File No.: G4-35220
WAC Doc ID: 4563058

State of Washington
REPORT OF EXAMINATION
FOR WATER RIGHT APPLICATION

PRIORITY DATE	APPLICATION NUMBER
November 25, 2013	G4-35220

MAILING ADDRESS	SITE ADDRESS (IF DIFFERENT)
Klickitat Public Utility District No. 1 1313 S. Columbia Ave. Goldendale, WA 98620-9578	Regional Disposal Company 500 Roosevelt Grade Road Roosevelt, WA 99356

REMARKS: This authorization is mitigated by a portion of Certificate No. S3-00845C(A).

Quantity Authorized for Withdrawal or Diversion

DIVERSION RATE	UNITS	ANNUAL QUANTITY (AC-FT/YR)
93	Gallons Per Minute (GPM)	89

Purpose

PURPOSE	WITHDRAWAL RATE			ANNUAL QUANTITY (AC-FT/YR)		PERIOD OF USE (mm/dd)
	ADDITIVE	NON-ADDITIVE	UNITS	ADDITIVE	NON-ADDITIVE	
Power Generation	43	0	GPM	49		Year-round, as needed
Dust Control/Methane Generation	50	0	GPM	40		Year-round, as needed

Source Location

WATERBODY	TRIBUTARY TO	COUNTY	WATER RESOURCE INVENTORY AREA
Groundwater		Klickitat	31

SOURCE FACILITY/DEVICE	PARCEL	TWN	RNG	SEC	QQ Q	DESCRIPTION
Well (BAR731)	0421220000300	4 N.	21 E.W.M.	22	SE SE	210 feet north and 875 feet west of the SE corner of Section 22

Datum: WGS84

Place of Use (See Attachment A)

PARCEL
0421220000300

LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE

The W½W½SW¼ of Section 22; the W½NE¼; NW¼SE¼; NW¼, and SW¼ of Section 27; the E½NE¼; the SE¼ and that portion of the W½ (less N½NW¼) lying east of the County Road, all in Section 28, the north 1400 feet of that portion of Section 33 east of County Road, all in T. 4 N., R. 21 E.W.M. Except that portion deeded to the County (Aud. No. 141547) the S½ of Section 21; the S½ less the W½SW¼ of Section 22; the SW¼SE¼ of Section 27; the NW¼SW¼ and the N½ less the NE¼NE¼ of Section 34, all in T. 4 N., R. 21 E.W.M., east of the Roosevelt Regional Landfill.

Proposed Works

A 6-inch diameter well drilled to a depth of 801 feet to be equipped with a 40 horsepower (hp) pump.

Development Schedule

BEGIN PROJECT	COMPLETE PROJECT	PUT WATER TO FULL USE
Started	January 1, 2019	January 1, 2020

Measurement of Water Use

How often must water use be measured?	Monthly
How often must water use data be reported to Ecology?	Annually (Jan 31)
What volume should be reported?	Total Annual Volume
What rate should be reported?	Annual Peak Rate of Withdrawal (gpm)

Provisions

Measurements, Monitoring, Metering, and Reporting

An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173, which describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology (Ecology) for modifications to some of the requirements.

Recorded water use data shall be submitted via the Internet. To set up an Internet reporting account, contact the Central Regional Office. If you do not have Internet access, you can still submit hard copies by contacting the Central Regional Office for forms to submit your water use data.

Monitoring Provisions

Given some uncertainty in water availability and impairment to the Roosevelt Regional Landfill's (Landfill) existing water supply well (WSW-1) the permit holder is required to perform long term monitoring of water levels. Long term water level trends shall be monitored in well BAR731 (at least quarterly). It is recommended that Public Utility District No. 1 of Klickitat County (KPUD) shut down the system for at least one week every year and collect/report a late winter static water level (SWL) to Ecology, however, alternate methodology can be adopted with Ecology's concurrence. It is further suggested that KPUD collaborate with the Landfill to monitor long term water levels in WSW-1.

Proof of Appropriation

The water right holder shall file the notice of Proof of Appropriation of water (under which the certificate of water right is issued) when the permanent distribution system has been constructed and the quantity of water required by the project has been put to full beneficial use. The certificate will reflect the extent of the project perfected within the limitations of the permit. The applicant is advised that a certificate may be issued in a smaller quantity should water not prove to be available at the permitted recommendations. Elements of a proof inspection may include, as appropriate, the source(s), system instantaneous capacity, beneficial use(s), annual quantity, place of use, and satisfaction of provisions.

Schedule and Inspections

Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, diversions, measuring devices, and associated distribution systems for compliance with water law.

Other Conditions

This permit is issued as junior to Groundwater Permits Nos. G4-30342 and G4-30197 and is subject to regulation should water levels decline enough to impact operation of wells at the Landfill.

Findings of Facts

Upon reviewing the Investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated. Furthermore, I concur with the Investigator that water is available from the source in question; that there will be no impairment of existing rights; that the purpose(s) of use are beneficial; and that there will be no detriment to the public interest.

Therefore, I ORDER approval of Application G4-35220, subject to existing rights and the provisions specified above.

Your Right To Appeal

You have a right to appeal this Order to the Pollution Control Hearings Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of the Order.

- File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.
- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION	
Street Addresses	**Mailing Addresses**
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503 **Pollution Control Hearings Board** 111 Israel RD SW STE 301 Tumwater, WA 98501	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608 **Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov
To find laws and agency rules visit the Washington State Legislature Website: http://www.leg.wa.gov/CodeReviser

Signed at Yakima, Washington, this 14th day of April 2015.

