Oregon

Tina Kotek, Governor

Oregon Water Resources Department
725 Summer St NE, Suite A
Salem, OR 97301

**MEMORANDUM**

**PREPARED FOR:** AR LL-1970 application file, Hudson Bay District Improvement Company (HBDIC), and Walla Walla Basin Watershed Council (WWBWC)

**PREPARED BY:** Jen Woody, Hydrogeologist

**SUBJECT:** Artificial groundwater recharge (AR) application LL-1970 status update

**DATE:** 4/6/2026

REGISTERED OREGON JENNIFER L. WOODY G2410 GEOLOGIST

Expires: 12/31/2026

---

**Application Timeline**

**3/22/2024:** OWRD receives application LL-1970 for AR testing.

**7/29/2024:** OWRD receives Confederated Tribes of the Umatilla Indian Reservation (CTUIR) comments.

**8/13/2024**: DEQ technical staff approve AR water quality monitoring plan.

**8/29/2024**: OWRD notifies WWBWC their application cannot be processed until they supply written permission from Walla Walla River Irrigation District (WWRID) to use their canals as the distribution system for AR.

**11/18/2024**: WWBWC provides an updated application map that reduces AR sites to those served only by HBDIC, because WWRID did not grant permission to access their canal system.

**12/18/2024**: WWBWC provides updated application rate to align with the reduced project size.

**1/7/2025-8/28/2025**: OWRD coordinates with Oregon Department of Fish and Wildlife (ODFW).

**10/??/2025:** OWRD staff meet with WWBWC staff to discuss the project's path forward. Discussion includes narrowing the project goals to better align with project actions and making goal accomplishments demonstrable through the monitoring data and analysis.

**2/2/2026:** OWRD receives comments from ODFW.

**2/3/2026**: WWBWC sends draft project goals and monitoring well network to OWRD for review.

**2/18/2026**: OWRD provides goal and monitoring well review comments to WWBWC.

**3/12/2026**: OWRD receives Oregon Department of Environmental Quality (DEQ) Division 33 limited license review.

**Application Status as of 4/6/2026**

1. OWRD, DEQ, CTUIR and ODFW have reviewed and commented on the application.
2. DEQ groundwater staff have approved water quality monitoring plan elements.

3. OWRD notes 2 remaining deficiencies in the application. Project goals, as required by OAR 690-350-0120(3)(c), need to be more narrowly defined, and the monitoring plan needs updates per OAR 690-350-0120(3)(g).
4. CTUIR comments request a more thorough review of the project, raise questions about process, Walla Walla River flow targets and benefits.
5. ODFW comments recommend multiple conditions, require bypass plan to be approved before LL- 1970 issuance and request a 2-year issuance limit. See ODFW memo for details.
6. DEQ Division 33 comments echo ODFW bypass flow requirements.
7. Although the application is currently incomplete, OWRD conversations with WWBWC staff indicate revisions are in progress, with a goal of obtaining an LL by October 2026 that authorizes at least 2 full cycles of testing.

**Application AR LL-1970 OWRD Groundwater Review Summary**

1. Reported volumes include water metered into AR sites plus conveyance losses, as required by previous licenses. Monitoring plans have been reviewed and approved to assess AR effects around the licensed AR sites, not the conveyance losses. Since there is no recovery or project storage account, this isn't currently a substantive issue, but it is worth acknowledging in case recovery is contemplated in the future.

2. The application and reports contain unquantified statements about testing results. This is discussed in detail later in this memo. WWBWC isn't required to respond directly to these comments. They are provided to guide updates to the monitoring plan, project goals and future annual reports. Topics include:
    a. Springflow data interpretation is unclear.
    b. A stated goal of AR is to mimic floodplain processes, but reports do not quantify or describe the floodplain processes measured or attained by the AR project.
    c. Project reports state that the alluvial aquifer is being restored by AR testing, but restoration is not defined.

3. Monitoring plan needs update and resubmission
    a. OWRD requires a complete, updated monitoring plan to satisfy OAR 690-350-0120(3)(g) . The revised plan should include:
        i. Tables and maps of wells whose water level data will be used to substantiate project results. Include WWBWC well names and OWRD logids
        ii. Updated tables and maps of water quality locations, sampling schedule and constituents
        iii. Protocols and QA/QC procedures where appropriate.
    b. Redefine project purpose per OAR 690-350-0120(3)(c) and provide a stronger link between the project goals and monitoring plan. Briefly describe how data will be analyzed to demonstrate stated goals.

