SJRRP Flow Bench Evaluation

March 8, 2011

The March 7th recommended flow schedule from the Restoration Administrator would increase releases from Friant Dam from 700 cfs to 900 cfs on March 8, 2011. Based on the following flow bench evaluation, Reclamation identified several monitoring wells at risk of exceeding the groundwater thresholds that avoid seepage impacts. Consistent with the procedures in the Seepage Management Plan, Reclamation will require the completion of several site visits prior to an increase in releases. Reclamation anticipates completion of the site visits will delay implementation of flow changes until Thursday, March 10th.

As of March 8, 2011:

1. Flow rates from provisional real-time data are below known conveyance thresholds (8,000 cfs in Reach 2A, 1,300 cfs in Reach 2B, and 1,300 cfs in Reach 3).

2. Daily operations coordination calls and the weekly planning call did not identify issues.

3. The seepage hotline received 1 call in Spring 2011 for properties in Reach 3 and the SJRRP responded by stopping Interim Flow releases below Mendota Dam until additional information can be gathered from a site visit.

4. Real-time groundwater monitoring identified high water tables in 3 wells:

    a. MW 54B (Reach 2B) – site visit underway

    b. MW-10-92 (Reach 4A) – protected by a recent tile drain installation

    c. MW-10-75 (Reach 3) – site visit underway

5. Priority well weekly groundwater measurements, Table 1, identified high water tables in:

    a. PZ-09-R2B-1 – license agreement pending to allow seepage

    b. MW-10-90 – Interim Flows below Sack Dam limited to 50 cfs

    c. MW-10-94 – Interim Flows below Sack Dam limited to 50 cfs

    d. MW-10-95 – Interim Flows below Sack Dam limited to 50 cfs

6. Stability has not been achieved. Flows rates continue to increase in Reach 1 and 2 in response to the prior changes in releases. Flow rates in lower reaches will decrease in response to stopping Interim Flow releases below Mendota Pool on March 7th. Little Dry and Cottonwood Creeks are adding approximately 75 cfs downstream of Friant Dam.

7. Projected shallowest groundwater levels from the proposed increase in flow, Table 3, are below thresholds except for 3 wells:

    a. MW-09-47 – site visit underway

b. MW-09-55B – site visit underway

c. PZ -09-R2B-1 – license agreement pending

8. The LSJLD will not be contacted until proposed changes pass prior evaluation steps.

9. The CCID will not be contacted until proposed changes pass prior evaluation steps.

10. The SLCC will not be contacted until proposed changes pass prior evaluation steps.

Analysis

On March 7th Reclamation received Seepage Hotline Call 2011-2. The landowner reported a rise in telemetered well MW-10-75 (Reach 3) water tables to 5 feet below the ground surface. The landowner identified flood irrigation on a neighboring farm as a potential factor. Interim Flows in Reach 3 are currently at 50 cfs, for a total flow of 600 cfs when combined with San Luis Canal Company deliveries. A site visit is planned for March 8, 2011. All Interim Flows will be stopped below Mendota Pool until additional information is gathered.

Real-time monitoring well 54B (Reach 2B) shows depths to groundwater in the field at the field threshold. Telemetry shows a depth below ground surface at the well of 15.8 feet. The SMP computed a ground surface buffer of 7.9 feet, minimum lateral gradient buffer of 2 feet from 2010 flows, and a field threshold of 10 feet. Reclamation will perform a site visit to evaluate the slope of the groundwater table and identify the linkage to river flows.

Real-time monitoring well 10-92 (Reach 4A) shows groundwater elevations above thresholds. A recently installed tile drain will protect the fields from river seepage. Conversations with the adjacent landowner and district managers on February 2nd did not identify a need to limit flows for parcels monitored by this well. Reclamation will continue to limit Interim Flow release below Sack Dam to less than 50 cfs to protect other properties in the area.

Real-time monitoring well 10-75 shows groundwater elevations above thresholds. Hotline call 2011-2 addresses Reclamation's response.

Projected groundwater levels in monitoring well 09-47 show a potential rise to 6.11 feet below the ground surface in the field using conservative assumptions of ground elevation differential and groundwater gradient information from a site visit in April 2010. This is above the field threshold of 7 feet below ground surface. This area currently has tile drains. A site visit is underway to confirm tile drains are protecting crops and this increase in river flows would not impact operations. Planned increases should be delayed until completion of the site visit.

Projected groundwater levels in monitoring well 09-55B show a potential rise to 6.41 feet below the ground surface in the field using conservative assumptions of ground elevation differential and groundwater gradient. This is above the field threshold of 7 feet below ground surface. A site visit is underway to confirm the ground surface difference, gradient, and the depth to

groundwater below the field ground. Planned increases should be delayed until completion of the site visit.

Projected groundwater levels in piezometer 09-R2B-1 show a potential rise to 3.01 feet below the ground surface in the field using conservative assumptions of ground elevation differential. This is above the threshold in the field of 5 feet below ground surface. Reclamation is working to complete a license agreement for the property. Planned releases can occur.

Data

The weekly groundwater report with manual measurements via electronic well sounder and recent flow data is available at: http://www.restoresjr.net/flows/Groundwater/Groundwater.html. Table 1 shows the manual measurements from field staff as reported in the weekly groundwater report on the Flow Monitoring page. Ground surface buffers are subtracted from measured groundwater depths in the well and lateral gradient buffers are added to obtain the field depths.

