



MEMORANDUM

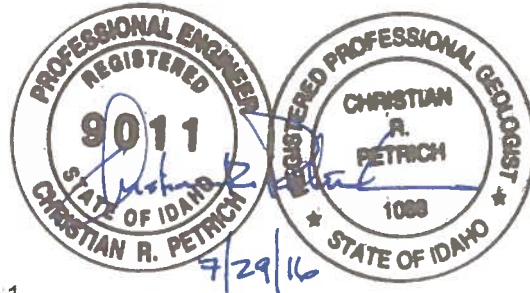
DATE: July 29, 2016

TO: Stony Yakovac
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Delivered via email to:
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FROM: Christian R. Petrich, Ph.D., P.E., P.G.

RE: Conveyance loss estimates for Transfer 80731



A. Introduction

Topaz Irrigation Company filed an Amended Application for Transfer on March 8, 2016. The purpose of the transfer was to add and change points of diversion (PODs) authorized under Water Right 29-180. The transfer was protested by the Lava Irrigation Company and the McCammon Ditch Company. One of the concerns listed in both protests is that possible channel losses in the reach between existing and proposed PODs.

This memorandum summarizes a review of existing literature pertaining to Portneuf River gains and losses, with particular focus on the Dempsey Creek and Portneuf River reaches affected by the proposed transfer. Conclusions from this review include the following:

1. Available information suggests that Dempsey Creek and the Portneuf River between the existing and proposed new PODs are gaining reaches. Thus, there would be no seepage losses associated with approval of Transfer 80731.
2. The transfer could, however, result in a minor increase in evaporative losses between the existing and proposed PODs. This amount will probably be less than 0.5% of the 2.109-cfs that would be conveyed from the existing POD to the proposed new POD.

B. Transfer 80731

Water Right 29-180 authorizes the diversion of up to 13.44 cfs between April 15 and September 15 from Dempsey Creek at a single point of diversion (POD) in the SENWNW

of Section 33 in Township 9S, Range 38E in Bannock County (Figure 1). Water right 29-180 authorizes the use of this water for the irrigation of 672 acres under an April 1, 1883 priority date. Transfer Application 80731 proposes adding a new POD in the SWNE of Section 23, Government Lot 2, Township 9S, Range 37E (Figure 1). The full 13.44 cfs will be diverted (when available) at the current POD. A portion of this amount – 2.109 cfs – will be re-injected into Dempsey Creek approximately 0.7 miles downstream of the current POD. This amount, less any losses, will be re-diverted from the proposed new POD in Section 23 of Township 9S, Range 37E.

