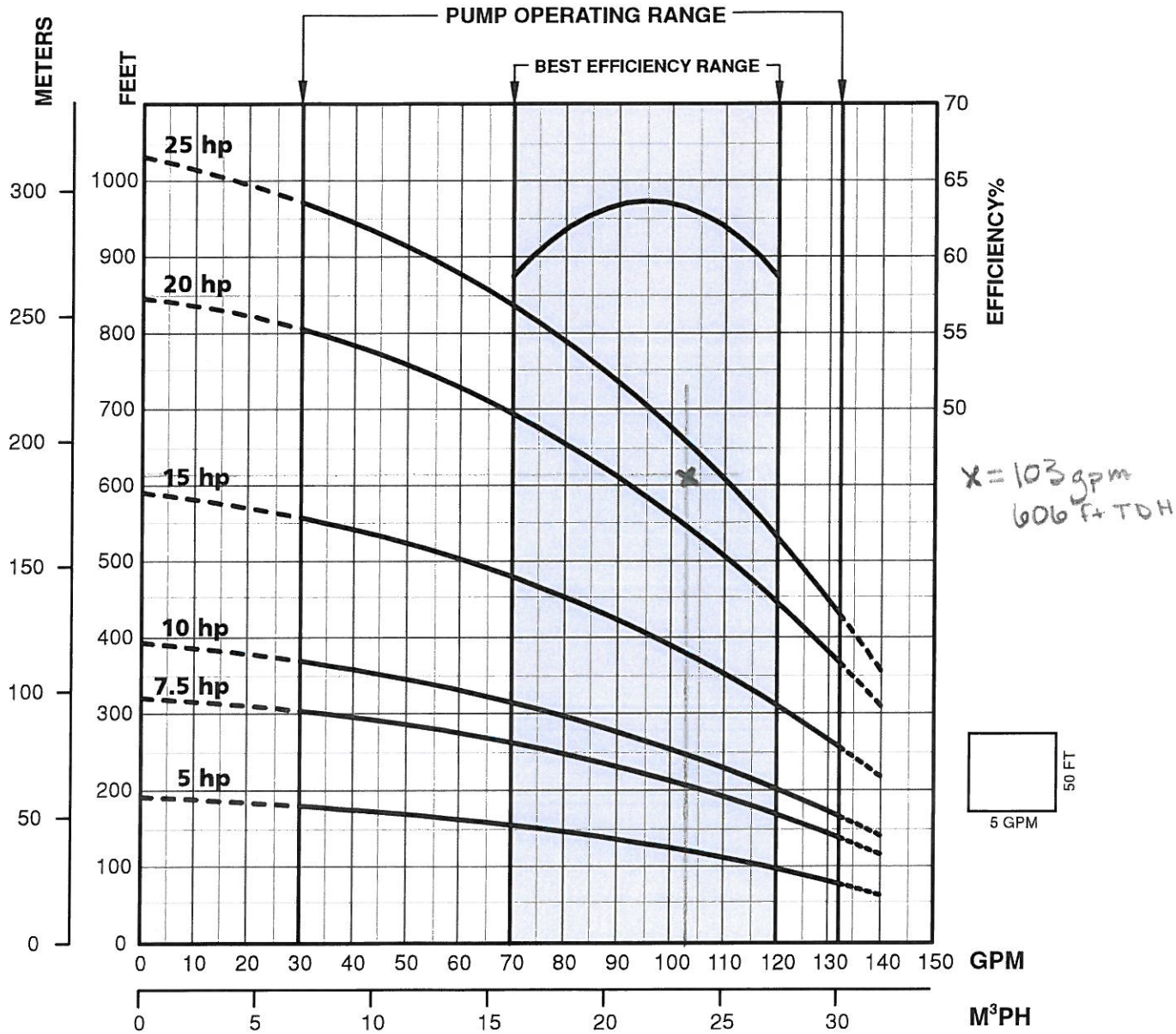
_____

_____

_____

6" High Capacity Pumps

100 GPM Performance Curves



Hazen-Williams Equation for Pressure Loss in Pipes

Specified Data

l = length of pipe (ft) (includes 100' equiv. length for pump/pipe fittings)	625
c = Hazen-Williams roughness constant (130 for PVC, 140 for D.I.)	140
q = volume flow (gal/min)	
dh = inside or hydraulic diameter (inches)	3

Calculated Pressure Loss

f = friction head loss in feet of water per 100 feet of pipe (ft H20 per 100 ft pipe)	0.00
f = friction head loss in psi of water per 100 feet of pipe (psi per 100 ft pipe)	0.00
Head loss (ft H20)	0.00
Head loss (psi)	0.00

