SJRRP Flow Bench Evaluation

March 5, 2024

Introduction

The following Flow Bench Evaluation (FBE) documents current releases and groundwater conditions and evaluates Restoration Flow within Seepage Management Plan (SMP) thresholds. This information is to help inform an Ad Hoc Flow Recommendation from the Restoration Administrator (RA). The current approved Restoration Flow Recommendation has a Gravelly Ford (GRF) target of 395 cfs (total 400 cfs); at Sack Dam (SDP), this equates to a current target of 290 cfs. This FBE focuses on Reach 4A as it is the current limiting reach based on SMP thresholds. The FBE evaluates the current releases and groundwater conditions monitored as of March 5, 2024 and determines at what flow rate Restoration Flows will be within groundwater thresholds. Note that use of "FBE" throughout the report refers specifically to the FBE model-based analysis described in Appendix J of the Seepage Management Plan (SMP).

As of March 5, 2024:

1. Channel conveyance: Flow rates are below known conveyance thresholds.

2. Operations Conference Call: An operations call was held on February 28, 2024. No known operational constraints were identified on the call.

3. Seepage Hotline Calls: The seepage hotline has received no calls regarding Restoration Flows in Water Year 2024.

4. Real-time wells: A number of real-time equipment locations are currently going through equipment upgrades. All functioning telemetered groundwater monitoring well levels are below SMP thresholds.

5. Priority wells: Weekly groundwater measurements in priority wells, both real-time and manually measured, indicate that all wells are below well thresholds. Note that manual monitoring efforts may be impacted by storm conditions, but data is collected using dataloggers at most locations and will be downloaded at the next opportunity.

6. Flow Stabilization: Releases at Sack Dam have been affected by recent storms (tributary flows causing variability in flow rates) and gauge error (DWR calibration measurements suggest that SDP gauge has been reporting lower than actual flows), but adjustments have been made consistent with the Sack Dam target for Restoration Flows. This includes an increase in flows past Sack Dam consistent with the current approved RA Recommendation for March.

7. Projected Groundwater Level Changes: With the flow scenarios evaluated in this FBE, groundwater levels are projected to decrease approximately 0.1 ft depending on well location in Reach 4A (see Summary).

8. Levees: LSJLD has not expressed concerns about current flows.

9. Water Districts: The SJRECWA has not identified any operational concerns.

Data

The following Data section considers monitoring measurements collected as of March 5, 2024. These values are referred to as "pre-condition" to inform current groundwater levels before any changes to Restoration Flows. The "projected" values indicate the results from this FBE model-based analysis indicating what flow rate of Restoration Flows will be within groundwater thresholds. Note that the expected Ad Hoc RA Recommendation may vary from the FBE results but should not be greater than the maximum projected flow before exceeding SMP thresholds.

Table 1 shows groundwater depths in one real-time well and two manual measurements from field staff. Measurements were taken on February 29, 2024 and March 5, 2024 and are reported in the Weekly Groundwater Report with a publish date for the week ending March 2, 2024. Reclamation publishes the Weekly Groundwater Report with manual measurements via electronic well sounder on the SJRRP website HERE. To calculate field depths, Reclamation adds ground surface buffers and lateral gradient buffers to measured groundwater depths in the well (Equation 1, Figure 1).

$$Field\ Depth_{Current} = D_{well} - GS_{Buffer} + LG_{Buffer} \quad (1)$$

Where:

$Field\ Depth_{Current}$	Current groundwater level depth in the field
D_{Well}	Current groundwater level depth as measured in the monitoring well
GS_{Buffer}	Ground surface buffer, or the difference in elevation between the well and the field
LG_{Buffer}	Lateral gradient buffer, to account for losing reaches where the groundwater table slopes away from the river (if any)

