

SJRRP Flow Bench Evaluation

July 21, 2017

The Restoration Administrator (RA), as of July 21, 2017, recommends Restoration Flow releases of 125 cfs past Gravelly Ford through August 31, 2017. The recommendation also includes a release of 43 cfs past Sack Dam, specifying that any additional Restoration Flows that arrive at Mendota Pool in excess of the Sack Dam target also be released downstream. The combined release from Friant Dam, including Restoration Flows and holding contract releases, will remain at least 350 cfs. This Flow Bench Evaluation will evaluate the transition from flood flows to Restoration Flows, which will be effective instantaneously throughout the Restoration Area.

As of July 21, 2017:

1. Channel conveyance: Flow rates are below known conveyance thresholds.
2. Operations Conference Call: An operations call was held on July 19, 2017. No issues were raised. A notification email is being sent to participants of the operations conference call to notify them of this switch to Restoration Flows.
3. Seepage Hotline Calls: The seepage hotline has received no calls regarding Restoration Flows in Water Year 2017.
4. Real-time wells: All telemetered groundwater monitoring well levels are below thresholds except for MW-09-49B. This well does not restrict releases since the projected groundwater elevation will fall below threshold with the current RA Recommendation.
5. Priority wells: Weekly groundwater measurements in priority wells, Table 3, indicate that most wells are below thresholds. FA-9, MW-09-47, MA-4, and MW-09-49B are projected to be below threshold with the decrease in river stage. MW-14-208 is projected to be below threshold by the drainage method (refer to Appendix J of the Seepage Management Plan).
6. Flow Stabilization: Flows in the system are not currently stable, and are decreasing from flood control releases. Since January 4, 2017, Friant Dam has been releasing flood flows. For the first week of July, flood flows were at 2,500 cfs. Flows ramped up to as high as 3,500 cfs in the second week of July and ramped back down to 2,150 cfs. For the last week, releases from Friant have reduced to 500 cfs and fell to 350 cfs on July 20, 2017. On July 21, 2017, flood flows are anticipated to cease and Restoration Flows are to resume, continuing the 350 cfs Friant Release. Groundwater levels are anticipated to fall over the next several days due to the recent decrease in flow.
7. Projected Groundwater Level Changes: Projected groundwater levels indicate that all priority monitoring wells will decrease in groundwater elevation or remain stable. This is a result of transitioning to Restoration Flows, with flow rates lower than recent flood control releases. The Reach 4A priority wells are projected to have minimal elevation change due to the release of Restoration Flows below Sack Dam targeted at 43 cfs, similar to current operations. All monitoring wells currently above threshold are projected to be below threshold by the Observed Groundwater Level Method or Drainage

Method (Appendix J). The Observed Groundwater Level Method applies the decrease in stage observed in the river to the well elevation. The Drainage Method accounts for sufficient drainage from the well to the river channel.

8. Levees: LSJLD has not expressed concerns about this flow increase.
9. Water Districts: The SJRECWA has not identified any operational concerns.

Analysis

All thirteen priority groundwater monitoring wells are predicted to decrease to below seepage thresholds, with most currently below thresholds at present. The SJRRP will continue weekly monitoring of groundwater wells to track the influence of Restoration Flows, and will update this analysis if any changes to Restoration Flows are recommended. Real-time monitoring equipment that required removal during flood flows will also be restored.

Data

Table 1 shows the groundwater depth in three real-time wells as of July 20, 2017 and ten manual measurements from field staff as reported in the weekly groundwater report with a publish date for the week ending July 22, 2017. Reclamation publishes the weekly groundwater report with manual measurements via electronic well sounder and recent flow data on the SJRRP website at: <http://www.restoresjr.net/monitoring-data/groundwater-monitoring/>. To calculate field depths, Reclamation adds ground surface buffers and lateral gradient buffers to measured groundwater depths in the well (Figure 1, Equation 1).