Table 1 – Priority Well Weekly Groundwater Measurements

Well	Measured Groundwater Depth in Well (feet)	Ground Surface Buffer (feet)	Lateral Gradient Buffer (feet)	Field Depth (feet)	Field Threshold (feet)	Comment
FA-9	8.4	-3.7	+2.5	7.2	5	Pilot project well within the channel, not suitable for operations
MW-09-47	8.48	-3.5	+3.3	8.28	7	Acceptable
MA-4	11.65	-6.1	+4.6	10.15	7	Pilot project well within the channel, not suitable for operations
MW-09-49B	6.15	-1.7	+2.4	6.85	4.5	Acceptable
MW-09-55B	9.21	-3.7	+3	8.51	7	Acceptable
PZ-09-R2B-1	**5.2**	**-1.3**	**0**	**3.9**	**5.0**	**License agreement pending**
MW-10-90	**2.84**	**-4.7**	**0**	**-1.86**	**7.0**	**50 cfs limit past Sack Dam for drainage**
MW-10-94	**4.19**	**0**	**0**	**4.19**	**7.0**	**50 cfs limit past Sack Dam for drainage**
MW-10-95	**3.76**	**-2.2**	**0**	**1.56**	**5.0**	**50 cfs limit past Sack Dam for drainage**

Table 2 shows the anticipated flow rates used to evaluate future groundwater depths. Losses from Friant Dam to the Mendota Pool assume a combination of current measurements from tributary inflows, recent flood releases, and the long-term pattern established by Exhibit B. Reach 3 includes an estimated 500 cfs delivery to Arroyo Canal. In Reach 4, a flow of 50 cfs was assumed based on the current operations for thresholds near the Eastside Bypass.

Table 2 Anticipated Change in Flows

	Current Flows (cfs)	Exhibit B Losses from Friant Dam (cfs)	Projected Losses from Friant Dam (cfs)	Projected Flows (cfs)
Reach 1	200	0	0	900
Reach 2A	220	-125	-125	775
Reach 2B	170	-225	-225	675
Reach 3	625	-225	n/a	550
Reach 4A	60	-225	n/a	50

Table 3 shows the current and maximum rise in groundwater based on estimated changes in river stage and the conceptual model shown in Figure 1. Subsequent pages show the rating curves for each of the key wells from the Mussetter Engineering, Inc., 2008 San Joaquin HEC-RAS Model Documentation Technical Memorandum prepared for California Dept. of Water Resources, Fresno, California, June 2.

Table 3 Maximum Increases in Groundwater Levels for Key + San Juan Ranch Wells

Well	Site	Current Depth Week of March 4th (feet)	Maximum Predicted Stage Increase (feet)	Ground Surface Buffer (feet)	Lateral Gradient Buffer (feet)	Projected Shallowest Field Depth (feet)	Field Threshold (feet)
FA-9	Reach 2A – Transect 12 – Left	8.4	-2.17	-3.7	+2.5	5.03	5
MW-47	**Reach 2A – Transect 12 – Right**	**8.48**	**-2.17**	**-3.5**	**+3.3**	**6.11**	**7**
MA-4	Reach 2A – Transect 13 – Right	11.65	-2.38	-6.1	+4.6	7.78	7
MW-49B	Reach 2A – Transect 13 – Left	6.15	-2.38	-1.7	+2.4	4.48	4.5
MW-54B	Reach 2B – San Mateo Ave. – Right	15.8	-2.2	-7.9	+2	7.70	7
MW-55B	**Reach 2B – San Mateo Ave. – Left**	**9.21**	**-2.2**	**-3.7**	**+3.1**	**6.41**	**7**
R2B-1	**Reach 2B – Right**	**5.2**	**-0.89**	**-1.3**		**3.01**	**5**