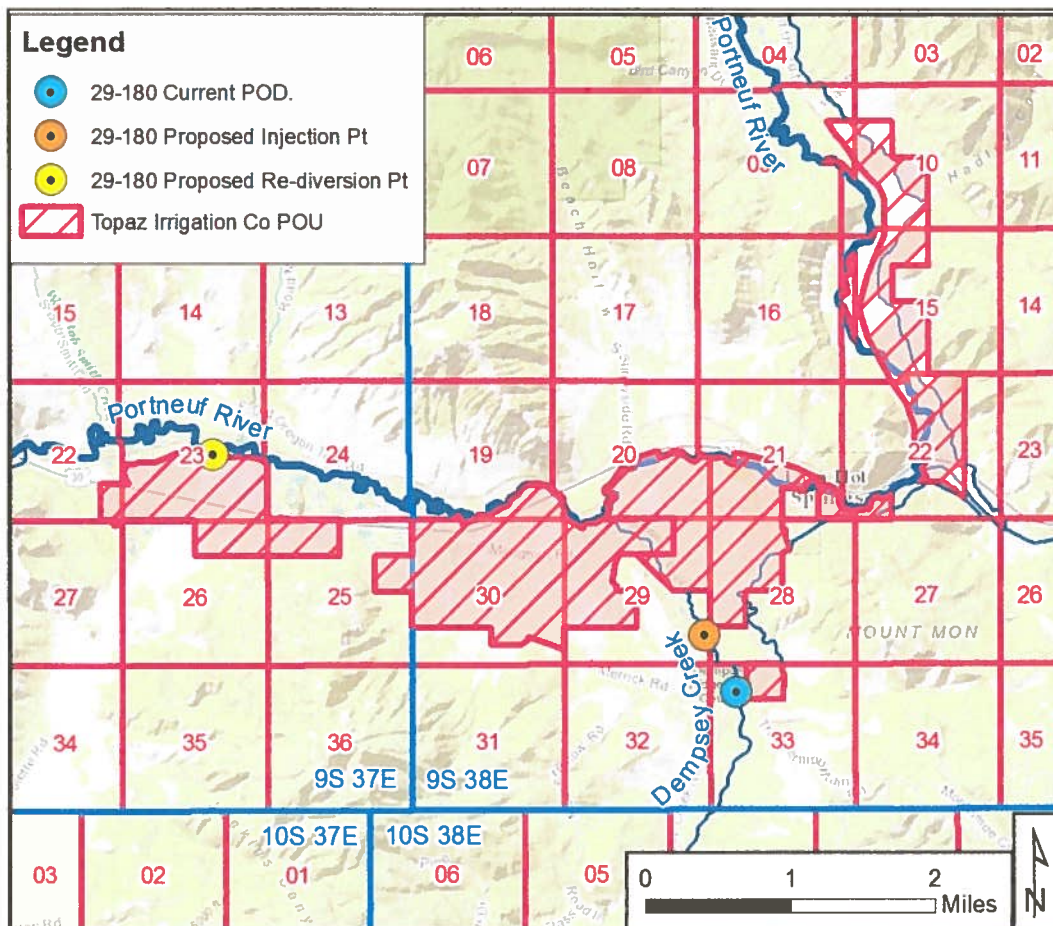


Figure 1. Current and proposed PODs under water right 29-180.

C. Groundwater-Surface water Interaction

The Portneuf River between Chesterfield Reservoir and the City of Pocatello has both gaining and losing reaches. The USGS delineated a losing reach of the Portneuf River

centered approximately 7.2 miles downstream from Chesterfield Reservoir (Barton, 2004). The length of the losing reach increased from 2.6 to almost 6 miles as the 2001 irrigation season progressed. Conveyance losses were found to be greatest (approximately 20 cfs) during mid-summer regulated flows.

Portions of Portneuf River between Portneuf Gap and the Pocatello area (Figure 2) have been described (Meehan, 2005; Welhan, 2006) as losing water to the subsurface (at least on a seasonal basis), with an annual loss of approximately 900 acre-feet (Welhan, 2006).