Sage Park

Sage Park, Section Manager
Water Resources Program/CRO

If you need this document in a format for the visually impaired, call the Water Resources Program at 509-575-2490. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

INVESTIGATOR'S REPORT

Kelsey Collins, Department of Ecology
Application for Water Right - Klickitat Public Utility District No. 1
Water Right Control Number G4-35220

BACKGROUND

On November 25, 2013, Public Utility District No. 1 of Klickitat County (KPUD) filed Application for Ground Water Right Permit No. G4-35220 with the Department of Ecology (Ecology)[1]. The new application requests 93 gallons per minute (gpm) and 89 acre-feet for power generation, dust control, and methane production at the Roosevelt Regional Landfill (Landfill). Water will be used for operation of the KPUD's Landfill Gas Power Plant, and by the Regional Disposal Company for dust control and methane production. The project site is located in Water Resource Inventory Area (WRIA) 31, the Rock-Glade Creek Watershed in Klickitat County.

Project Description

The intent of this project is to secure a water right permit for the groundwater used in the production of power at the Landfill Gas Power Plant. The Landfill Gas Power Plant is a landfill-gas-to-energy facility built on land leased from Allied Waste.

The KPUD's state of the art facility generates power from methane gas that is collected in a network of wells and perforated pipe buried in the Landfill. The system is able to collect nearly 90 percent of the methane generated, and hundreds of feet of collection pipe transport the methane from the Landfill to equipment that compress the gas and filter out impurities. Clean, compressed gas is used to operate the turbines at the power plant.

The project includes two 10 mega watt combustion turbines with additional capacity of approximately 6 mega watt through a heat recovery steam generator and steam turbine, for a capacity of 26 mega watt.

The Landfill Gas Power Plant is located within the Landfill property boundary in the northeast quarter of Section 27, Township 4 North, Range 21 E.W.M., approximately five miles northeast of the small community of Roosevelt in Klickitat County. Access to the site is via the Landfill's haul road. The facilities are located approximately one mile east of the Landfill operations building, and half a mile from each other.

KPUD has also agreed to make the well available to the Landfill for general operations. Water will be used as needed for dust control and as a water source for increased methane production. Allied Waste will access the water via a pumping station at the wellhead and transport water in tanker trucks.

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[1] This application replaces a previous filing by the same number

Table 1: Summary of Application No. G4-35220

Attributes	*Proposed*
Applicant	Klickitat Public Utility District No. 1
Application Received	November 25, 2013
Instantaneous Quantity	93 gpm
Source	Well
Point of Withdrawal	210 feet north and 875 feet west of the SE corner of Section 22
Purpose of Use	Power Generation, Dust Control, and Methane Production.
Period of Use	Year-round, as needed.
Place of Use	The W½W½SW¼ of Section 22; the W½NE¼; NW¼SE¼; NW¼ and SW¼ of Section 27; the E½NE¼; the SE¼ and that portion of the W½ (less N½NW¼) lying east of the County Road all in Section 28, the North 1400 feet of that portion of Section 33 east of County Road all in Township 4 North, Range 21 E.W.M. Except that portion deeded to County (Aud. No. 141547) the S½ of Section 21; the S½ less the W½ of the SW¼ of Section 22; the SW¼ of the SE¼ of Section 27; the NW¼ of the SW¼ and the N½ less the NE¼ of the NE¼ of Section 34, all in Township 4 North, Range 21 E.W.M.

Legal Requirements for Application Processing

The following requirements must be met prior to making a permit decision:

- **Public Notice**

  A notice of publication was published in the Goldendale Sentinel on February 19 and 26, 2014. No protests were received as a result of the public notice.

- **State Environmental Policy Act (SEPA)**

  The subject water right is not subject to SEPA [WAC 197-11-305 or WAC 197-11-800(4)], because the instantaneous quantity is less than the threshold of 2250 gpm.

- **Water Resources Statutes and Case Law**

  Chapters 90.03 and 90.44 RCW authorize the appropriation of public water for beneficial use and describe the process for obtaining water rights. RCW 90.42.100 authorizes the use of trust water rights to mitigate for beneficial use under Chapter 90.03, 90.44, or 90.54 RCW.

- **Cost Reimbursement and Expedited Processing**

  Based on the provisions of RCW 43.21A.690 and RCW 90.03.265, this application has been processed by Pacific Groundwater Group under Ecology Cost-Reimbursement Agreement Contract No. C1000192, Work Assignment PGG019.

  RCW 90.03.265(2) provides that, in pursuing a cost-reimbursement project, Ecology must determine the source of water from which the water is proposed to be diverted or withdrawn, including the boundaries of the area that delimit the source. Ecology must determine if any other water right applications are pending from the same source. A water source may include surface water only, groundwater only, or surface and groundwater together, if Ecology finds they are hydraulically connected. Ecology shall consider technical information submitted by the applicant in making its determinations under this subsection.

  RCW 90.03.265(1)(b) provides that the requirement for an applicant to pay for the processing of senior applications does not apply in situations where it can be determined that the water allocated to one party will not diminish the water available to a senior applicant from the same source of supply. One special consideration for this project is pending Application No. G4-31883, filed by Rabanco\Allied Waste in 1993. This application requests additional water for Landfill operations and is senior to the KPUD's filing. The parties have made arrangement to allow the earlier filing to be skipped to allow priority processing of the KPUD's filing. Under the terms of this agreement, KPUD agrees to provide water to the Landfill on a limited basis.

