# Memorandum

To: Adam Fredrick, Water Rights Supervisor; Doug Jones, Northern Region Manager

From: Daniel Sturgis, Technical Hydrogeologist

Date: January 5, 2021

Re: City of Lewiston Well 7 and Water Right Transfer Assessment

**Introduction and Purpose**

The City of Lewiston is planning on installing a new well to add to their existing municipal water supply system. The City of Lewiston currently has six wells as part of their system, two wells completed in the Wanapum Basalt Aquifer and four wells completed in the Grande Ronde Basalt Aquifer. With the exception of Lewiston 2, these wells are located within the Lewiston Plateau Ground Water Management Area (Figure 1).

As required by groundwater management plan for the Lewiston Plateau, a water right transfer more than one-quarter of a mile in the groundwater management area may be approved only after it has been determined there is a sufficient water supply and other water rights will not be injured. The purpose of this memo is to assess potential impacts of Lewiston 7 on existing wells completed in and diverting ground water from the Grande Ronde Aquifer.

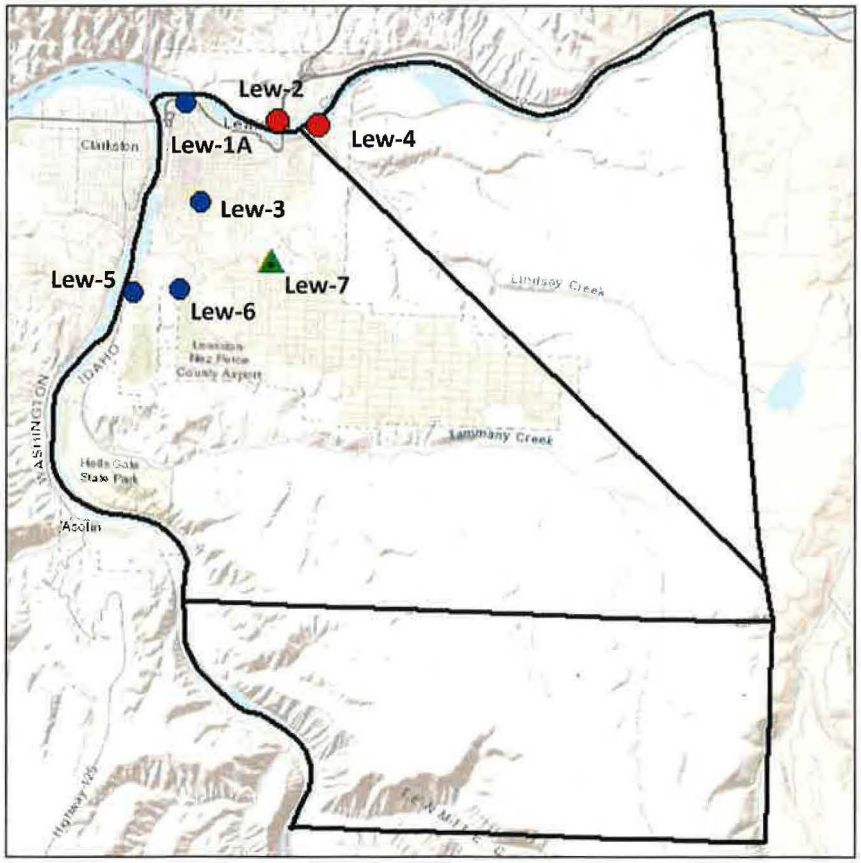


**Figure 1.** Existing City of Lewiston wells and planned location of Lewiston 7. Wanapum wells in red. Grande Ronde wells in blue.

**Pumping Capacity of City of Lewiston Wells**

The City of Lewiston has applied for a water right transfer to include a 6 cfs diversion rate for Lewiston 7. Based on the specifications provided by JUB Engineering for Lewiston 7, the city will require a minimum of 2,100 gpm (4.7 cfs). The proposed completion depth of the well is 1,850 feet below ground surface. The geology and production rate is expected to be similar to Lewiston 6 as well as L.O.I.D. 5 and 6 located approximately two miles southeast of Lewiston 7. Table 1 summarizes well completion depths and production of municipal wells located in the vicinity of Lewiston 7.