bgs = below ground surface

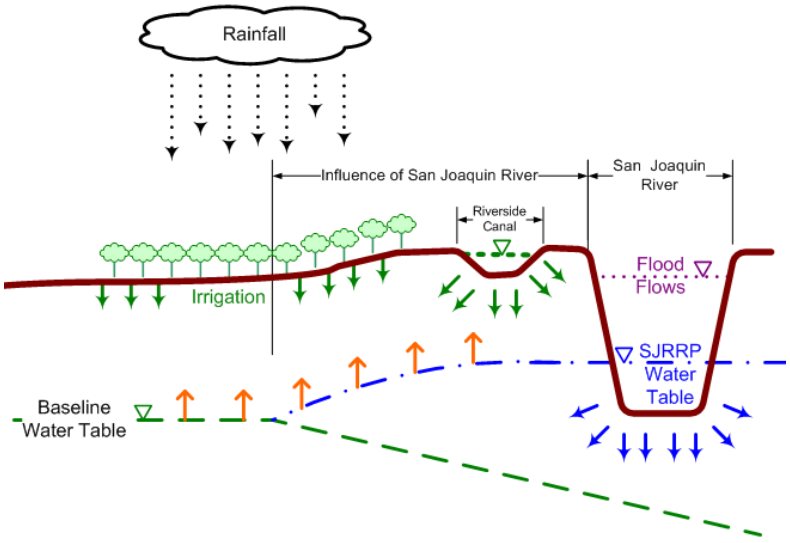
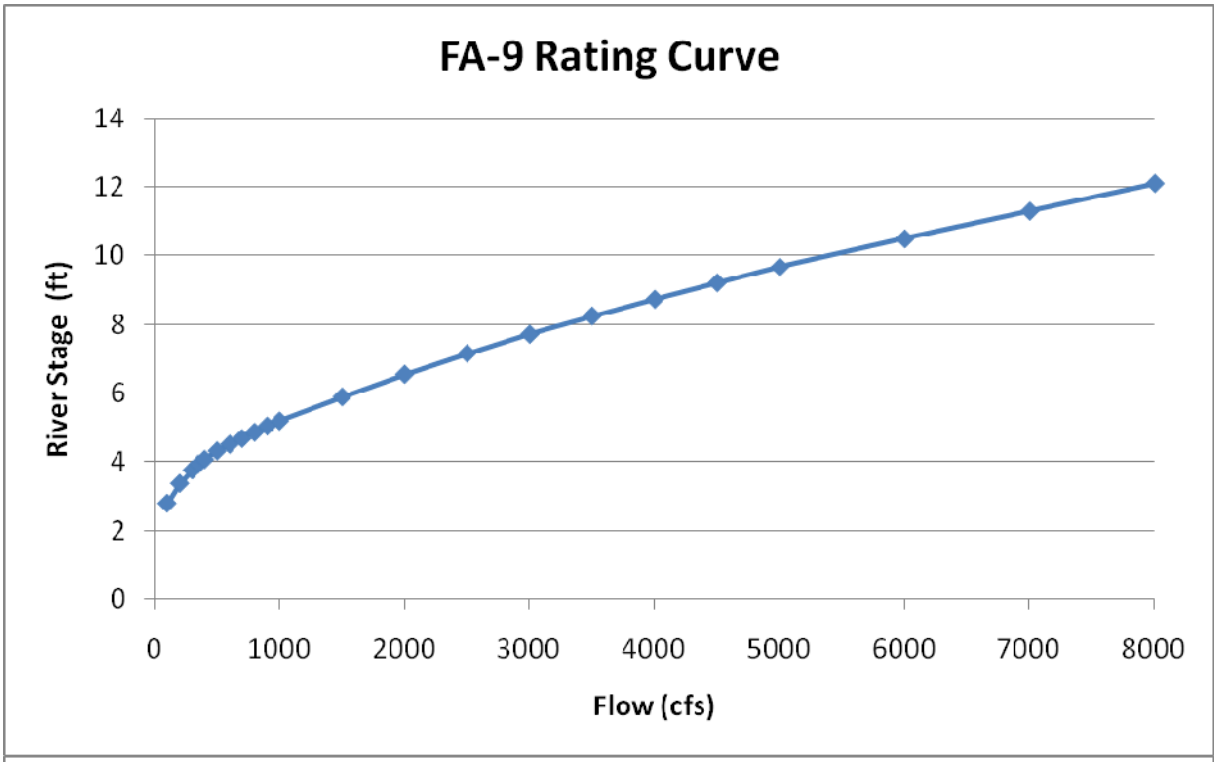