INVESTIGATION

The examination of Ground Water Right Application No. G4-35220 was led by Pacific Groundwater Group which was contracted as part of Ecology's cost reimbursement program to facilitate the processing of the application. Kelsey Collins, of Ecology's Water Resources Program, Central Regional Office, oversaw the examination and provided review.

Site Visit

A site visit was conducted by Jill Van Hulle of Pacific Groundwater Group on August 14, 2013. In attendance were Kevin Ricks, Jimmy Wells, Ron Ihrig with KPUD, and John Grimm, the applicant's project consultant. The tour included the inspection of the production well and the project site.

The investigation included, but was not limited to, the review of:

- Driscoll, 1986. Groundwater and Wells, Second Edition. Johnson Division, St. Paul Minnesota.
- Pacific Groundwater Group, 1989. Hydrogeologic Characterization Rabanco Regional Landfill, Klickitat County, Washington (consultant's report prepared December 1989).
- Pacific Groundwater Group, 1994. Hydrogeologic Characterization to meet WAC 173-351 Roosevelt Regional Landfill. Klickitat County, Washington. November 1994.
- The State Water Code, specifically RCW 90.03 and 90.44, and several Chapters in WAC 173.
- Washington State Department of Ecology, 2013, Washington State Well Log Viewer website, http://apps.ecy.wa.gov/welllog/index.asp
- Washington State Department of Ecology, 2013, Water Rights Tracking System (WRTS) website http://www.ecy.wa.gov/programs/wr/rights/tracking-apps.html
- Washington Department of Natural Resources (WDNR), 2008. Digital Geology of Washington State at 1:10,000 Scale version 2.0. October 2008.

- WRIA 31 Planning Unit, 2008. Watershed Management Plan Rock-Glade Watershed (WRIA 31).
- Water Well Reports from the Department of Ecology well log database (various dates).
- U.S. Geological Survey. Hydrogeologic Framework and Hydrologic Budget Components of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho. Scientific Investigations Report 2011-5124.

Site Description

The point of withdrawal (unique well ID BAR731) is located on a plateau above the Columbia River within the Landfill property about five miles northeast of the town of Roosevelt and about two miles north of the Columbia River (Southeast quarter of Section 22, Township 4 North, Range 21 E.W.M.). The surface elevation at the well site is about 1515 feet above sea level or about 1250 feet above the normal pool elevation of the Columbia River above the John Day Dam (265 feet above sea level). The John Day Dam is located about 30 miles downriver from the project area.

Except for the Landfill facility, the place of use is largely undeveloped. The topography of the site rises gently to the north-northwest towards the town of Bickleton. The site is dissected by deep, steep-walled canyons (with depths close to 1000 feet below the plateau) towards the east-northeast, west, and south. These canyons comprise Pine Creek, Wood Gulch Creek, and the Columbia River respectively. Coyote Creek is a smaller localized intermittent creek that drains the site east to west and discharges to Pine Creek. No irrigation occurs near the site or in the headwaters of Pine and Wood Gulch Creek. The closest irrigation occurs about 7.5 miles east-northeast of the site within the Alder Creek drainage basin.

Setting

WRIA 31 is located in eastern Klickitat County, southeastern Yakima County, and western Benton County, Washington. The streams in the WRIA drain to the Columbia River. From west to east, major drainages in WRIA 31 include Rock, Wood Gulch, Pine, Alder, Dead Canyon, Glade Creeks, Fourmile, and Switzler Canyons. All streams in WRIA 31 that discharge to the Columbia River, including Pine Creek, Wood Gulch Creek, and Coyote Creek are intermittent (lacking dry season flow) except in localized spring-fed reaches (WRIA 31 Planning Unit, 2008) or return flow from summertime irrigation. The project site is situated in the Wood Creek and Pine Creek subbasins.

WRIA 31 drains south from the Horse Heaven Hills into the Columbia River. Elevations range from nearly 4800 feet in the northern part of the Rock Creek subbasin to 265 feet at the Columbia River, and generally decreases from west to east and from north to south.

The entire WRIA is underlain by the Miocene Columbia River Basalt, including the Grande Ronde, Wanapum, and Saddle Mountain Basalt Members (WDNR 2008). The Wanapum Basalt is the dominant geologic formation at the surface in Rock Creek, with the younger Saddle Mountain Basalt dominating at the surface in the Wood Gulch and Pine Creek subbasins. The volcanic bedrock forms the steep canyon walls of many of the larger streams as they have cut down into the basalt, which provides gravel and cobble-sized sediments to these streams as well as forming bedrock chutes and falls in a few locations.

The climate in the vicinity of the project area is modified continental, with cool to cold winters and hot summers. Average precipitation is on the order of 9.5 inches per year with most falling during October through March (PGG, 1989).

Hydrologic/Hydrogeologic Evaluation

The discussion of geology and hydrogeology in this section is based on review of Pacific Groundwater Group (1989 and 1994), examination of the 1:100,000 surficial geologic map (WDNR, 2008), and water-well logs. The evaluation of regional geology and interpretation of aquifer testing was performed by PGG's licensed hydrogeologist Dawn Chapel.