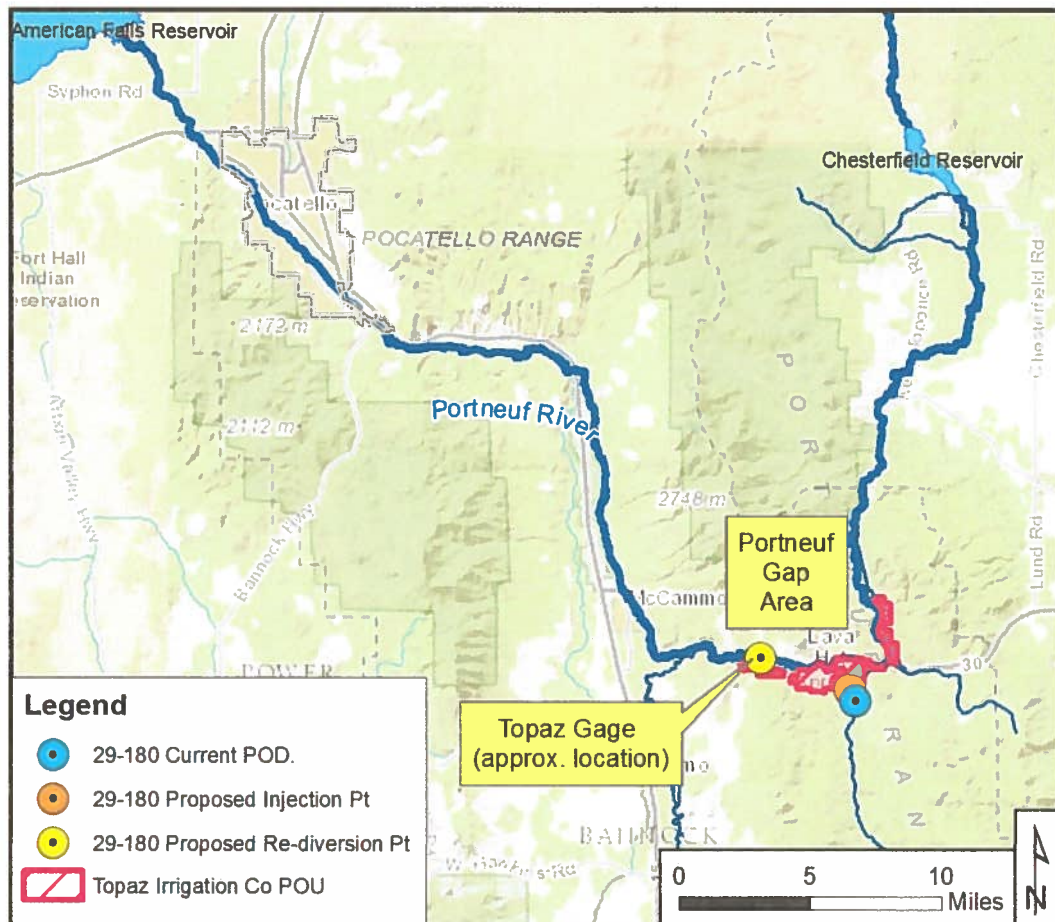


Figure 2. Portneuf River, Chesterfield Reservoir to Pocatello reach.

The City of Pocatello, in support of proposed Transfer 76779, maintained that the Portneuf River is a gaining reach downstream of the Topaz Gage (Figure 2):

"The results of the gain analysis indicate that the Portneuf River from the Topaz Gage to the Pocatello gauge is a gaining stream, therefore, it is expected that there will be little or no transit loss in delivering the acquired storage rights to Pocatello except for temporary bank storage" (Sullivan, 2010).

The USGS (Barton, 2004) study represents the most detailed analysis of seepage in the immediate vicinity of the existing and proposed PODs under Transfer 80731. The USGS measured Portneuf River flows and estimated reach gain/loss rates in the Portneuf River between Pebble and Topaz (Figure 3) on September 17, 2001, October 18, 2001, and May 29, 2002. The Topaz gauge is very near the proposed POD in Transfer 80731.