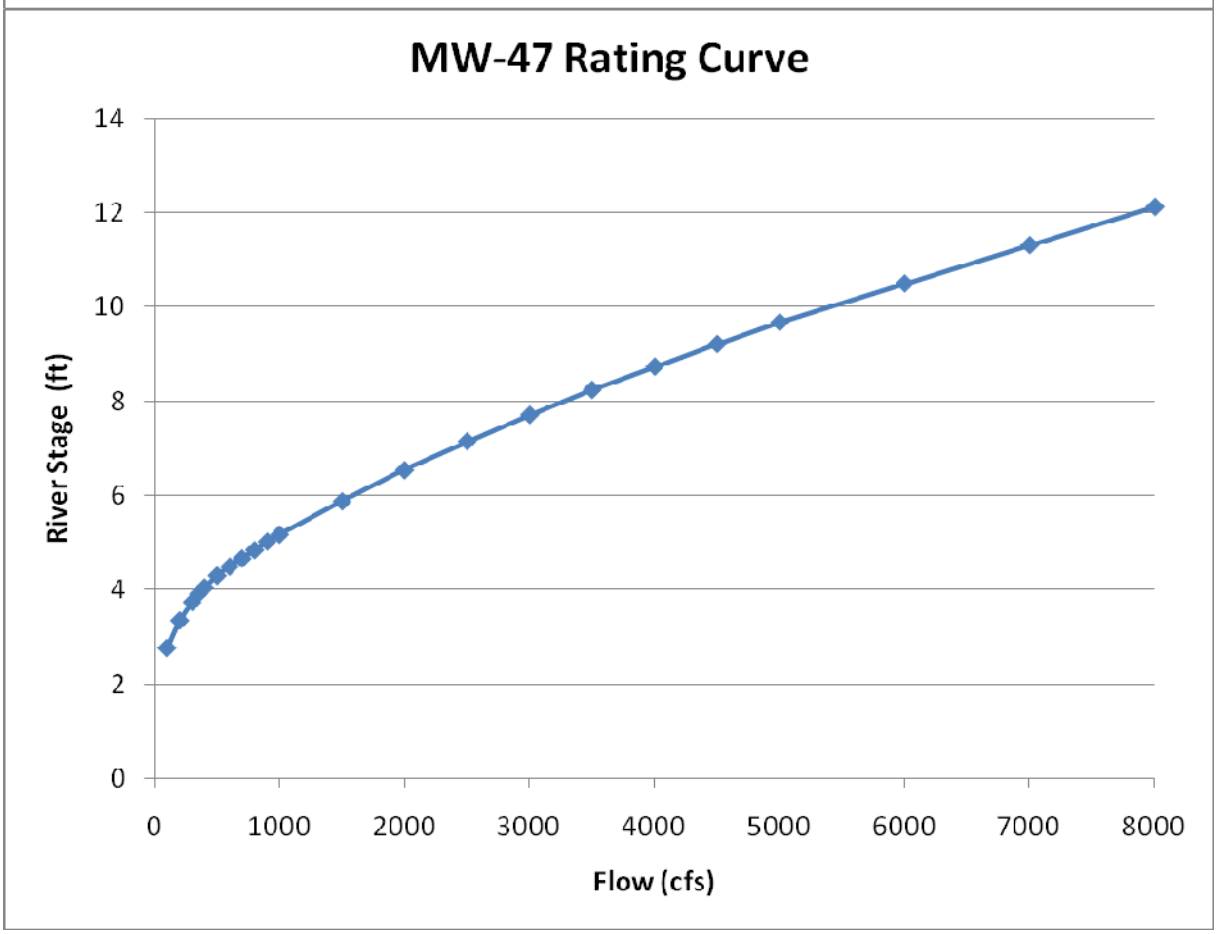
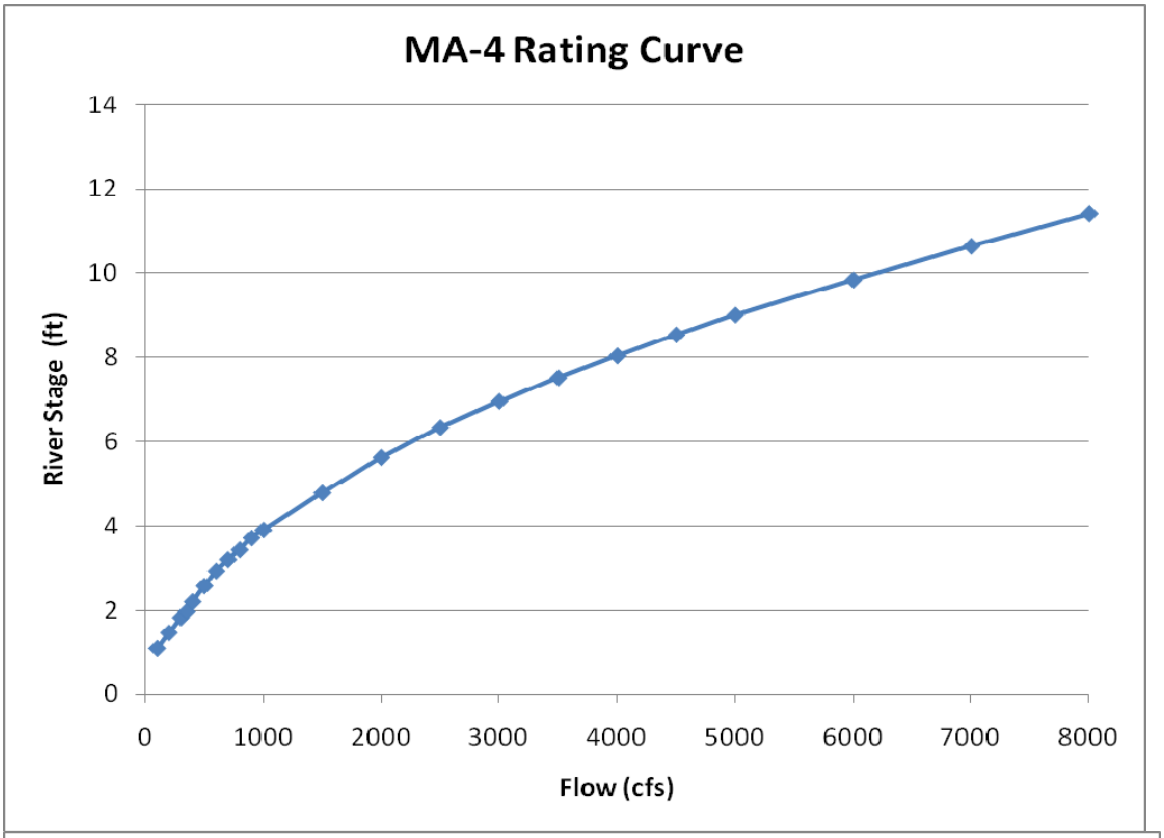
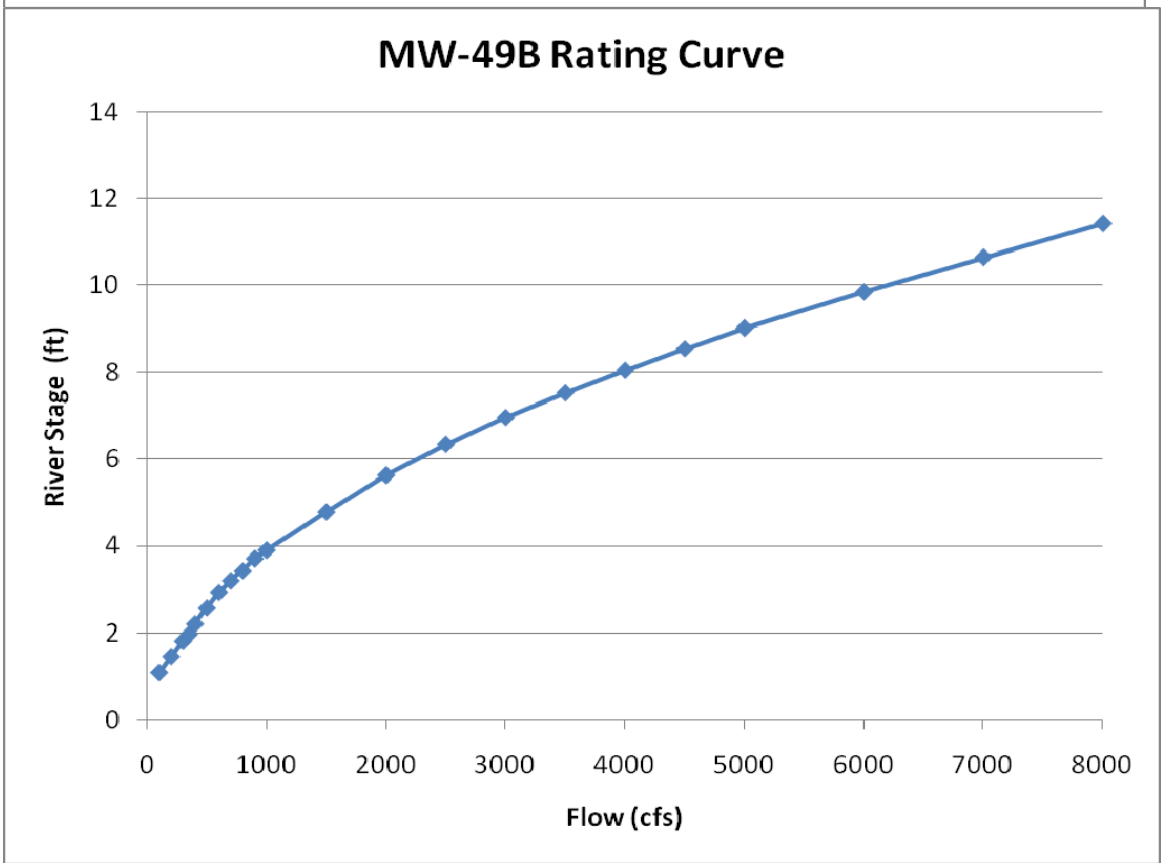