Calculated Flow Velocity

v = flow velocity (ft/s)	0.00

f-loss	FLOW q	Velocity (ft/s)	Friction headloss (ft)	Total Headloss (ft)	Friction headloss (psi)	Total headloss (psi)
0	0	0.00	0.00	0.00	0.00	0.00
0.037899	10	0.45	0.24	0.24	0.10	0.10
0.136815	20	0.91	0.86	0.86	0.37	0.37
0.289905	30	1.36	1.81	1.81	0.78	0.78
0.493903	40	1.82	3.09	3.09	1.34	1.34
0.746654	50	2.27	4.67	4.67	2.02	2.02
1.046557	60	2.72	6.54	6.54	2.83	2.83
1.392349	70	3.18	8.70	8.70	3.77	3.77
1.782992	80	3.63	11.14	11.14	4.82	4.82
2.217603	90	4.09	13.86	13.86	6.00	6.00
2.695421	100	4.54	16.85	16.85	7.29	7.29
3.215777	110	5.00	20.10	20.10	8.70	8.70
3.778073	120	5.45	23.61	23.61	10.22	10.22
4.381772	130	5.90	27.39	27.39	11.86	11.86
5.026386	140	6.36	31.41	31.41	13.60	13.60
5.711467	150	6.81	35.70	35.70	15.45	15.45
6.436605	160	7.27	40.23	40.23	17.42	17.42
7.201419	170	7.72	45.01	45.01	19.48	19.48

TD&H Engineering

OPERATING AT 80 GPM:	
FRICTION HEADLOSS(FT)	13.04
TOTAL HEADLOSS (PSI)	5.64

these values combine the D.I. pipe and the PVC pipe

Hazen-Williams Equation for Pressure Loss in Pipes

Specified Data

l = length of pipe (ft)	2700
c = Hazen-Williams roughness constant (130 for PVC, 140 for D.I.)	130
q = volume flow (gal/min)	
dh = inside or hydraulic diameter (inches)	6

Calculated Pressure Loss

f = friction head loss in feet of water per 100 feet of pipe (ft H20 per 100 ft pipe)	0.00
f = friction head loss in psi of water per 100 feet of pipe (psi per 100 ft pipe)	0.00
Head loss (ft H20)	0.00
Head loss (psi)	0.00

Calculated Flow Velocity

v = flow velocity (ft/s)	0.00

f-loss	FLOW q	Velocity (ft/s)	Friction headloss (ft)	Total Headloss (ft)	Friction headloss (psi)	Total headloss (psi)
0	0	0.00	0.00	0.00	0.00	0.00
0.001491	10	0.11	0.04	0.04	0.02	0.02
0.005384	20	0.23	0.15	0.15	0.06	0.06
0.011408	30	0.34	0.31	0.31	0.13	0.13
0.019435	40	0.45	0.52	0.52	0.23	0.23
0.029381	50	0.57	0.79	0.79	0.34	0.34
0.041182	60	0.68	1.11	1.11	0.48	0.48
0.054789	70	0.79	1.48	1.48	0.64	0.64
0.070161	80	0.91	1.89	1.89	0.82	0.82
0.087263	90	1.02	2.36	2.36	1.02	1.02
0.106065	100	1.14	2.86	2.86	1.24	1.24
0.126541	110	1.25	3.42	3.42	1.48	1.48
0.148667	120	1.36	4.01	4.01	1.74	1.74
0.172423	130	1.48	4.66	4.66	2.02	2.02
0.197788	140	1.59	5.34	5.34	2.31	2.31
0.224746	150	1.70	6.07	6.07	2.63	2.63
0.25328	160	1.82	6.84	6.84	2.96	2.96
0.283376	170	1.93	7.65	7.65	3.31	3.31