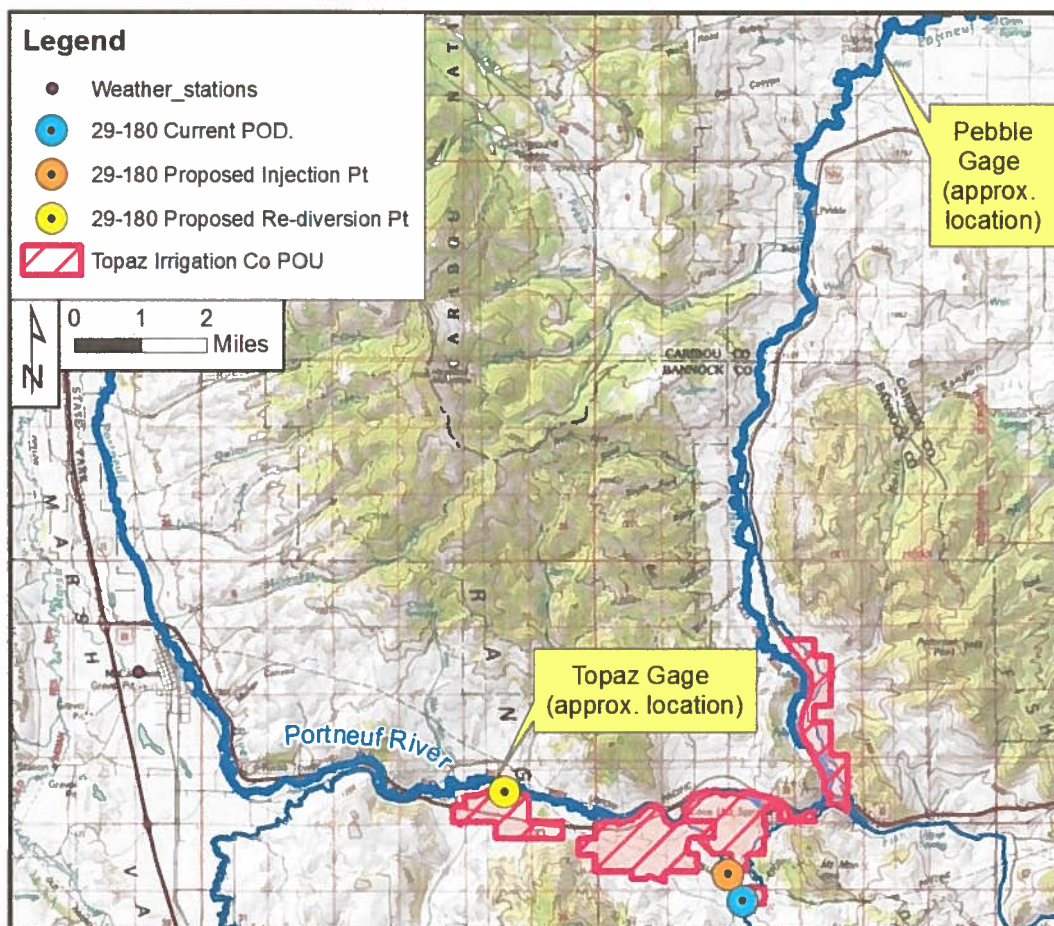
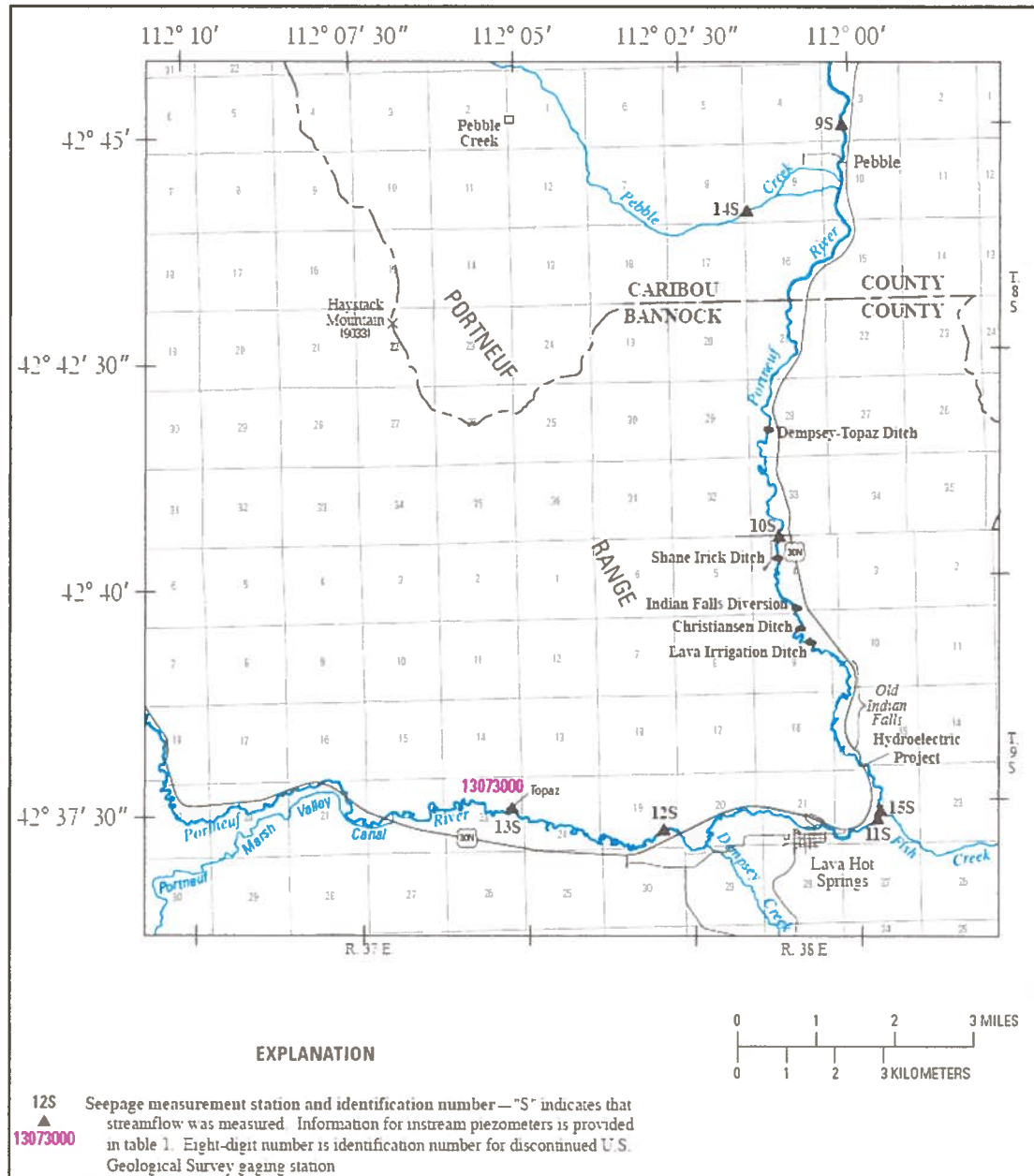


Figure 3. Portneuf River, Pebble to Topaz reach.