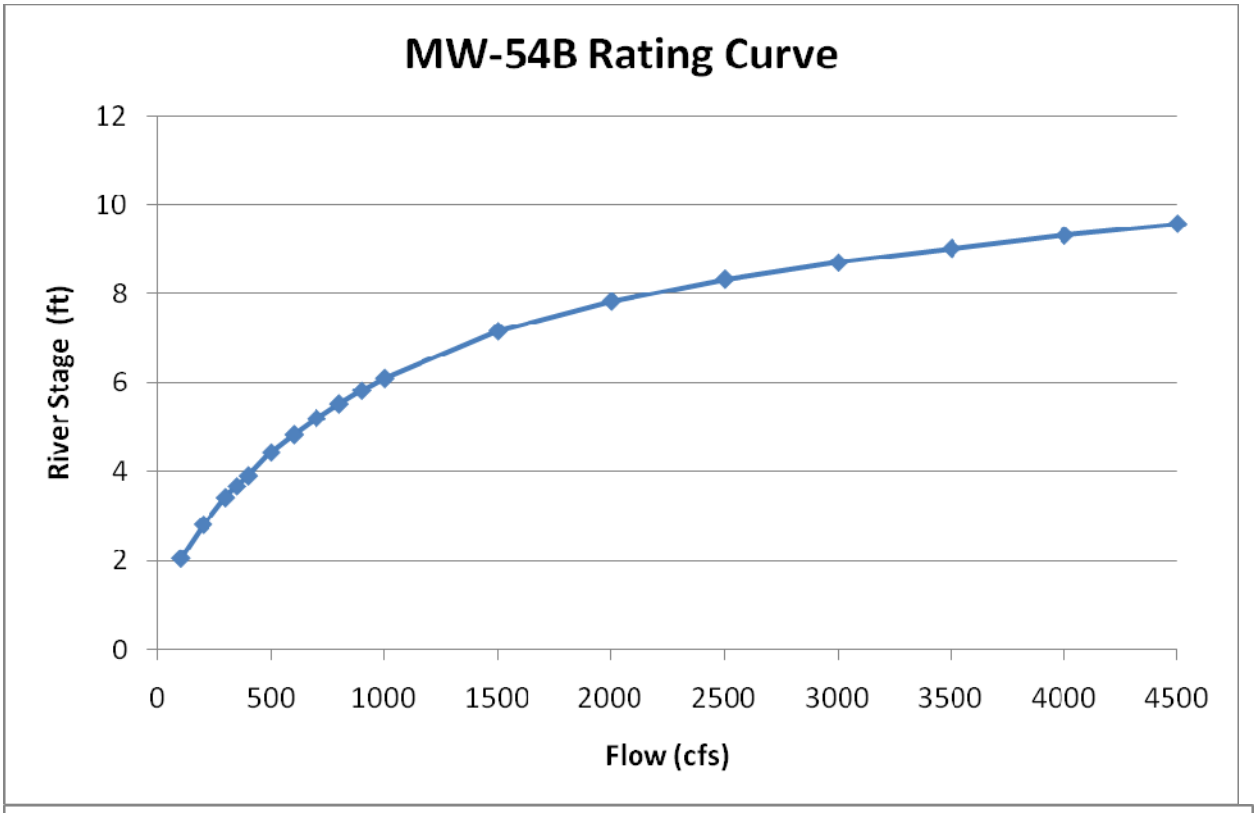
Figure 1 Conceptual Model for Flow Bench Evaluations Estimated Groundwater Depths