## Project Discussion and Technical Groundwater Review

### Background

WWBWC and HBDIC tested artificial groundwater recharge (AR) under a series of limited licenses, beginning in 2005: LL- 758, LL-1189, LL-1433, LL-1621, LL-1848. Starting with one infiltration basin site, the project expanded to include up to 17 recharge sites located in the Walla Walla Valley, 14 of which were active according to the 2023-2024 annual report. AR sites range in annual recharge volume from 25 acre-feet/year per site to 4,500 acre-feet/year per site, with an annual total diversion from the Walla Walla River of approximately 6,000 acre-feet.

WWBWC maintains a network of surface water gages across the basin, including some at spring vents down-gradient of AR sites. These sites are not required by AR limited licenses when no recovery is occurring and therefore have not been reviewed by OWRD scientists from the perspective of quantifying AR-related flow changes, although annual reports have cited that benefit. WWBWC also maintains a network of groundwater level monitoring sites, some targeting AR impacts, some for other purposes. OWRD staff have attended WWBWC groundwater level and surface water monitoring site visits to learn about the data collection techniques and sites, and OWRD staff routinely pull verifiable WWBWC manual groundwater level measurements into Oregon's Groundwater Information System (GWIS). OWRD recognizes the extensive effort the WWBWC dedicates to data collection and will continue to collaborate on this effort.

The project has never proposed licensed recovery of the recharged water and therefore has never been required to develop a monitoring plan that characterizes and quantifies where and when the recharged water flows once it enters the groundwater system. The project has been required to monitor and report source and groundwater quality, the quantities of water diverted and delivered to AR sites, and groundwater level impacts in the vicinity of AR test sites. Previous applications have been held to a no-injury standard rather than a proven AR benefit that allows licensed recovery. Application LL-1970 and recent annual reports include statements of goals, benefits and WWBWC data. This review examines those statements using WWBWC data in the context of longer-term data collected by OWRD and USGS.

Stated water quantity project goals in application LL-1970 and Water Year 2024 annual report include:

1. Goal: Limit shallow aquifer declines and stabilize aquifer levels, maximize the benefits of existing sites to counteract decline of alluvial groundwater.
2. Goal: Reduce hydraulic gradient away from streams and creeks in the valley to reduce surface water seepage, especially during dry winter months.
3. Goal: Mimic lost floodplain processes.
4. Goal: Increase flows in spring creeks.

**Discussion of how available data align with these statements follows.**

WWBWC has collected extensive data, and with a few changes to data presentation and format, reports will be more compelling. Annual reports present each well's data set without the context of other nearby spring or groundwater level data. They appear to be period of record hydrographs as they appear on WWBWC's website. To better describe AR project results, OWRD recommends that future reports synthesize the various data sets which WWBWC staff work so hard to collect, to back up the stated conclusions about AR results and how they demonstrate goals are met. Without extensive data downloads, data set transformations and compiling records of the timing of each AR event, it is hard to independently assess the project's hydraulic impacts. Data formats are non-standard as provided on WWBWC's website: for example, groundwater levels are all provided as negative values. It is standard hydrogeologic practice to publish depth to groundwater as a positive value, unless a well is flowing artesian, in which case it is expressed as a negative value. This means that integrating WWBWC data sets with other sources requires an extra level of processing. Well data should be tied to the project names significant to WWBWC and the driller's well report logids. OWRD staff have made these correlations to the extent possible and import verifiable WWBWC groundwater level measurements into OWRD's Groundwater Information System to facilitate data set integration.