**Table 1.** Summary of Municipal Wells near Lewiston 7.

| Well | Depth (ft) | Aquifer | Production (gpm) | Production (cfs) | Status |
|---|---|---|---|---|---|
| Lewiston 1A | 735 | Grande Ronde – R2 | 1800 | 4.0 | Active |
| Lewiston 2 | 275 | Wanapum | 450 | 1.0 | Active |
| Lewiston 3 | 600 | Grande Ronde – R2 | 1200 | 2.67 | Active |
| Lewiston 4 | 358 | Wanapum | 500 | 1.11 | Active |
| Lewiston 5 | 600 | Grande Ronde – R2 | 1000 | 2.22 | Active |
| Lewiston 6 | 1440 | Grande Ronde – R2/N1 | 1800 | 4.0 | Active |
| Lewiston 7 | 1850 | Grande Ronde – R2/N1 | 2100-2700 | 4.7-6.0 | Planned |
| LOID 5 | 1900 | Grande Ronde – R2/N1 | 2000 | 4.5 | Active |
| LOID 6 | 2000 | Grande Ronde – N1 | 2000 | 4.5 | Inactive |

**Potential Effects on the Grande Ronde Aquifer**

In order to assess the potential drawdown effects Lewiston 7 might have on the Grande Ronde Aquifer and wells completed in the Grande Ronde Aquifer, the hydraulic properties of the aquifer must first be estimated. This can be accomplished by using the specific capacity of the well as observed during pumping. Driscoll (1986) provides the following equation to estimate transmissivity of a confined aquifer based on pumping rate and measured drawdown.

$$\frac{Q}{s} = \frac{T}{2000}$$

where,

Q = pumping rate (gallons/minute)

s = drawdown (feet)

T = transmissivity (gpd/ft)

Estimated transmissivity values are provided in Table 2. Since Lewiston 7 will be completed similar and closer to Lewiston 6, Lewiston 6 estimates might be more appropriate and are used for drawdown assessment.

Storativity values for confined aquifers can typically range from 0.001 to 0.00001 (Dominico and Schwartz, 1990). For purposes of estimating drawdown effects from pumping Lewiston 7 a storativity value of 0.001 and 0.0001 are used. These values were selected based on other pumping test results in the Grande Ronde Aquifer in Lewiston.

**Table 2.** Estimated Transmissivity at Select Municipal Wells

| Well | Depth (ft) | Aquifer | Q (gpm) | s (ft) | T (ft2/day) |
|---|---|---|---|---|---|
| LOID 6 | 2000 | Grande Ronde-N1 | 3000 | 27 | 29709 |
| LOID 5 | 1900 | Grande Ronde-R2/N1 | 2000 | 19 | 28145 |
| LOID 4 | 1625 | Grande Ronde-R2/N1 | 1200 | 31 | 10350 |
| LEW-1A | 735 | Grande Ronde-R2 | 1800 | 25 | 19251 |
| LEW-3 | 600 | Grande Ronde-R2 | 1200 | 61 | 5260 |
| LEW-6 | 1440 | Grande Ronde-R2/N1 | 1800 | 10 | 48128 |

Figures 2 and 3 show the estimated drawdown effects of Lewiston 7 on the Grande Ronde Aquifer based on the Theis (1935) equation for a confined aquifer. These estimates use a transmissivity and storativity value similar to Lewiston 6.