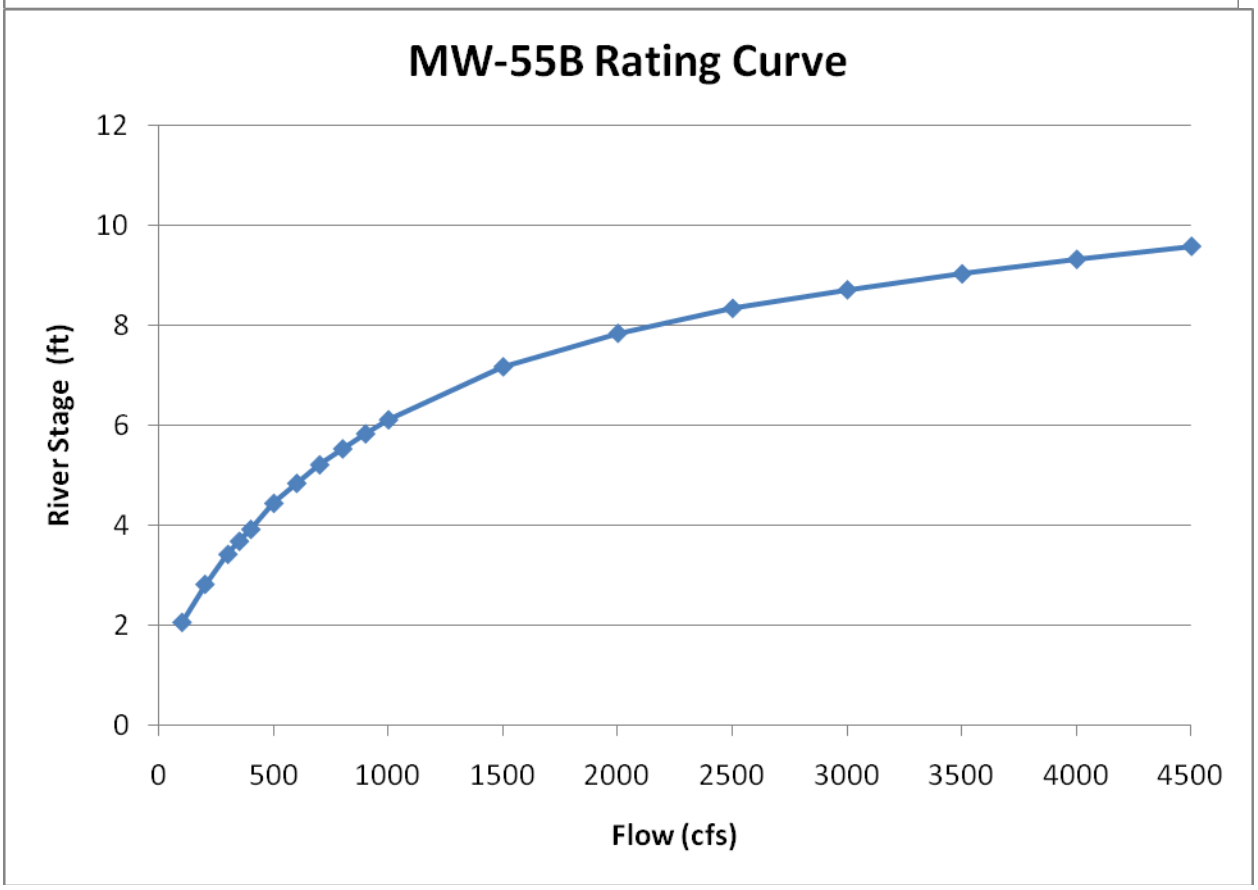

FA-9 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000
Flow (cfs)