The project area is underlain by the Miocene Columbia River Basalt Group (CRBG), with the Saddle Mountain and Wanapum Basalt Formations and the Ellensburg Sedimentary Formation (interbeds within the CRBG) exposed at the land surface. An extensive hydrogeologic investigation was performed for the Landfill in 1989 and 1994 by Pacific Groundwater Group, which included drilling numerous monitoring wells and a deep WSW-1 and construction of several geologic cross sections.

Based on correlation to WSW-1 and geologic cross sections, the following units appear to be penetrated by well BAR731:

- Saddle Mountain Formation (Elephant Mountain Member): 4 to 7 feet depth (3 feet thick).
- Ellensburg Formation (Rattlesnake Ridge Member): 7 to 114 feet depth (107 feet thick).
- Saddle Mountain Formation (Pomona Member): 114 to 205 feet depth (91 feet thick).
- Ellensburg Formation (Selah Member): 205 to 538 feet depth (333 feet thick).
- Wanapum Formation (Priest Rapids Member): 538 to 730 feet depth (192 feet thick).
- Ellensburg Formation (Squaw Creek Member): 730 to 753 feet depth (23 feet thick).
- Wanapum Formation (Top of the Frenchman Springs Member): 753 to 801 feet bottom of well.

WSW-1 is located on the plateau about 8000 feet west-southwest of well BAR731 and was initially drilled to a depth of 1535 feet and penetrated into the upper part of the Grand Ronde Formation. That well indicates the Frenchman Springs Member of the Wanapum Formation is about 675 feet thick beneath the site.

The first groundwater zone beneath the site occurs within the Pomona Member of the Saddle Mountain Formation. Beneath the Pomona is the Selah Member of the Ellensburg Formation; a thick, clay-rich sedimentary confining unit with local areas of variably lithified, well sorted, sand to sandstone (PGG, 1994). The Selah unit separates groundwater in the Pomona Member from the deeper aquifers in the Priest Rapids and Frenchman Springs Member of the Wanapum Formation. As described below, well BAR731 is completed in a water bearing interval of the Frenchman Springs at a depth of 753 to 775 feet (or at an elevation of 762 to 740 feet). The elevation of this interval occurs above the Columbia River (normal pool elevation of 265 feet) and is projected to outcrop within the valleys of Wood Gulch and Pine Creek approximately 4.0 miles upstream of the Columbia River.

A series of broad, low-amplitude, east-west trending, east plunging anticlines and synclines define the local geologic structure beneath the site (PGG, 1994). The dips and plunges of the local folds are on the order of two to five degrees with amplitudes of less than 200 feet (PGG, 1994).

Surficial geologic mapping (DNR, 2008 and PGG, 1989) shows the Frenchman Springs basalt is exposed at the base of the bluffs along the Columbia River and along the Wood Gulch Creek from its confluence with the Columbia River to about 6 miles upstream. The Frenchman Springs Member is not mapped as exposed along Pine Creek. Most of the surficial geology in Pine Creek is mapped as recent alluvium or landslide material with only a few bedrock outcrops mapped as the Priest Rapids Member. If the surficial geology map is correct and the Frenchman Springs does not outcrop in Pine Creek, it suggests localized folding or faulting may have displaced the unit.

The deep valleys of the adjacent Wood Gulch Creek, Pine Creek, and the Columbia River likely form no-flow boundaries for aquifers in the Frenchman Springs at the project site. These boundaries would limit any recharge from the east, west, and south. Most of the recharge to the Frenchman Springs aquifer likely originates from sources that lie to the north. Based on historic operation of well BAR731 since 2008, and WSW-1 since 1990, groundwater yields in the Frenchman Springs aquifer at this location appears to be sufficient to allow both wells to operate, suggesting a regional recharge source to the north.

Groundwater flow in the shallow Pomona Aquifer is eastward (based on measurements from numerous landfill monitoring wells) towards several springs along the bluffs above Pine Creek (PGG, 1994). Some vertical discharge through the Selah Member may also occur (PGG, 1994). The limits of saturation and flow direction in the Pomona Aquifer are strongly influenced by the structural shape of the aquifer and the orientation of the underlying clays of the Selah unit (PGG, 1994). A potentiometric map of the aquifer constructed in 1994 shows limited to no saturation occurs in the aquifer towards the west of the site near Wood Gulch Creek (Figure 8-2, PGG, 1994). Recharge to the Pomona aquifer come entirely from localized precipitation on or near the site (PGG, 1994).

Groundwater flow in the Priest Rapids and Frenchman Springs of the Wanapum Formation is likely predominantly southwards towards the Columbia River (the regional discharge point). The precise direction on site cannot be measured because there are not enough wells in these zones in the study area. However, significant decreasing heads were observed during drilling of WSW-1 and BAR731, indicating a strong downward gradient toward the Columbia River. Furthermore, there do not appear to be any major springs along the bluffs to the east or west at an elevation correlative with the Frenchman Springs, suggesting a dominant southward flow direction in this aquifer.

At Ecology's request (Memorandum to the File dated June 26, 2014) PGG conducted some additional evaluations of conditions noted in a nearby well drilled for Whitmore Lawrence in 2007 (Ecology Well ID APT731). Ecology suggested information from this well could be informative in interpreting the regional groundwater flow behavior. The well was initially drilled to 470 feet, and deepened to 580 feet in 2010, but was dry and therefore drilling discontinued. Well APT731 is located about 2.3 miles west of BAR731 and the well log for APT731 indicates sandstone, clay, and some wood between depths of 114 feet to 445 feet (elevation of 1636 to 1305 feet). This 331-foot thick zone appears to correlate with the clay and wood interpreted as the Selah Member in BAR731 (elevation 1310 to 977 feet) and suggest about 325 feet of offset over a distance of 2.3 miles. This would indicate a slope in geologic units towards the east of about 1.5 degrees, which is consistent with previous studies of the geologic structure (PGG, 1994). Based on the depth of well APT731 and correlation with the Selah Member, it is most likely that well APT731 was drilled into the upper portion of the Priest Rapids Member of the Wanapum Formation.