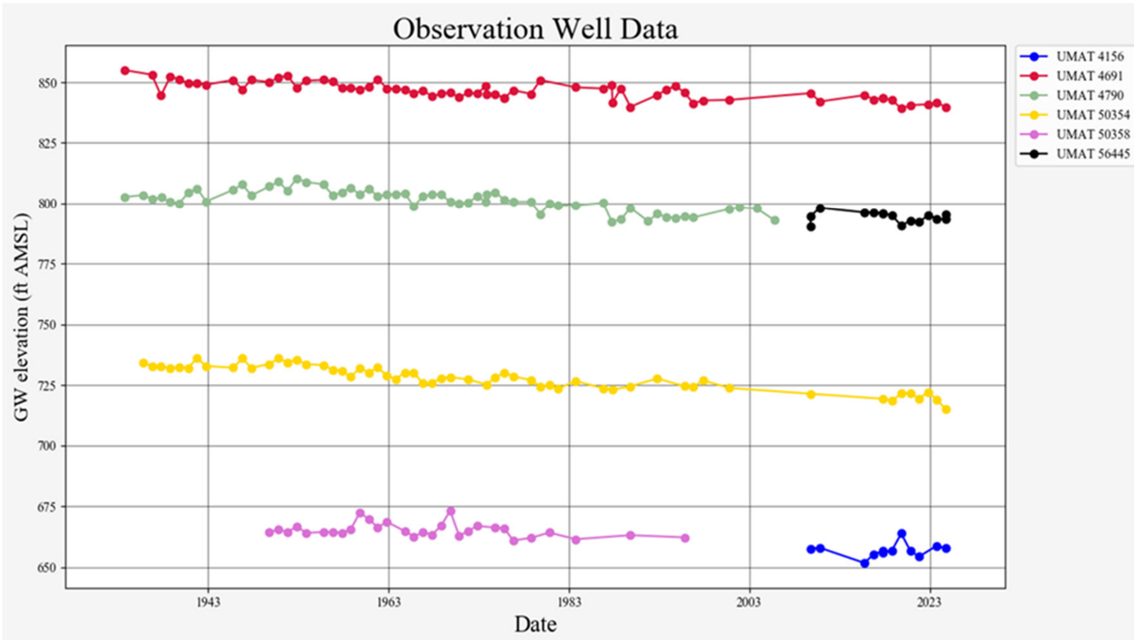
**Limit shallow aquifer declines and restore aquifer**

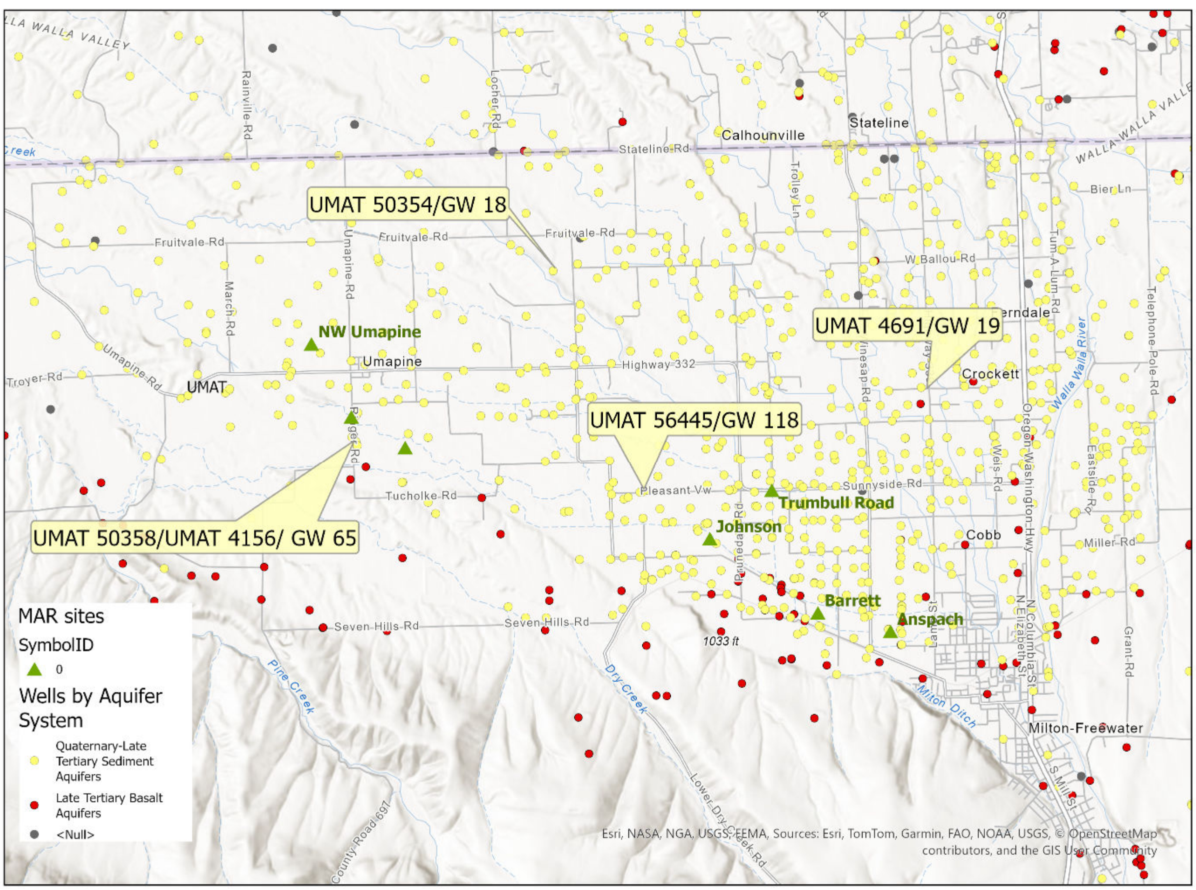
First, OWRD recommends defining aquifer restoration, particularly if the term is used to mean something different from returning static groundwater levels to historic high levels. Secondly, annual reports present groundwater hydrographs one well at a time, in feet below land surface, and include all measurements taken in every season and status: rising, falling, static. It is difficult to quantify trends from these figures, rather they are qualitatively described. OWRD recommends future reports include multiple well hydrographs to examine the timing and magnitude of water level changes and how they relate to timing, location and magnitude of AR tests. Consider filtering water level data by season and status.