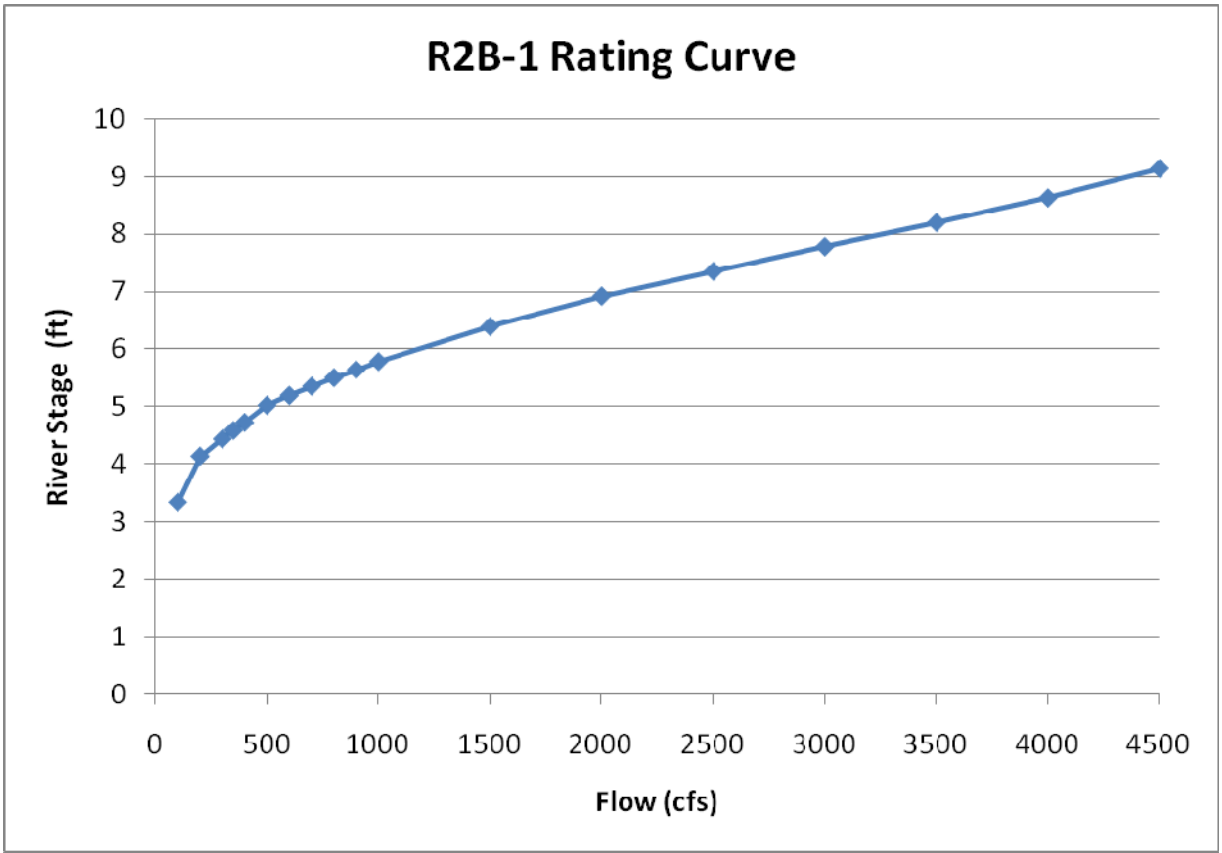

MW-47 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000
Flow (cfs)

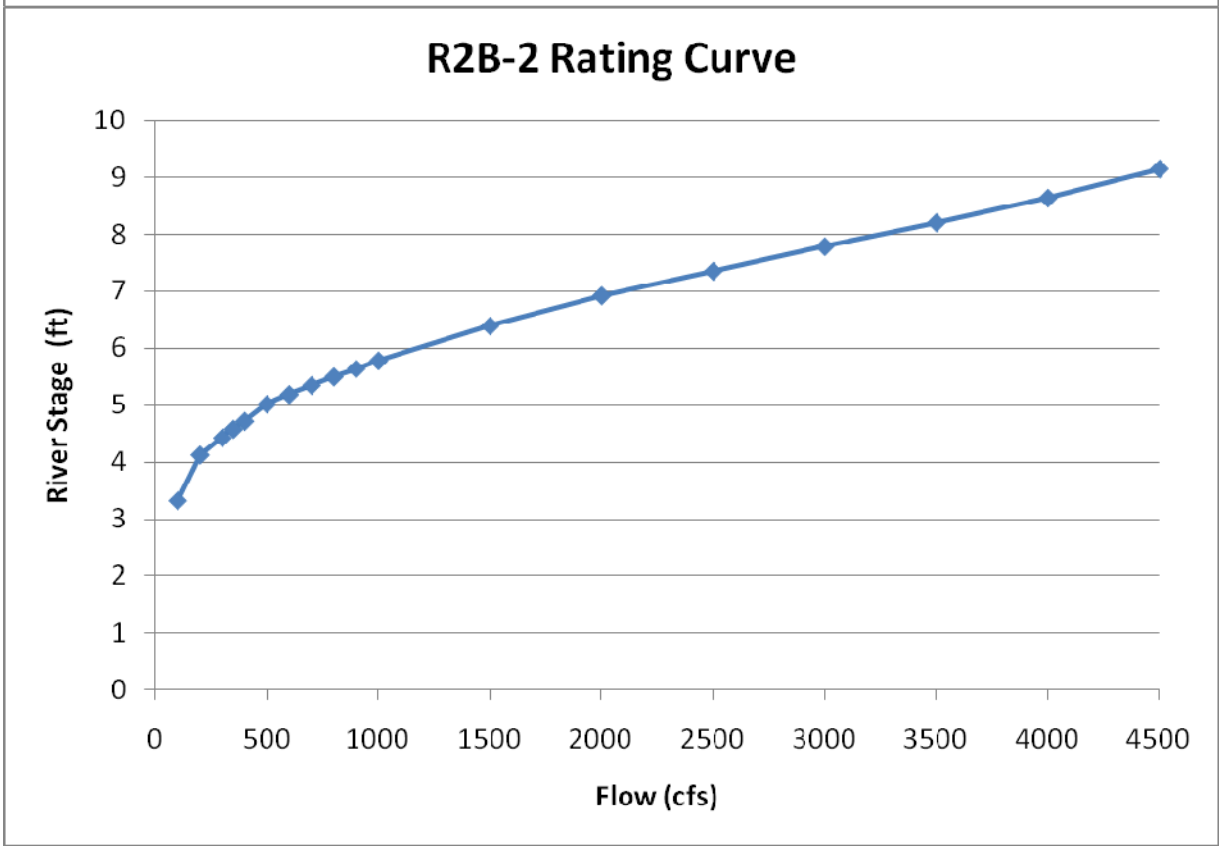

MA-4 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000
Flow (cfs)