The reach between Stations 11S and 13S (Figure 4) – the Portneuf River reach impacted by the proposed change in PODs under Transfer 80731 – was found to be either a gaining or neutral reach in the September, October, and May seepage runs (Barton,

2004, pgs. 23 and 33). Reach gains/losses between Stations 10S and 12S could not be quantified because of diversions to, and returns from, a hydroelectric facility.



From Barton (2004).

Figure 4. Measurement-station locations in Barton (2004).

Of particular interest is the reach between USGS Stations 12S (just downstream of the mouth of Dempsey Creek) and 13S (near the proposed additional POD for water right 29-180). In September 2001 the USGS measured a 20-cfs gain in this 3.2-mile reach between Stations 12S and 13S, of which about 19 cfs was attributed to groundwater seeping up through the riverbed (Barton, 2004, page 28). A 4-cfs gain in stream flow was measured in this reach in October 2001, all of which was attributed to groundwater seeping up through the riverbed. In the May 2002 the USGS recorded a 19 cfs gain in this reach, of which all but 2 cfs was attributed to groundwater seeping up through the riverbed (Barton, 2004, page 21).

These findings are consistent with your anecdotal observations. You indicated to me that you have observed water in the lower portion of Dempsey Creek at times when the entire upper Dempsey Creek flow is diverted under water right 29-180 at the current POD. Absent other tributary inflows, this is an indication of channel gains from the subsurface.

These USGS measurements and your anecdotal observations suggest that Dempsey Creek and the Portneuf River between existing and proposed PODs under water right 29-180 are gaining reaches. As such, there would be no conveyance losses associated with the change in PODs proposed under Transfer 80731. However some minor losses to evaporation might be attributed to returning the 2.109 cfs to Dempsey Creek and conveying it in the Portneuf River between existing and proposed PODs.

An estimate of evaporative loss might be based on an assumed increase in water surface area in the Dempsey Creek and Portneuf River between the existing and proposed points of diversion. The increased surface area in Dempsey Creek, assuming an approximate 2-foot water surface area over a distance of approximately 1.1 miles (5,800 feet), would be approximately 0.27 acres (Table 1). Similarly, the increased surface area in the Portneuf River, assuming a generous 1-foot increase in water-surface with as a result of the increased flow, would be approximately 0.39 acres. The evaporative loss from the assumed surface-area increase in Dempsey Creek and the Portneuf River, based on a mean evaporative loss of 3.15 feet per acre (ET Idaho estimate based on McCammon National Weather Service data), would be approximately 2.1 acre-feet (AF). This volume is equivalent to a uniform flow of 0.007 cfs over a 5-month irrigation season. Thus, accounting for evaporative losses would result in a diversion of 2.102 cfs at the proposed POD instead of 2.109 cfs at the existing POD, representing a diversion-rate reduction of 0.3%.

Potential Evaporative Loss Calculations			
Parameter	Dempsey Creek	Portneuf River	Units
Increased channel flow as result of transfer	2.109		cfs
Assumed increased water-surface width	2	1	feet
Approximate channel length	1.1	3.2	miles
Approx. increase in surface area from transfer	11,616	16,896	ft ²
Approx. increase in surface area from transfer	0.27	0.39	acres
Potential evaporation from open water and shallow systems (ponds, streams) per ET Idaho based on McCammon NWS data	3.15		ft
Evaporative loss	0.84	1.22	AF
Combined evaporative loss	2.06		AF
Equivalent uniform flow over 150 days	0.007		cfs
Reduced diversion at new POD that accounts for evaporative losses	2.102		cfs
Percentage diversion reduction	0.3%		%

Table 1. Potential evaporative loss calculations.

D. References

- Barton, G.J., 2004. Surface-and ground-water relations on the Portneuf River, and temporal changes in ground-water levels in the Portneuf Valley, Caribou and Bannock Counties, Idaho, 2001-02, U.S. Geological Survey Scientific Investigations Report 2004-5170, 50 p.
- Meehan, C.W., 2005. Geochemistry of the Southern Pocatello Aquifer and its Implications for Aquifer Recharge and Contamination Potential, a thesis submitted for Master of Science in Geology, Idaho State University.
- Sullivan, G.K., 2010. Report in Support of the City of Pocatello's Application for Transfer of Water Rights – Chesterfield Reservoir, consulting report prepared by Spronk Water Engineers, Inc., August 30, 2010.
- Welhan, J.A., 2006. Water Balance and Pumping Capacity of the Lower Portneuf River Valley Aquifer, Bannock County, Idaho, Idaho Geological Survey Staff Report 06-5, July 2006.

7/28/2016

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