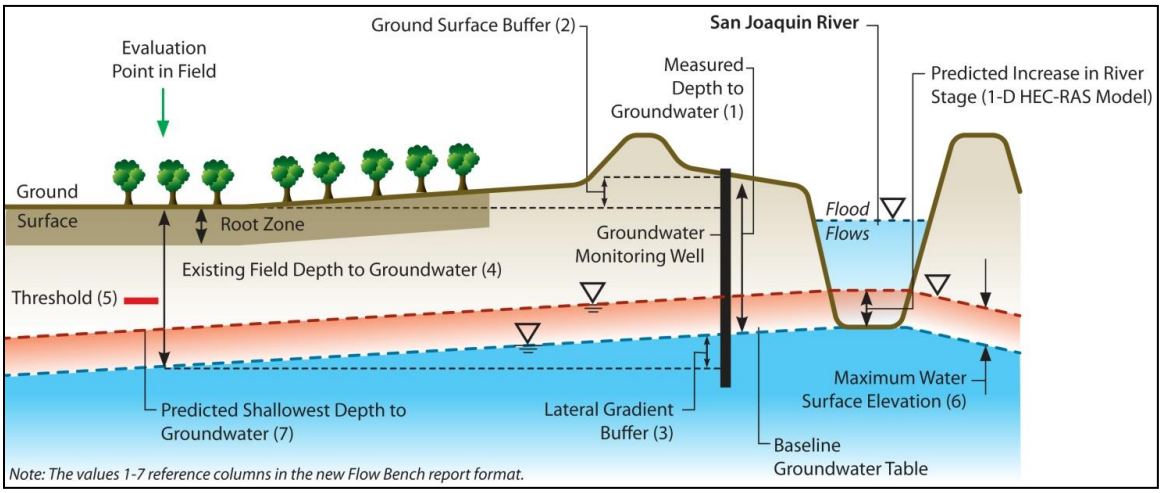

Figure 1. Conceptual Model for Observed Groundwater Level Method

The pre-condition well data in Table 1 show groundwater levels above threshold at MW-18-80B in Reach 4A. This is a result of Appendix H SMP updates published on March 1, 2024 which included updates to crop types. Based on updated crop data near well MW-18-80B, the root zone associated with the agricultural method threshold increased from 5 ft to 6 ft. The ground surface

buffer depicted in Figure 1 was also updated based on most recent LiDAR (DWR 2021) but had a limited influence of 0.3 ft. Therefore, the well threshold for MW-18-80B was updated from 9.7 ft_bgs to 11.0 ft_bgs. A Site Visit was conducted on March 5, 2024 to verify groundwater levels and this FBE is being completed in response to inform an Ad Hoc Flow Recommendation from the RA.

Table 1. Pre-Condition Well Data

Well	Reach	1 - Measured Groundwater Depth in Well (feet bgs)	Date Measured	2 - Ground Surface Buffer (feet)	3 - Lateral Gradient Buffer (feet)	4 - Field GW Depth (feet bgs)	5 - Field Threshold (feet bgs)	Comment
MW-18-80B	4A	10.9	3/5/2024	4.5	1.2	7.6	7.7	Above Threshold
MW-17-225	4A	8.8	2/29/2024	1.3	1.1	8.6	6.5	Acceptable
MW-10-89	4A	11.0	2/29/2024	3.3	-	7.7	6.5	Acceptable

bgs = below ground surface; GW = groundwater

Analysis

Although Restoration Flow releases past Sack Dam have been increasing given the current RA Recommendation for March, these flows were released consistent with SMP thresholds. It is not until thresholds, including crop types, were updated on March 1 that Restoration Flows should be adjusted for groundwater levels at MW-18-80B. Given current flow rates, the projected flow rate to meet the necessary decrease in water surface elevation was estimated based on the concept illustrated in Figure 2 (i.e., a 1:1 relationship between stage and groundwater levels).