OWRD and USGS staff have maintained a groundwater level monitoring network in the Walla Walla River Basin since the 1940's, and WWBWC has complemented that with many additional wells over the last 20 years. To assess long-term storage changes in the alluvial aquifer, the following analysis limits data to static measurements collected in October. October is before AR begins most years and when large-scale groundwater pumping is decreasing or done for the year. Therefore, it represents the most static conditions in the alluvial aquifer within the areas influenced by AR.

At the long-term observation wells shown in Figure 1, October static groundwater levels have declined from 4 to 19 feet since the 1940s. The AR project has infiltrated approximately 6,000 AF/year for 15 years, for a total of 90,000 acre-feet. This has not returned groundwater to historic high static elevations at these wells. This does not mean the project has no benefits. It does suggest that restoring the aquifer to 1940's groundwater levels is not an attainable near-term goal, given the high transmissivity of the target aquifer and the current project scale. Predictive numerical groundwater modeling by GeoSystems Analysis, Inc. (2016) came to a similar conclusion, estimating that over 20,000 acre-feet infiltrated annually may be required to reach goals.

**Figure 1**: October static water levels at alluvial aquifer wells in the Walla Walla River Basin, 1940s to present. The map shows well locations relative to AR sites.



The Johnson AR site receives the largest annual recharge volume and was the first AR site developed. It therefore has the longest record. Down-gradient observation wells include a state observation well with time series data beginning in the 1940s (UMAT 4790 and its replacement, UMAT 56445). Groundwater level data from this site are examined by season in Figure 2. The following discussion examines water levels and how they relate to AR project operation. There are undoubtedly other stresses on the aquifer that are not parsed out for the purpose of this discussion.