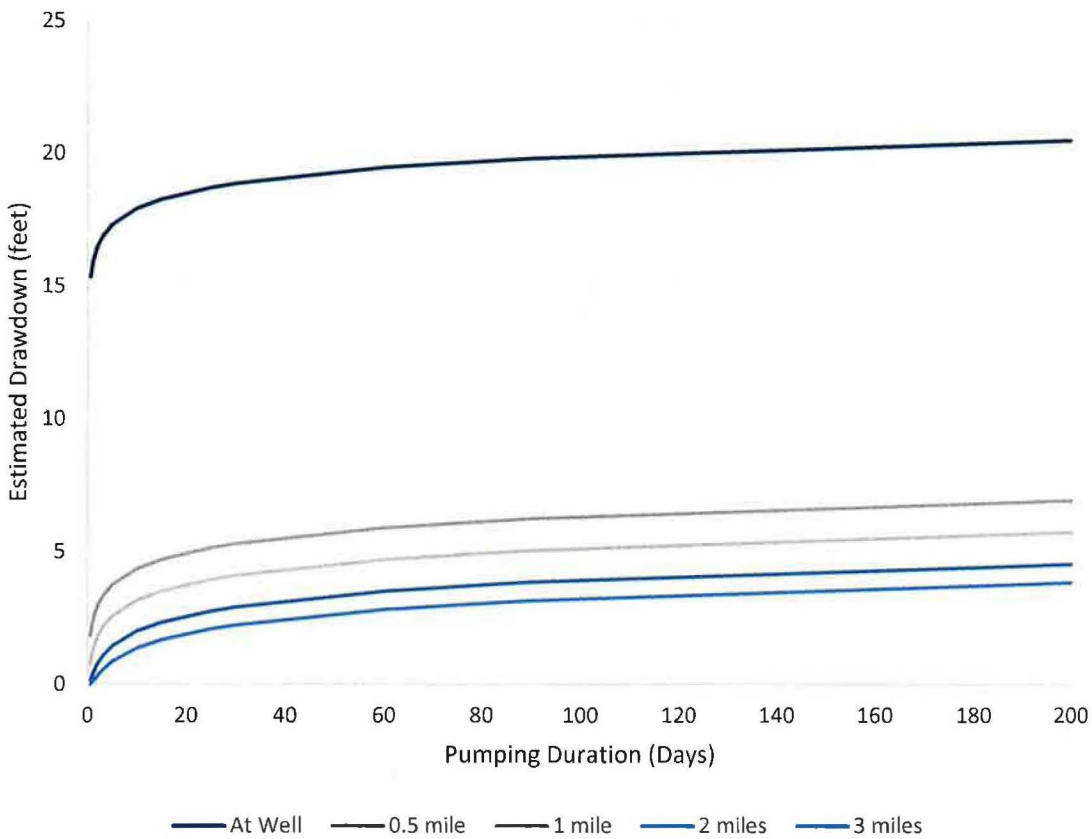


**Figure 2.** Estimated drawdown with time from Lewiston 7 for select distances. Note: Pumping rate: 2700 gpm; Transmissivity: 48000 ft2/day; Storativity: 0.001.

**Existing Grand Ronde Aquifer Wells**

Approximately 90 wells in the Lewiston Plateau Ground Water Management Area are completed in the Grande Ronde Basalts with 25 of these wells within a three-mile radius of Lewiston 7. Grande Ronde wells typically produce water from the Grande Ronde-R2 unit and are not deep enough to intersect the lower N1 unit.

Wells located nearest to Lewiston 7 are approximately 1.25 miles to the west. These wells are Lewiston 3 and 6. Estimates suggest these wells could experience three to eight feet of drawdown during pumping of Lewiston 7.

Other wells within a two mile to three mile radius of Lewiston 7 have 50 feet to 780 feet of water column in the well. Drawdown estimates suggest a response of about 1.5 to 6.5 feet at these wells.