The lack of water noted in the upper Priest Rapids in the drillers log at the location of Well APT731 may be due to the well's relatively close proximity to the steep bluffs of Wood Gulch Creek. Wood Gulch Creek bluff is located about 2000 feet immediately east of the well and the bottom of the canyon (900 feet elevation) is about 270 feet lower than the bottom of the total drilled depth of APT731 (1170 feet elevation). Given the proximity of the steep bluff, it may be that the upper portion of the Priest Rapids aquifer does support saturation at this location compared to locations further east.

Long Term Groundwater Elevations

There is no information available on long term groundwater level trends in the Frenchman Springs aquifer in the vicinity of the project site. Groundwater level declines in the Wanapum Basalt aquifers are reported in some areas of the region due to long term pumping of irrigation wells; however, the

The estimated specific capacity from the first pumping test is:

- Based on pumping rate during first 13 minutes: SC = 22 gpm/0.7 ft = 31 gpm/ft
- Based on pumping rate during remainder of test: SC = 50gpm/2.3 ft = 22 gpm/ft

The estimated specific capacity from the second pumping test is:

- Based on initial drawdown stabilization: SC = 30 gpm/0.9 ft = 33 gpm/ft

Using an average specific capacity value of 29 gpm/ft, we use an empirical relationship between specific capacity and transmissivity for confined aquifers (Driscoll, 1986) to estimate the aquifer transmissivity:

- T = C*SC = 2000*29 = 58,000 gpd/ft

  Where

  T = Transmissivity (gallons per day(gpd)/ft)

  C = 2000 (a constant)

  SC = Specific Capacity (gpm/ft)

The estimated transmissivity for BAR731 is slightly lower than the transmissivity calculated for the Landfill's WSW-1 (85,000 gpd/ft) from a 24 hour aquifer pumping test (PGG, 1994). WSW-1 is located about 1.5 miles west-southwest of BAR731 and is completed in a deeper water bearing zone in the Frenchman Spring Member (about 100 feet deeper than BAR731).

The long term drawdown in BAR731 was evaluated assuming a constant average pumping rate 55 gpm. This evaluation uses the above estimate for transmissivity and a median aquifer storage coefficient of $4x10^{-5}$ for the Wanapum basalt (USGS, 2011) and assumes three no flow boundary conditions to represent the truncated aquifer to the east, west, and south due to the steep valleys of Pine Creek, Wood Gulch Creek, and the Columbia River truncating the aquifer. For the analysis we used the forward Theis solution for confined aquifers and Aqtesolv® aquifer test analysis software package (Hydrosolve, Inc. 1996-2007)

The analysis shows a total drawdown in the well of 18 feet after one year of continuous operation at 55 gpm. This is less than the available drawdown in the well (estimated to be about 30 feet) and indicates a long term pumping rate of 55 gpm could be achievable. The available drawdown in the well is based on a pump set depth of 756 feet, a static water level of 715 feet, and maintaining at least 10 feet of water above the pump.

The analysis also shows drawdown accelerates significantly at later time (after about 1000 minutes) due to the bounded nature of the aquifer. These natural boundaries could limit long term supply if the well is over-pumped. A similar boundary effect was observed after 500 minutes during the 24 hour pumping test of the Landfill's WSW-1 (PGG, 1994), which is consistent with the observation of no major spring activity along the bluffs at an elevation correlative with the Frenchman Springs.

Yield of the well will be controlled by recharge to the aquifer from the region north of the site. Long term groundwater level trends need to be closely monitored in BAR731 and KPUD will need to shut down the system for at least one week every year and collect/report a late winter SWL to Ecology (see monitoring provisions above).

closest irrigation area is about 7.5 miles east-northeast of the site in the Alder Creek basin and irrigation withdrawals from that basin are not likely to influence groundwater levels at the Landfill property.

Well Construction and Testing

Well BAR731 is a 6-inch well drilled in 2008 to a total depth of 801 feet. A surface seal extends to a depth of 555 feet. A 6-inch welded casing extends to 801 feet with factory slot perforations between a depth of 758 and 798 feet. The well is completed in the upper part of the Frenchman Springs Member of the Wanapum Basalt Formation. A water bearing zone in the Frenchman Springs is identified on the well log at 753 to 775 feet depth (or at an elevation between 740 to 762 feet). Two upper water bearing formations at 205 to 230 feet depth and 565 to 575 feet depth (Saddle Mountain Basalt and Priest Rapids Basalt respectively) are sealed with two formation packers on the 6-inch casing at 667 feet and 668 feet. The static water level in the well at time of drilling was 715 feet below ground surface.

Two 24-hour pumping tests were recently performed by KPUD using the well's dedicated pump. There is currently no access port available for collecting hand measurements of the water level in the well. The drawdown in the well was monitored during the pumping test using a dedicated vented transducer with an automated SCADA system. As described below, the pressure transducer data collected during the two tests displayed unusual readings, which made it infeasible to determine the aquifer transmissivity using the traditional drawdown curve method. Instead, as described below, we used specific capacity information from the two tests to estimate the transmissivity.