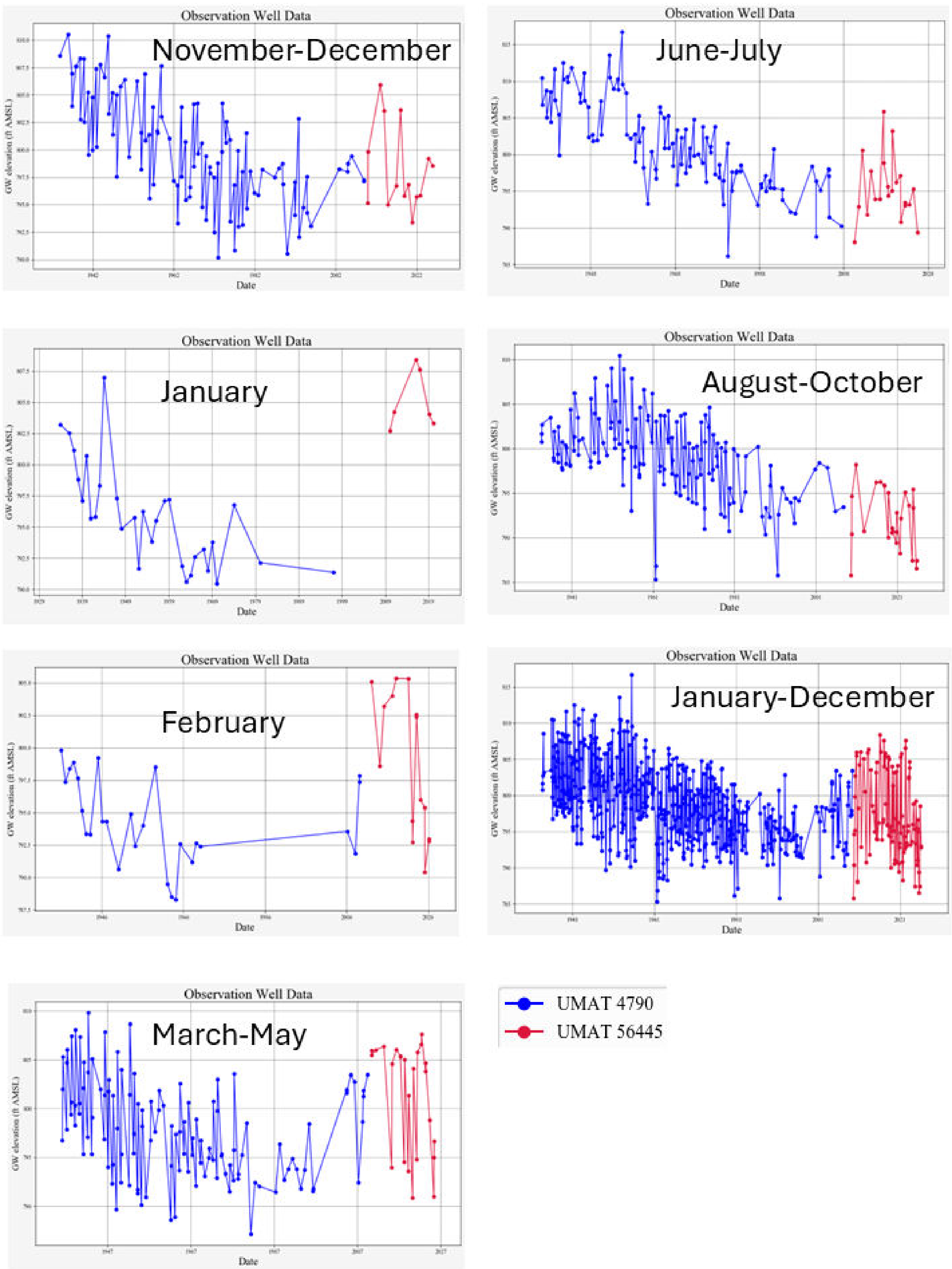
While long-term October static water level data show negligible increases at this well since AR began (Figure 1), other seasonal trends have changed (Figure 2). Annual high groundwater levels are higher than pre-AR levels, and they are time-shifted to earlier in the calendar year than the pre-AR highs. Annual high groundwater levels in the 1940s and 1950s occurred during the months of May and June. Since AR testing began in 2006, annual highs down gradient of the Johnson site occur between December through May. January levels at UMAT 56445 while AR is occurring show a 10-to-18-foot water level increase between 2005 and the present. Annual low groundwater levels remain similar to pre-AR levels. Annual lows occur August through October, with little change between 2005 and the present. In 2025, there was no AR, and November through January water levels at UMAT 56445 remained at pre-2005 levels.

The observation that AR water level increases dissipate within the same calendar year indicates that infiltrated water flows away quickly, to wells, springs and/or along shallow, highly transmissive preferential flow paths within the sedimentary package. Jimenez (2012) conducted a tracer study to track water molecules across the 3,300 feet between the Johnson AR site and UMAT 4790 /UMAT 56445. The average water molecule flow velocity between the Johnson site and UMAT 56445 and the Johnson and Dugger Creek spring vents was 60 meters/day (197 feet/day). Petrides concluded that water infiltrated at the Johnson site flowed primarily along the transmissive upper layers of the alluvial aquifer, while a small fraction infiltrated deeper and flowed more slowly in the same direction.

Project analysis hasn’t demonstrated a year-over-year increase in groundwater storage volume, which would manifest as a year- over-year static groundwater level increase outside the recharge season. However, there is a seasonal (winter and spring) increase in groundwater level, and recharged water appears to discharge to the surface or to wells within the same season either to springs or shallow wells. While this doesn’t fit a definition of aquifer restoration, it does take pressure off the groundwater system when alluvial aquifer wells pump AR water instead of natural groundwater. These benefits are likely experienced seasonally by a diffuse group of alluvial aquifer and spring branch users.