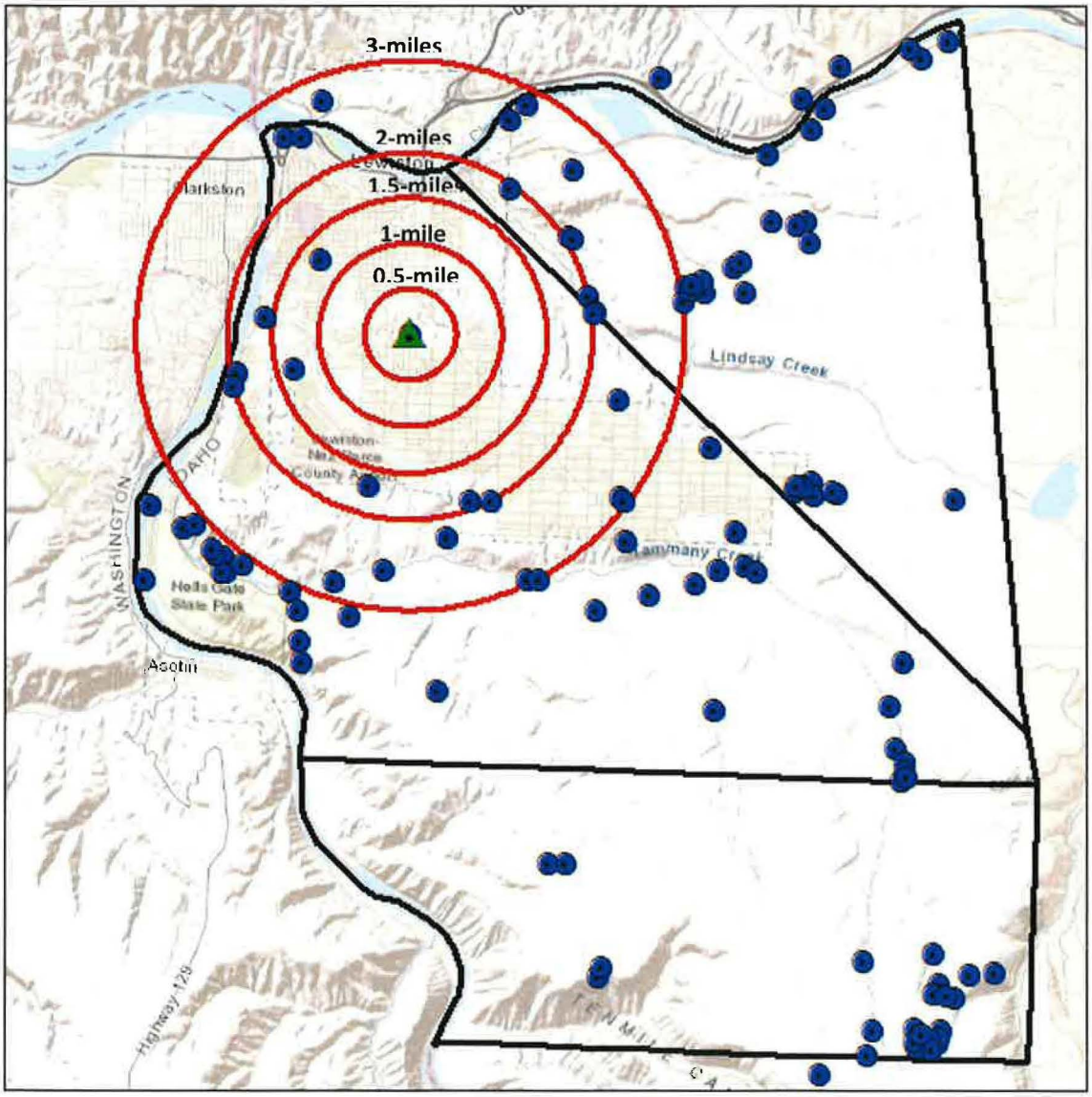


**Figure 4.** Location of wells completed in the Grande Ronde Basalt (blue) and Lewiston 7 (green).

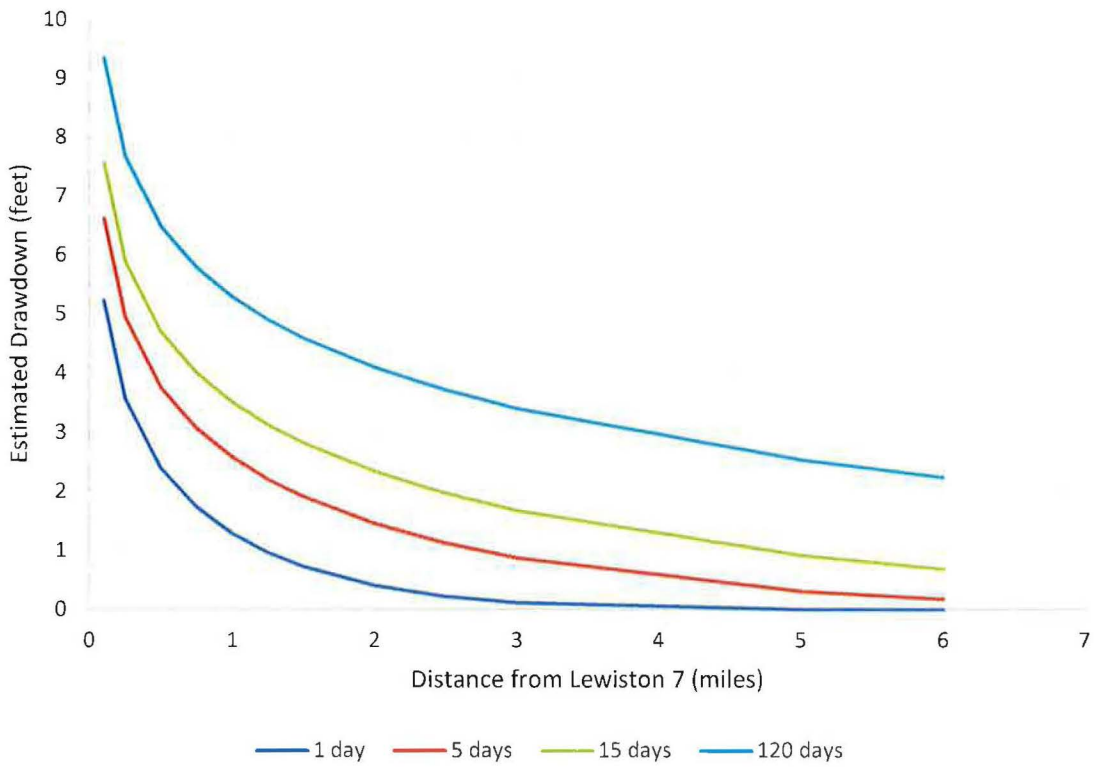


**Figure 3.** Estimated drawdown with distance from Lewiston 7 for select pumping durations. Note: Pumping rate: 2700 gpm; Transmissivity: 48000 $ft^2$/day; Storativity: 0.001.

In addition to estimating the minimum drawdown effects based on observations at Lewiston 6, the lower transmissivity value observed at LOID 5 is used to estimate the maximum effects from pumping Lewiston 7. Both estimates are presented in Table 3 for select distances.

**Table 3.** Estimated drawdown in the Grand Ronde Aquifer from Lewiston 7 pumping 2700 gpm.

| Distance (miles) | Minimum Drawdown (ft) T=48000$ft^2$/d, S=0.001 | Maximum Drawdown (ft) T=28000$ft^2$/d, S=0.0001 |
|---|---|---|
| 0.5 | 4.7 | 10.7 |
| 1.0 | 3.5 | 8.6 |
| 1.5 | 2.8 | 7.4 |
| 2.0 | 2.3 | 6.6 |
| 3.0 | 1.7 | 5.4 |

**Observed Long-Term Water Levels**

Long-term water level records are available for nearby City of Lewiston wells 1A, 3, and 5. Hydrographs are provided in Figure 5. These hydrographs show a water level rise in 1975 related to backwater effects of the Lower Granite Dam on the Snake River. The long-term record appears to be stable, however, a water level decline at Lewiston 5 of about 10 feet was observed between the late 1970's and early 1990's. Water levels at Lewiston-1A have been stable and it is assumed that water levels at Lewiston 5 have been stable since the 1990's.