The first pumping test was performed on November 19, 2013. The initial pumping rate was set to about 22 gpm during the first 13 minutes of the test, and then it was slowly increased to 50 gpm between 13 and 21 minutes, after which it was pumped at 50 gpm until the end of the test (approximately 24 hours). The initial drawdown in the well after the first 13 minutes was 0.7 feet. As the pump was increased to 50 gpm between 13 and 21 minutes, the drawdown increased to 2.3 feet, but then the transducer data shows the water level began to slowly rise in the well for the next 100 minutes before switching to a slow decline for the remainder of the test with a total drawdown of 3.4 feet. Once the pump was turned off the water level in the well began to increase, but never fully recovered (still 1.5 feet below original static water level one day after test). Furthermore, after about 9 hours of recovery the water level in the well began to decline. The rising water level during the pumping test and later decline during the recovery suggests a possible interference from the Landfill's WSW-1 during the test or possibly some other influence. This fact, together with the variable pumping rate, complicated data analysis for the first pumping test.

The second pumping test was performed on January 21, 2014. The Landfill's WSW-1 was not operating during the second test and a single constant pumping rate was used. The pumping rate was set to 30 gpm within the first 2 minutes of the test and was run at this rate until the end of the test (about 27 hours). The transducer data shows the well drawdown immediately stabilized at 0.9 feet within the first minute of the test, after which the water level very slowly began to rise 0.05 feet over the next 6 hours, after which the water level began to decline slowly to a total of 1.1 feet drawdown 22 hours into the test. At about 22 hours into the test, the water level again began to rise before the pump was shut down at 27 hours. The recovery data shows the water level continuing to rise (with period changes to a decline) with full recover to the initial static level approximately 56 hours after turning the pump off.

The abnormal deviations in the drawdown curve observed during both tests may be at least partially due to shifts in barometric pressure. Unfortunately, it appears that the transducer in the well may have some moisture in the vent tube, which could result in unusual readings that are difficult to correct for when trying to look at small changes in drawdown. We, therefore, used specific capacity information from the two tests to estimate aquifer transmissivity. Specific capacity (SC) is the pumping rate (Q) of the well divided by the observed drawdown (DD) in the well.

Statutory Tests

This Report of Examination (ROE) evaluates the application based on the information presented above. To approve the application, Ecology must issue written findings of fact and determine that each of the following requirements of RCW 90.03.290 has been satisfied:

- The proposed appropriation will be put to a beneficial use;
- Water is available for appropriation;
- The proposed appropriation will not impair existing water rights.

Beneficial Use

The facility is currently in operation with water use closely managed so as to avoid exceeding the 5000 gpd groundwater exemption. In general this facility was designed to be very water efficient. Water is used for two primary functions at the gas plant; in emission control where water is blended with the methane stream to reduce fouling and control temperature, and in cooling where an evaporative cooling system cools the fuels inlets.

In addition to the Landfill Gas Plant, KPUD plans to provide water on a limited basis to Allied Waste for dust control. Allied holds its own water rights for dust control from wells located near the main office complex, however, the Landfill is a large facility and having an alternative place for Allied Waste to fill water trucks would be more efficient.

The parties have agreed that up to 15 ac-ft/yr (approximately 13,400 gpd and 9.3 gpm) could be supplied to Allied Waste from the gas plant production well without impacted operations at the facility.

Water use at the gas plant is expected to range from a peak day water demand scenario of approximately 41,000 gpd (28.5 gpm), to an average day demand of 22,800 gpd (15.8 gpm). Total average instantaneous water demand at the facility, with the dust control component, is approximately 38 gpm, with total peak demands amounting to 93 gpm.

Availability

Water is physically available for use and has been used for supply of this LGP since the plant became operational. The long term yield of the well will be controlled by recharge to the aquifer from the region north of the site. As discussed above, KPUD's well is currently operated intermittently at a rate of 50 gpm and an average of less than 5000 gpd and testing at a higher rate yielded conflicting information regarding long term sustainability of increased production.

Legally, new consumptive water uses are not available. Groundwater proposed for this new use would otherwise eventually discharge to the Columbia River. Ron Ihrig, KPUD, provided Ecology with a Quit Claim Deed for 0.21 cfs and 89 ac-ft/yr; a portion of S3-00845C(A) to use as mitigation for this new permit.

Impairment Considerations

Effects on Other Water Rights

The nearest supply well to BAR731 is the Landfill's WSW-1 located about 1.5 miles west-southwest of BAR731. WSW-1 was originally drilled to a total depth of 1535 feet into the Grande Ronde Formation, but higher yields were observed in the overlying Frenchman Springs Member of the Wanapum Formation. The well was therefore modified and completed in a water bearing zone between 615 and 665 feet elevation, about 100 feet below the water bearing zone screened by well BAR731 (740 to 762 feet elevation). The static water level elevation in WSW-1 (at time of well completion) is 822 feet.