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

Where:

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

Table 1. Well Data

Well	Reach	1 - Measured Groundwater Depth in Well (feet bgs)	2 - Ground Surface Buffer (feet)	3 - Lateral Gradient Buffer (feet)	4 - Field GW Depth (feet bgs)	5 - Field Threshold (feet bgs)	Comment
FA-9	2A	7.1	2.0	2.5	7.6	6.0	Acceptable
MW-09-47	2A	6.5	2.5	3.3	7.3	6.5	Acceptable
MA-4	2A	10.4	6.1	4.6	8.9	7.0	Acceptable
MW-09-49B	2A	3.9	1.7	2.4	4.6	5.5	Acceptable
MW-09-54B	2B	10.4	7.9	5.5	8.0	7.0	Acceptable
MW-09-55B	2B	6.8	3.7	3.0	6.2	5.5	Acceptable
PZ-09-R3-5	3	8.9	1.2	0.0	7.8	5.7	Acceptable
MW-12-191	3	10.3	0.0	0.0	10.3	7.0	Acceptable
PZ-09-R3-7	3	7.3	0.7	0.0	6.6	6.5	Acceptable
MW-10-75	3	18.1	0.5	0.2	17.8	8.0	Acceptable
MW-14-208	4A	5.3	0.0	0.0	5.3	7.0	Acceptable by Drainage
MW-10-89	4A	10.5	1.0	0.0	9.5	6.5	Acceptable
MW-10-92	4A	6.9	1.0	0.0	5.9	4.8	Acceptable

bgs = below ground surface; GW = groundwater

Table 2 shows the anticipated flow rates used to evaluate future groundwater depths. Reclamation calculated losses from Friant Dam to the Mendota Pool based on the long-term pattern established by Exhibit B. Note that flows are currently not at steady state, Friant Dam reduced releases at 1300 (1:00 pm) on July 19 to 350 cfs, and this change has not yet equilibrated throughout the system. Actuals were used at gage locations in Reach 1, 2A, 2B as of 0000 (12:00 am) on July 20. Reaches 1, 2A and 2B currently represent higher flows than anticipated in steady-state conditions for a 350 cfs Friant release.

Table 2. Anticipated Change in Flows

	Recent Flows (cfs)	Projected Flows for Evaluation (cfs)
Reach 1	496	350
Reach 2A	671	125
Reach 2B	625	45
Reach 3	542	543
Reach 4A	42	43

Table 3 shows the current and maximum rise in groundwater based on estimated changes in river stage and the conceptual models shown in Figure 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 buffer, and subtracting the maximum predicted stage increase (Equation 2).