In 2025, when AR did not occur, the Department received reports of decreased well yields near the Johnson site during late winter before the irrigation canals filled. Yields reportedly recovered once the canals were running for irrigation season. This anecdotal information supports the concept that AR produces seasonal benefits to the down-gradient alluvial aquifer and spring branch users. If use is relying on artificially recharged water and not natural groundwater for part of each year, the AR project is taking pressure off the natural groundwater system. The artificial bolstering of groundwater levels early in the year, before canals deliver irrigation water, provides a tangible benefit to shallow well and spring branch users. Therefore, WRD recommends designing the monitoring plan to quantify this tangible benefit, for example, which wells and springs show transient water level increases that can be correlated to the timing of recharge?

**Figure 2.** Groundwater level data from UMAT 4790/UMAT 56445/GW 118, 1940s through the present.



**Reduce hydraulic gradient away from streams and creeks in the valley to reduce surface water seepage**

It is not clear what monitoring plan elements address this goal, or if this is a seasonal or year-over-year goal. It is also not supported by data in annual reports. This requires detailed analysis such as groundwater elevation contour maps over the time period of interest. Transducer data have been collected and might help understand changes in groundwater gradient spatially and temporally, but reports don't contain the level of analysis to demonstrate this goal is attained. If there are other data being collected that support this conceptual benefit, its analysis should be included in annual reports. If the data don't yet demonstrate this benefit, OWRD suggests removing it from application materials, annual reports, and project narratives.

**Mimic lost flood plain processes**

The concept sounds important but is poorly identified in the project documents provided to OWRD. The AR monitoring plan doesn't include actions designed to quantify this benefit. Suggest articulating how this is measured, or removing it from stated AR project goals, reports, and project narratives.

**Increase flows in spring branches**

This is a goal that could be better described and quantified using the available data: when, where, how much is a given spring's flow increasing relative AR operation? Which springs and creeks are targeted by which AR sites? What background data will AR data be measured against to demonstrate increases? Qualitatively, consider sharing local experiences that can be tied to a timeline of springs disappearing/reappearing. Annual reports and the monitoring plan should articulate pre-AR conditions and quantify where and when increases to springs are measured.

Monitoring Plan Section 4.4: Spring monitoring states "While groundwater elevation data typically represent conditions in a very small area surrounding each well, the area influencing each spring's discharge is spatially larger." This statement is hard to follow. A static measurement at a properly constructed well or at a spring are point measurements that can be influenced by nearby conditions. However, a network of well and spring measurements collectively describes aquifer conditions. Annual reports include spring discharge hydrographs and statements such as: "Water management factors like irrigation withdrawals and tailwater inputs make it difficult to directly correlate the measured stream flows with recharge activities. Nonetheless, these flow data can indicate trends in spring discharge and help to evaluate aquifer storage." Reports do not explain how aquifer storage is being evaluated with spring discharge data. Spring discharge rates decay back to the same lows as the pre-recharge season each year. Are there spring flow increase benefits that extend beyond the recharge season? In future reports, OWRD recommends detailing how data support the conclusions, if the project continues stating this benefit.

**Next Steps for application LL-1970**

1. Update project goals, objectives and the related water quantity monitoring plan, submit complete monitoring plan to OWRD for review. This will satisfy OAR 690-350-0120(3)(c) purpose of recharge and OAR 690-350-0120(3)(g) monitoring plan.
2. ODFW has requested a bypass plan (see their review here: https://apps.wrd.state.or.us/apps/wr/wrinfo/wr_details.aspx?snp_id=225665) draft and submit to ODFW and OWRD for review.
3. Once ODFW and OWRD approve these 2 plans, OWRD will act on the application.

**References**

GeoSystems Analysis, Inc., 2016, Walla Walla Basin Integrated Water Flow Model: Piping and MAR Alternatives Management Report, 50 pages.

Jimenez, Aristedes Chrisostomos Petrides, 2012, Managed Aquifer Recharge and Hydrological Studies in the Walla Walla Basin to Improve River and Aquifer Conditions, Thesis, Oregon State University, 225 p.

Oregon Water Resources Groundwater Information System , https://apps.wrd.state.or.us/apps/gw/gw_info/gw_info_report/Default.aspx

Oregon Water Resources Department Water Rights Information System, https://apps.wrd.state.or.us/apps/wr/wrinfo/wr_details.aspx?snp_id=225665 .

WWBWC annual reports, 2020-2024.