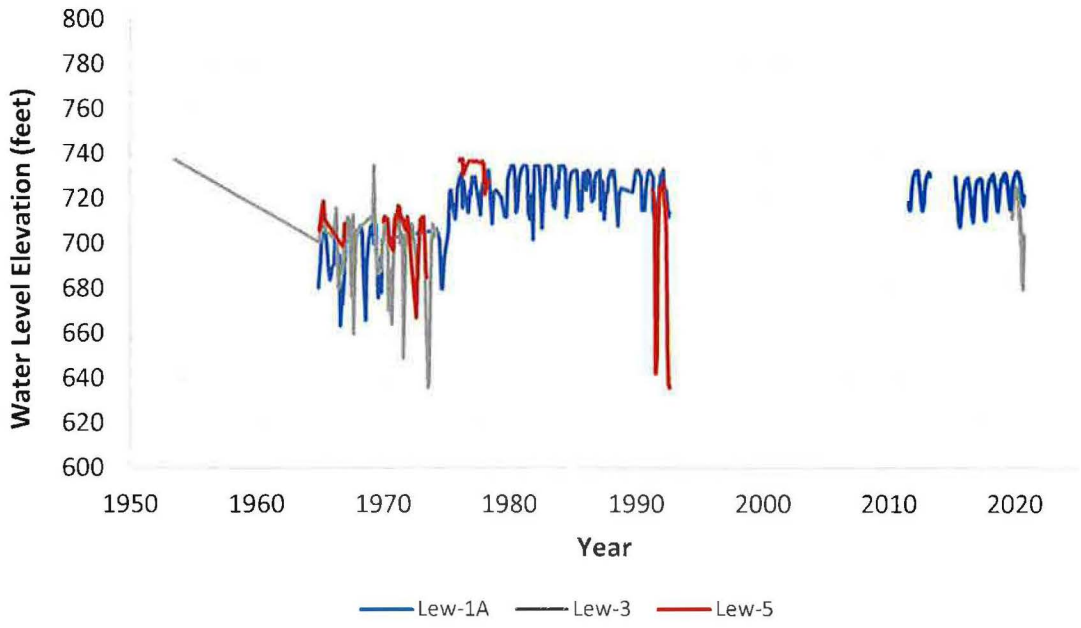


**Figure 5.** Water level data for select City of Lewiston wells.

**Conclusions and Recommendations**

The City of Lewiston is planning to incorporate an additional point of diversion to their existing water rights for the Grande Ronde Aquifer. This will not be the development of a new water right. Therefore, since no "new" ground water is being allocated, I do not expect to see any long-term drawdown effects on the Grande Ronde Aquifer.

Based on a review of the well construction plan, water level data, and well logs, there appears to be sufficient groundwater to supply the new well with minimal potential effects on existing wells and water rights. I recommend the water right transfer for Lewiston Well 7. IDWR will require water level monitoring at Lewiston 7 per the LPGWMA Plan. IDWR will continue to monitor water levels to observe the influence Lewiston 7 has on the groundwater resources.

One concern to be aware of with the addition of Lewiston 7, the City of Lewiston will have the capabilities to instantaneously pump ground water at a greater rate than their water right allows. For example, if Lewiston 1A, 3, 6, and 7 pump simultaneously, the diversion rate would be 16.68 cfs. This is greater than the water right of 16.41 cfs. Pumping rates and volumes may need to be monitored and reported to IDWR.