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

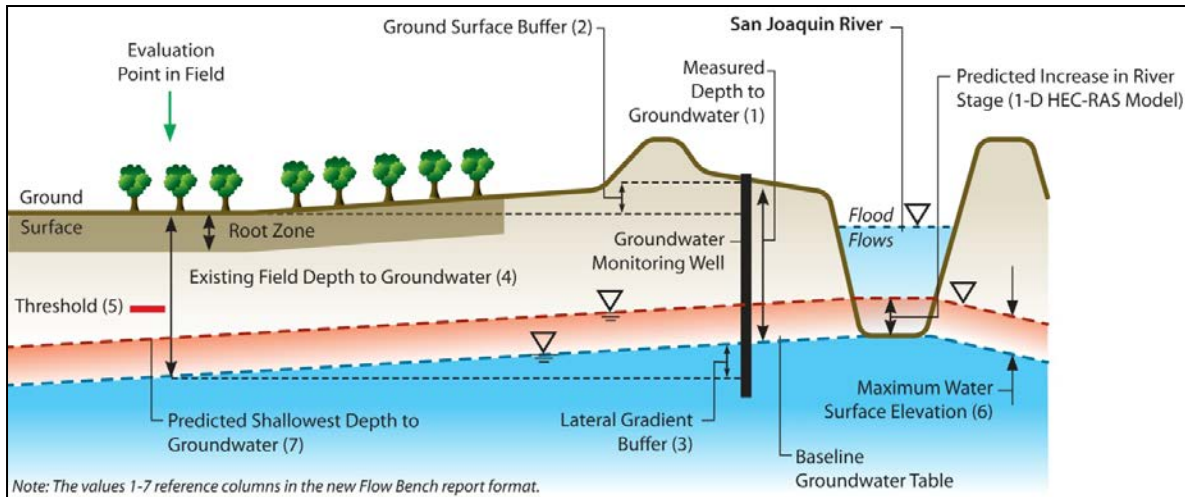


Figure 1: Conceptual Model for Observed Groundwater Level Method

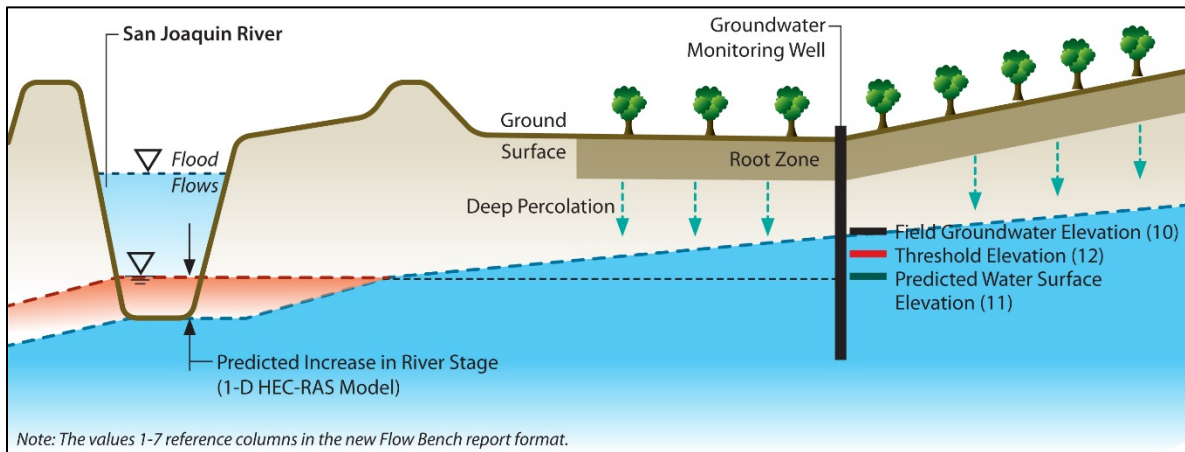


Figure 2: Conceptual Model for Drainage Method

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Table 3: Predicted Groundwater Levels for Priority Wells

Well	Reach	1 - Measured Groundwater Depth in Well (feet bgs)	2 - Ground Surface Buffer (feet)	3 - Lateral Gradient Buffer (feet)	4 - Field GW Depth (feet bgs)	6 - Maximum Predicted WSEL Increase (feet)	7 - Predicted Shallowest GW Depth (feet bgs)	5 - Field Threshold (feet bgs)	Comment
FA-9	2A	7.1	2.0	2.5	7.6	-1.9	9.6	6.0	Acceptable
MW-09-47	2A	6.5	2.5	3.3	7.3	-1.9	9.2	6.5	Acceptable
MA-4	2A	10.4	6.1	4.6	8.9	-1.7	10.6	7.0	Acceptable
MW-09-49B	2A	3.9	1.7	2.4	4.6	-1.7	6.4	5.5	Acceptable
MW-09-54B	2B	10.4	7.9	5.5	8.0	-4.5	12.5	7.0	Acceptable
MW-09-55B	2B	6.8	3.7	3.0	6.2	-4.5	10.7	5.5	Acceptable
PZ-09-R3-5	3	8.9	1.2	0.0	7.8	0.0	7.8	5.7	Acceptable
MW-12-191	3	10.3	0.0	0.0	10.3	0.0	10.3	7.0	Acceptable
PZ-09-R3-7	3	7.3	0.7	0.0	6.6	0.0	6.6	6.5	Acceptable
MW-10-75	3	18.1	0.5	0.2	17.8	0.0	17.8	8.0	Acceptable
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bgs = below ground surface; GW = groundwater; WSEL = water surface elevation