Potential interference drawdown in WSW-1 from the long term pumping of BAR731 at an average pumping rate of 55 gpm was evaluated in Aqtesolv®. For the analysis we used the forward Theis solution for confined aquifers and assume three no flow boundary conditions to represent the truncated aquifer due to the steep valleys of Pine Creek, Wood Gulch Creek, and the Columbia River to the east, west and south respectively. The results indicate the interference drawdown in WSW-1 after one year of continuous pumping of BAR731 at 55 gpm would be 16 feet. This is a conservative estimate because it is not likely that the well would be operated continuously for a whole year. Also, WSW-1 is completed in a deeper water bearing zone within the Frenchman Springs Member (100 feet deeper) relative to well BAR731, and the hard basalt separating the two water bearing zones likely limits the hydraulic connection between the two zones.

The available drawdown in WSW-1 is about 160 feet (difference between static water level and top of screen). The conservative estimate of interference drawdown therefore represents about 10 percent of the available drawdown in WSW-1. There are no closer wells to analyze for potential impairment.

A review of Ecology records indicates that with the exception of the Allied Waste\Rabanco permits no formal water rights have been issued within a two mile radius. Table 2 shows several water right claims that are on file for the surrounding area.

Table 2: Water Right Records[2] Within a Two Mile Radius of Subject Well

Document	Person	Doc	Date	Purpose	Qi	UOM	Qa	TRS	Source
S4-050710CL	WHITE RANCH INC.	Claim S	12/26/1973	ST		CFS		4N 21E 23	SPRING
S4-050711CL	WHITE RANCH INC.	Claim S	12/20/1973	ST		CFS		4N 21E 23	SPRING
S4-013536CL	MILLER JAMES H.	Claim L	1/1/1925	ST	10	CFS	2	4N 21E 24	SPRING
G4-050712CL	WHITE RANCH INC.	Claim S		ST		GPM		4N 21E 26	WELL
G4-31883	REGIONAL DISPOSAL CO	NewApp	12/27/1993	EN,DS	700	GPM		4N 21E 26	WELL
G4-005387CL	CLARK KENNETH J.	Claim L	1/1/1920	ST,DG	4	GPM	1	4N 21E 27	
S4-005403CL	CLARK KENNETH J.	Claim L	1/1/1916	ST	3	CFS	1	4N 21E 27	SPRING
S4-301245CL	PINE CREEK RANCHES INC	Claim	1/1/1917	ST	0	CFS	1	4N 21E 28	SPRING
G4-30342	RABANCO REGIONAL LANDFILL CO	Pmt	7/17/1990	CI	200	GPM	30	4N 21E 28	WELL
G4-30197	RABANCO REGIONAL LANDFILL CO	Pmt	3/12/1990	IR,EN	200	GPM	61	4N 21E 28	WELL
S4-064060CL	WN. ST. DEPT. NAT. RSO.	Claim L	11/11/1889	WL,ST	0	CFS	2	4N 21E 36	SPRING

As previously noted, pending Application G4-31883 has been voluntarily skipped by the applicant. The applicant of G4-31883, and Landfill operator Arthur Mains, Environmental Manager, Regional Disposal Company, has subsequently provided a letter to Ecology stating they acknowledge the potential for small impacts to their system. Mr. Mains states that based on their long and cooperative working relationship with KPUD on mutually beneficial goals, they do not object to the issuance of this permit. We note that the Landfill's rights are senior to this filing, and that adequate regulatory and legal processes are in place to prevent KPUD's withdrawal to create actual impairment to the Regional Disposal Company.

[2] WRATS Database accessed 3/26/2014.

RECOMMENDATION

Based on the information presented above, the author recommends that the request to appropriate the following quantities be approved in the amounts described, limited, and provisioned on page 1 through 3 of this report.

- 93 gpm, 89 ac-ft/yr for year-round power generation, dust control, and methane production.

Report by: Jill E Van Hulle 4/1/15

Jill Van Hulle, Pacific Groundwater Group, C.W.R.E. Date

Dawn Chapel

Report by: Dawn Chapel 4/1/15

Dawn Chapel, Pacific Groundwater Group Date

Reviewed by: Kelsey L Collins 4/1/15

Kelsey Collins, Water Resources Program Date

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Other small surface water diversions or private domestic wells are unlikely to be affected by withdrawals from the applicant's deep production well.

Effect to Surface Water

Two intermittent streams that discharge to the Columbia River occur within 3 miles of well BAR731. Wood Gulch Creek occurs about 2.5 miles west, and Pine Creek occurs about 0.8 miles north and 2 miles east. A third smaller intermittent stream, Coyote Creek, is located about 0.4 miles south of BAR731 and drains the site east to west and discharges into Pine Creek.