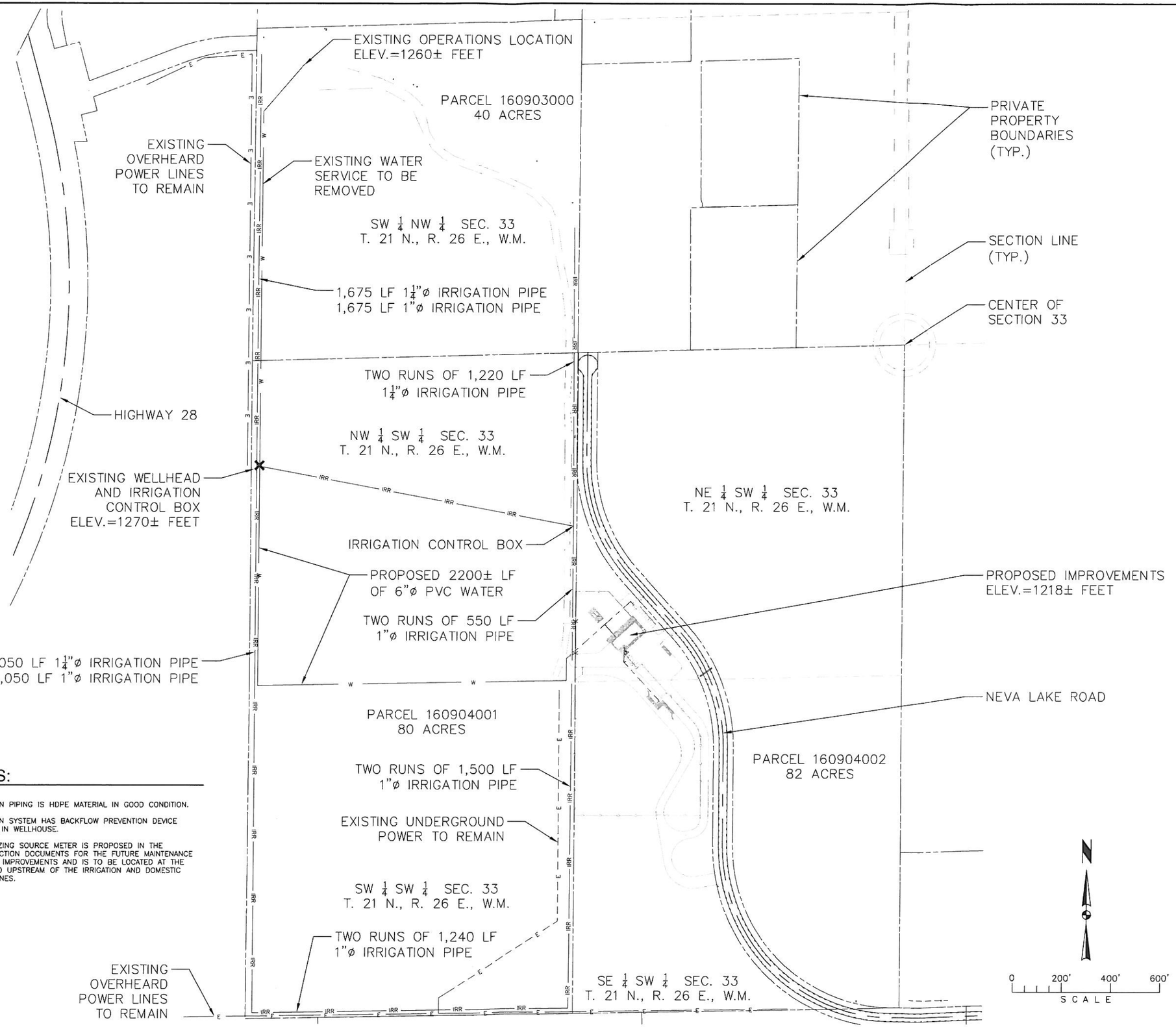
TD&H Engineering

NOTE

Actual pipe length is roughly 2500 feet

Equivalent Pipe Length is 2700 and accounts for 6" diameter pipe losses plus 100 feet to be conservative

90 degree Elbow	9 ft each x	2 elbows = total Eq. L	18	ft
45 degree bend	6	1	6	
Tee	4	1	4	
gate valves	3	4	12	
check valve	65	1	65	
			105	ft



NOTES:

1. IRRIGATION PIPING IS HDPE MATERIAL IN GOOD CONDITION.
2. IRRIGATION SYSTEM HAS BACKFLOW PREVENTION DEVICE LOCATED IN WELLHOUSE.
3. A TOTALIZING SOURCE METER IS PROPOSED IN THE CONSTRUCTION DOCUMENTS FOR THE FUTURE MAINTENANCE BUILDING IMPROVEMENTS AND IS TO BE LOCATED AT THE WELLHEAD UPSTREAM OF THE IRRIGATION AND DOMESTIC WATER LINES.

REVISIONS

BY	DATE	DESCR
BY	DATE	DESCR
BY	DATE	DESCR

THOMAS, DEAN & HOSKINS, INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL
SPOKANE
LEWISTON
MONTANA
WASHINGTON
IDAHO

TD&H

DRAWN BY:	ATJ
DESIGNED BY:	ATJ
QUALITY CHECK:	
DATE:	4/20/11
JOB NO.	S10-014
FIELDBOOK	

EPHRATA LANDFILL
EPHRATA, WA

WATER SYSTEM EXHIBIT

S10-014-BASEMAP

SHEET 1/1

P 206.329.0141 | **F** 206.329.6968

2377 Eastlake Avenue East | Seattle, WA 98102

P 206.842.3202 | **F** 206.842.5041

8150 West Port Madison NE | Bainbridge, WA 98110

P 360.570.8244 | **F** 360.570.0064

1627 Linwood Avenue SW | Tumwater, WA 98512

www.pgwg.com

PgG