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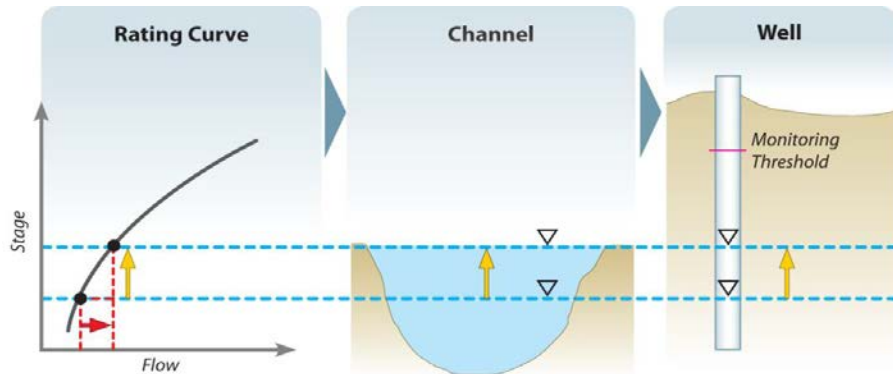


Figure 3: Conceptual Relationship between River Stage and Groundwater Levels

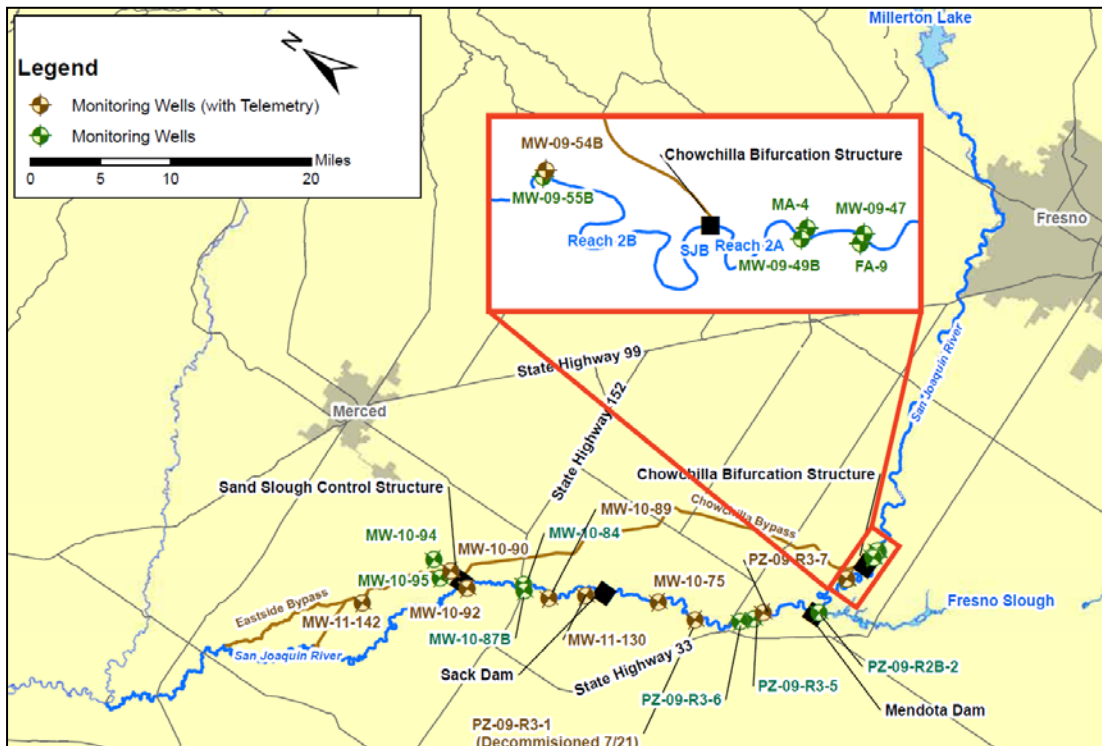


Figure 4: Key Monitoring Well Locations

