Additional Information in Support of Permit Application 29-14315

Brockway Engineering, PLLC C. G. Brockway Ph.D., P.E. June 30, 2020

Background



Initial discussions were held during late 2018 and early 2019 with City of Pocatello staff regarding the possibility of developing a public water system to serve the Pocatello Heights Apartments. Several concerns were raised by Pocatello during these discussions. The owner ultimately decided to focus primarily on covering the irrigation usage on the property from a system having no connection to the City's water system.

A water right transfer application was filed with IDWR on March 25, 2019 to move 5.0 acres of water right 35-14286 to the property, with its proportional diversion rate and volume of 0.06 cfs (27 gpm) and 20.0 ac-ft/year. The transfer application was published in the Idaho State Journal on April 18 and April 25, 2019 as evidenced by affidavit contained in IDWR files. The application was also published on the IDWR website No protests were received¹. IDWR approved the transfer on May 20, 2019 and numbered the new portion 29-14300.

Subsequently, a permit application numbered 29-14315 was filed with IDWR on April 8, 2020 for the purpose of augmenting the flow rate only (no additional acres or volume of water). IDWR published the permit in the Idaho State Journal on May 7 and May 14, 2020, and also individually notified the City of Pocatello. Due to an error in the basin number (19 instead of 29), IDWR re-advertised the application on May 21 and May 28, 2020 and again individually notified the City of Pocatello. The City of Pocatello filed a protest against the permit application on June 5, 2020.

The protest lists four (4) items regarding a possible conditional approval in lieu of a denial of the application. The purpose of this letter is primarily to provide technical information to address the technical concerns in the protest (#1 and #2).

Although the City's protest pertains only to permit application 29-14315, the technical analysis will focus on the project as a whole in an effort to alleviate the City's concerns regarding water quantity and water quality.

Item 1. A demonstration by the applicant that the diversion of water would not impact the quantity of water for the City's water supply.

The City appears to be concerned about the Lower Portneuf Valley Aquifer, the alluvial aquifer from which the proposed Pocatello Heights well would draw, and in which numerous City wells

¹ IDWR is not obligated to notify individual parties of new water right applications

are developed. The question of impact must be approached in three ways: a) considering the annual water budget to ensure no increase in aquifer depletion will occur; b) considering the magnitude of depletion with respect to the magnitude of groundwater discharge, and c) considering localized effects due to the pumping well cone of depression (local well interference).

a. Annual groundwater budget

The water right will be used to irrigate approximately 4.1 acres around the apartment buildings. Using evapotranspiration data from Allen and Robison $(2012)^2$ for the Pocatello station with a crop of Irrigated Turf, the growing season consumptive depletion (precipitation deficit) from this usage will be 888 mm or 34.96 inches. On 4.1 acres, this amounts to 11.9 ac-ft/year. Assuming an irrigation efficiency of 75%, the volumetric withdrawal will be 15.9 ac-ft/year from the well (less than the water right allowed 20.0 ac-ft/year).

Historically and currently, the same amount of irrigation with the same irrigation system has occurred at the apartment complex as is contemplated under water right 29-14300 and application 29-14315. This irrigation supply has come from the City of Pocatello water system, which is supplied by wells developed in the same groundwater system as the proposed Pocatello Heights well.

The proposed project would reduce the aquifer demand at the City well field, and correspondingly increase the aquifer demand at the proposed Pocatello Heights well by the same amount. There will be no net change in the annual diversion volume, annual consumptive depletion, or instantaneous diversion rate from the aquifer.

Though there will be no net change in pumping, there will be a reduction in demand from the City municipal system. Numerous municipalities in southern Idaho are investigating or implementing programs to reduce demand on public drinking water systems, one common way being elimination of large irrigated areas from public supply. The City of Twin Falls is a model in this regard.

c. Localized changes in depletion location

Although the project will not result in any net depletion of the aquifer system, it will result in a "shift" in the location of the depletion to the Pocatello Heights well and away from the City's well field. There is no way to know the current distribution of depletion across the dozens of City wells that is due only to Pocatello Heights. The most conservative way to analyze this is to assume that the depletion at Pocatello Heights is brand new, and compare it to the total groundwater discharge in the alluvial aquifer at that point, ignoring any benefit distributed across the City's well field.

Calculating the total groundwater discharge requires aquifer gradient, width, saturated depth, and hydraulic conductivity. Gradient from the calibrated ESPA model is 0.00178 ft/ft. The width

² This is the database used by IDWR for consumptive use evaluations.

from the ESPA model and from topographic boundaries is 10,300 feet. Saturated depth was based on well drilling records within approximately 1.5 miles of Pocatello Heights and having depths >150 feet (Figure 1 and Table 1). The logs are consistent in indicating an alluvial aquifer comprised of sand, gravel, cobble, and clay underlain by quartzite at depths of 100 feet to greater than 260 feet. The average saturated depth (distance from static water level to bedrock) is 145 feet.