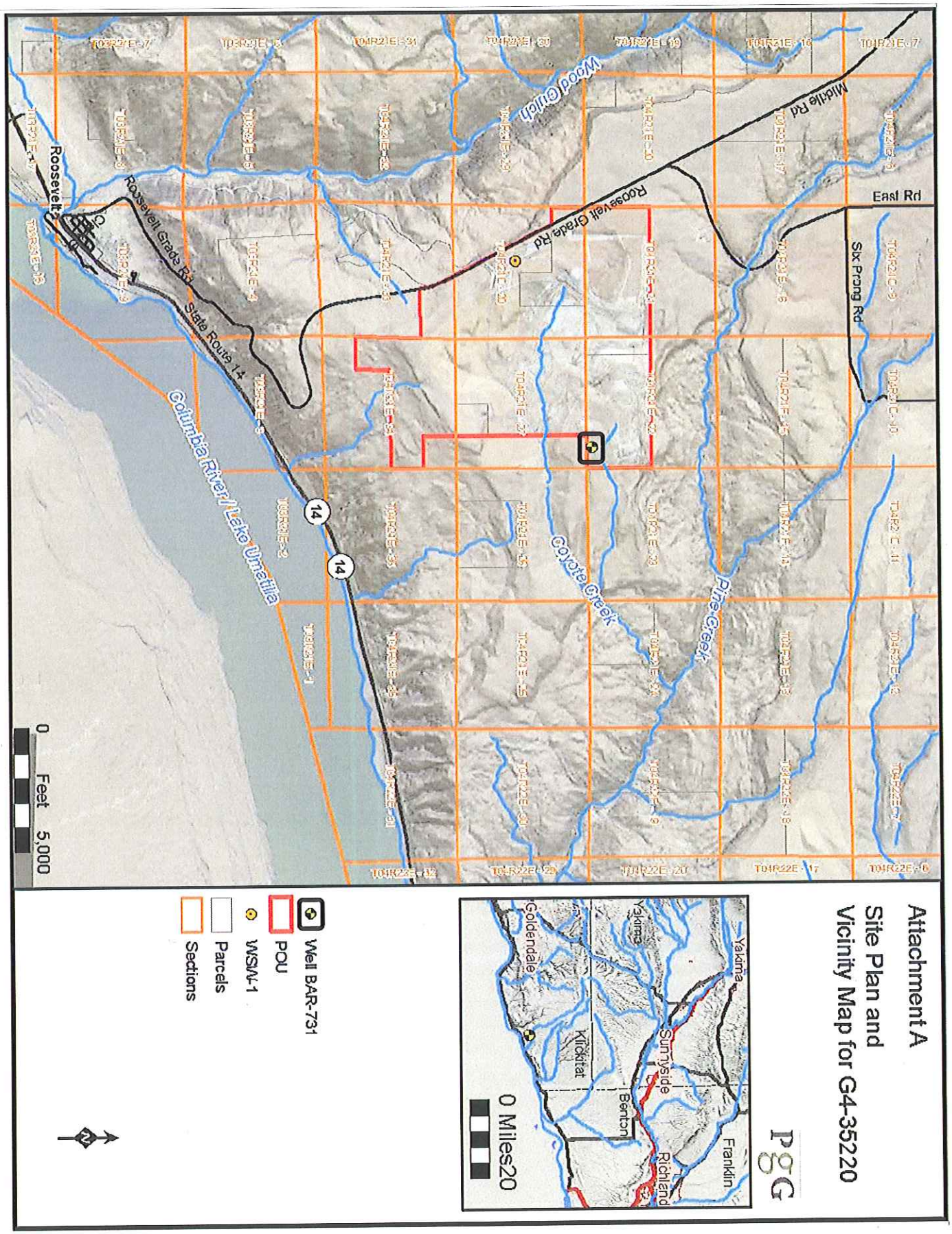
All streams in WRIA 31 discharge to the Columbia River, including Pine Creek, Wood Gulch Creek, and Coyote Creek, which are naturally intermittent (lacking dry season flow) except in localized spring-fed reaches (WRIA 31 Planning Unit, 2008).

As discussed above, there are some springs along the bluffs that originate from shallow groundwater sources (Saddle Mountain Basalt or Ellensburg Formation) that contribute to some localized water in the streams during the dry season. A total of 14 springs have been identified within 4 miles of well BAR731 (USGS 7.5 minute topographic map and PGG 1989 survey). Discharge from these springs is reported to be a trace to 3 gpm (PGG, 1989). All but two of the springs occur high up on the bluffs at elevations above 1,200 feet indicating they are fed by shallow groundwater sources in the Saddle Mountain Basalt or Ellensburg Formation. Two damp areas mapped as springs by PGG along the bluffs overlooking the Columbia River are at elevations below 800 feet, suggesting some discharge from the Frenchman Springs Member may occur along the bluffs of the Columbia River. However, review of air photos shows minimal vegetation and no indication of flowing water, suggesting these damp areas are not significant discharge sources.

As discussed above, groundwater flow in the Frenchman Springs is likely southwards towards the Columbia River (the regional discharge point). Significant downward vertical gradients observed in the aquifer suggest a strong downward gradient towards the Columbia River. It is highly unlikely that use of the well BAR731 will impact the flows of Pine, Wood Gulch, or Coyote Creek. Furthermore, there are no major springs along the bluffs to the east or west at an elevation correlative with the Frenchman Springs, suggesting a southward flow direction towards the Columbia River. A negative hydraulic boundary observed during the 24-hour pumping test of the WSW-1 also supports this interpretation (see above). Any long term impacts to Columbia River instream flows is mitigated by the quit claim deed provided to Ecology by the KPUD.

CONCLUSIONS

- The proposed appropriation for power generation, dust control, and methane production purposes is a beneficial use of water;
- The 93 gpm, and 89 ac-ft/yr requested is available for appropriation;
- The new appropriation will not impair senior water rights or Columbia River instream flows since it is mitigated with a portion of Certificate No. S3-00845CA.


Attachment A
Site Plan and
Vicinity Map for G4-35220
PGG
Yakima
Sunnyside
Richland
Franklin
Benton
Klickitat
Goldendale
0 Miles20
Well BAR-731
POU
WSW-1
Parcels
Sections
0 Feet 5,000
Columbia River/Lake Umatilla
State Route 14
Roosevelt Grade Rd
Roosevelt
Wood Gulch
Coyote Creek
Pine Creek
Roosevelt Grade Rd
Six Prong Rd
East Rd
Middle Rd