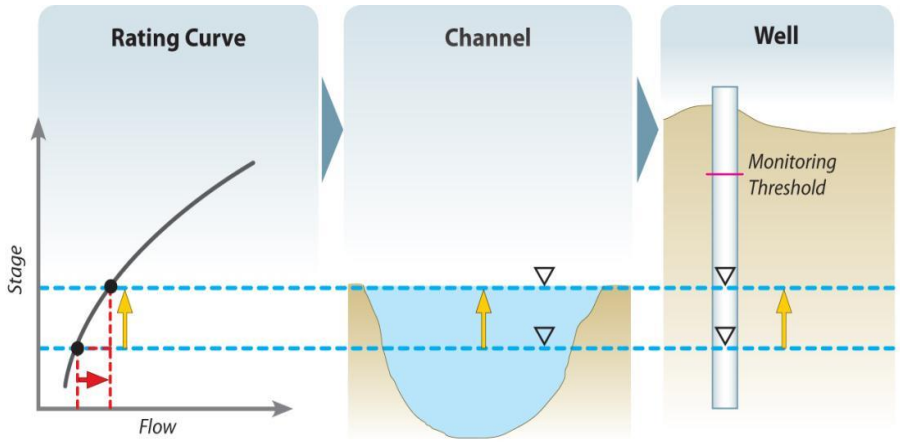

Figure 2. Conceptual Relationship between River Stage and Groundwater Levels

Table 2 shows the flow rates analyzed to achieve the necessary 0.1 ft decrease in groundwater level at MW-18-80B. Pre-condition flows are based on the current Sack Dam target of 290 cfs, plus the current SDP gauge error of being approximately 20 cfs too low. The comparison of pre-condition and projected flows informs the maximum projected flow before exceeding SMP threshold. The maximum flow estimate below Sack Dam before SMP thresholds are exceeded is 285 cfs.

Table 2. Maximum Projected Flow Before Exceeding SMP Threshold to Inform Ad Hoc RA Recommendation

	Pre-condition Flows (cfs)	Projected Flows from Evaluation (cfs)
Reach 4A	310[1]	285[2]

[1] Source: Current Sack Dam target (290 cfs) plus approximately 20 cfs gauge error.
[2] Calculated from Flow Bench Evaluation

Table 3 shows the change in groundwater for the maximum flow of 285 cfs below Sack Dam based on estimated changes in river stage and the conceptual models shown in Figures 1 and Figure 2. Field depths are calculated by taking the most recent measurements from Table 1, adding the ground surface and the lateral gradient buffers, and subtracting the maximum predicted stage change (Equation 2).

$$Field\ Depth_{Predicted} = Field\ Depth_{Current} - WSEL_{Max\ Increase} \quad (2)$$

Summary

This analysis, in combination with recent field measurements, indicates acceptable conditions for up to 285 cfs past Sack Dam. Note that the expected Ad Hoc RA Recommendation may vary from the FBE results but should not be greater than the maximum projected flow before exceeding SMP thresholds. Groundwater levels will continue to be monitored as flows are adjusted and stabilize. Reclamation retains the right to recapture Restoration Flows in Mendota Pool to adjust for any Restoration Flow constraints. Subsequent FBEs will be performed to inform any other potential flow changes.

Table 3. Predicted Groundwater Levels for Priority Wells with Maximum Flow of 285 cfs below Sack Dam

Well	Reach	1 - Measured Groundwater Depth in Well (feet bgs)	Date Measured	2-Ground Surface Buffer (feet)	3 - Lateral Gradient Buffer (feet)	4 - Field GW Depth (feet bgs)	6 - Predicted WSEL Change (feet)	7 - Predicted Shallowest GW Depth (ft bgs_field)	5 - Field Threshold (feet bgs)	Comment
MW-18-80B	4A	10.9	3/5/2024	4.5	1.2	7.6	-0.1	7.7	7.7	Acceptable
MW-17-225	4A	8.8	2/29/2024	1.3	1.1	8.6	-0.1	8.7	6.5	Acceptable
MW-10-89	4A	11.0	2/29/2024	3.3	-	7.7	-0.1	7.8	6.5	Acceptable

bgs = below ground surface; GW = groundwater; WSEL = water surface elevation