Figure 1. Drilling records on file with IDWR for deep wells in alluvial aquifer within about 1.5 miles of Pocatello Heights. Boundaries of the alluvial aquifer are indicated in red.

Well	Depth	SWL	Bedrock	Sat Depth	Lithology	Test (large flow wells with data)	Calc K (ft/d)
City 10	302	43	None	>259	Sand, gravel, clay	2240 gpm at 0.46 ft drawdown, 10.7 hrs	9470
Int Gas 1	173	79	None	>94	Clay to 41, gravel & clay to 173		
Int Gas 2	180	47	137	90	Sandy gravel, gravel		
Int Gas 3	170	None	None	n/a	Boulders, gravel, sand		
City - Walnut St	340	63	None	>277	Sand, gravel, clay	2500 gpm, 33 ft drawdown, 72 hrs	74.6
City MW South & Arthur	198	34	101	164	Boulders, gravel, clay		
City 12	132	35	132?	>97	Gravel, basalt, clay	2100 gpm, 1.9 ft drawdown, 12 hrs	4020
City MW#3	140	58	123	65	Sand & gravel		
Int Gas 4	167	45	166	121	Sand, gravel, clay		
ISU Library	230	Unread- able	90	n/a	Sandy clay, gravel, "quartsite"	600 gpm, 4 ft drawdown, 5 hrs	263

Table 1. Information for wells shown in Figure 1.

Hydraulic conductivity was estimated using pumping test data from well drilling records for the three nearest City wells, employing the commonly-used Theis approach to estimate hydraulic conductivity from a single flow-drawdown measurement, with a correction for partial penetration of the aquifer. Wells 10 and 12 pumped large flows with exceptionally low drawdown, leading to extremely large hydraulic conductivity estimates compared to the Walnut St. well. It is likely not warranted to use such extreme values to represent the entire aquifer, as they exceed the range expected even for very productive sand and gravel aquifers such as the Lower Portneuf, which is typically 100 ft/day to 1000 ft/day. Conversely, the estimated value for the Walnut St. well is at the very low end of the expected range for such aquifers. The ISU library well indicates a value squarely within the expected range. For the purposes of conservatively estimating groundwater flow, a value of 200 ft/day was assumed. Using this value will likely underestimate the flow.

With a hydraulic conductivity of 200 ft/day, the transmissivity is 200 ft/day x 145 ft = 29,000 ft²/day or 217,000 gpd/ft. Using the above parameters, the total groundwater discharge in the alluvial aquifer from Darcy's Law is 532,000 ft³/day or 4,460 ac-ft/year.

The proposed depletion at Pocatello Heights is 11.9 ac-ft/year, or 0.27% of the total groundwater flow. Therefore, even if the Pocatello Heights depletion were a brand new impact on the aquifer, it would be a negligible fraction of the available groundwater supply.

b. Local well interference.

A local interference analysis is useful to estimate the drawdown effect caused by the cone of depression that propagates outward from a pumping well. Using aquifer parameters described above, the Theis approach was used to determine drawdown versus time at several distances

from the proposed Pocatello Heights well. The well was assumed to be pumping continuously at the daily volume rate of 38,900 gpd, representing the maximum demand period in July. The nearest City well to the proposed well is 3,900 feet away. At this distance, the analysis indicates a drawdown of 0.01 feet after 30 days of pumping and 0.03 feet after 180 days of pumping (Figure 2). Since Pocatello Heights is relatively close to a hydraulic boundary (the east edge of the aquifer), an investigation was made of the effects of the boundary by employing the image well technique. It was found that the presence of the boundary adds 0.01 feet to the drawdown.

This analysis is conservative because 1) the well will never pump at the maximum rate for 180 days continuously and 2) the analysis is based on gross diversion from the well, not depletion, i.e. return to the aquifer is ignored. In any case, the predicted drawdowns are negligible and will not interfere with the operation of the City's well.



Figure 2. Local drawdown prediction.

Item #2. Installation of a full casing seal from the surface to the point of contact with the aquifer, to reduce potential for impact to water quality of the City's water supply.

This item reflects good design practice and will be followed for the Pocatello Heights well. The attached schematic has been prepared illustrating the proposed well design. This design exceeds standards imposed by IDWR for all wells, and by IDEQ for public water supply wells.

Item #3. The applicant demonstrating that it has sufficient financial resources to satisfy both the well construction requirements imposed by this permit and to comply with applicable regulations.

The applicant is willing to provide the City of Pocatello sufficient demonstration in confidential manner.

Item #4. The applicant demonstrating that it can and will satisfy all applicable local ordinances and DEQ statutes and regulations.

DEQ has no jurisdiction over wells used only for irrigation purposes. Nevertheless, the well will be constructed to a higher design standard than a public drinking water well in terms of protection from surface water contamination. The applicant will comply with applicable ordinances in effect at the time the project was contemplated and discussed with the City staff and City attorney.