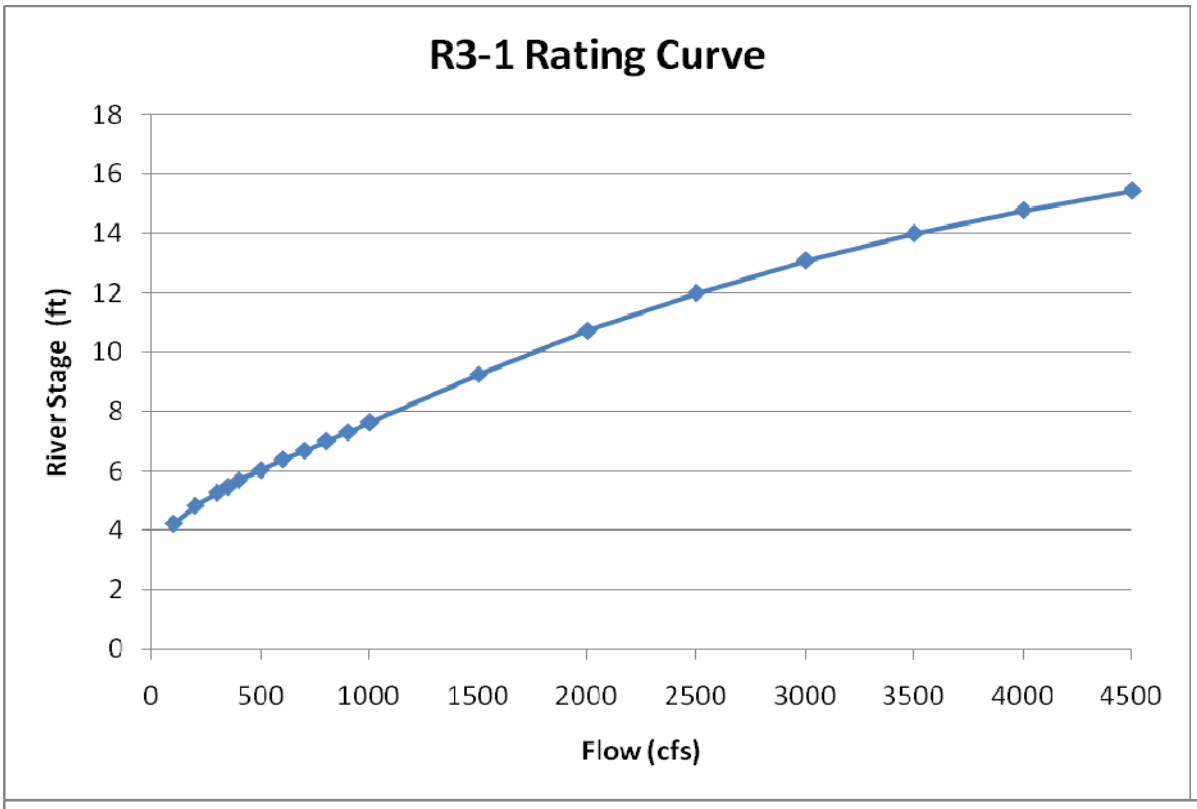

MW-49B Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000
Flow (cfs)

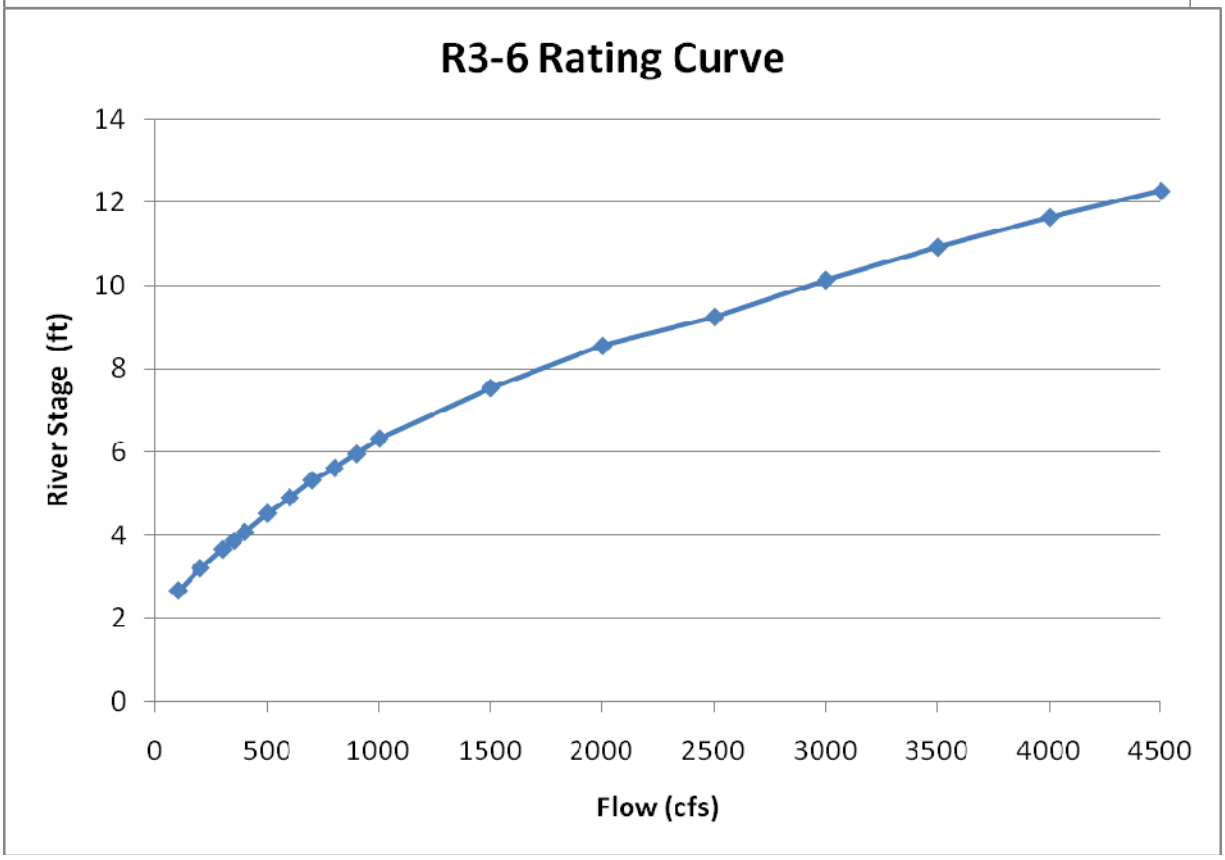

MW-54B Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)

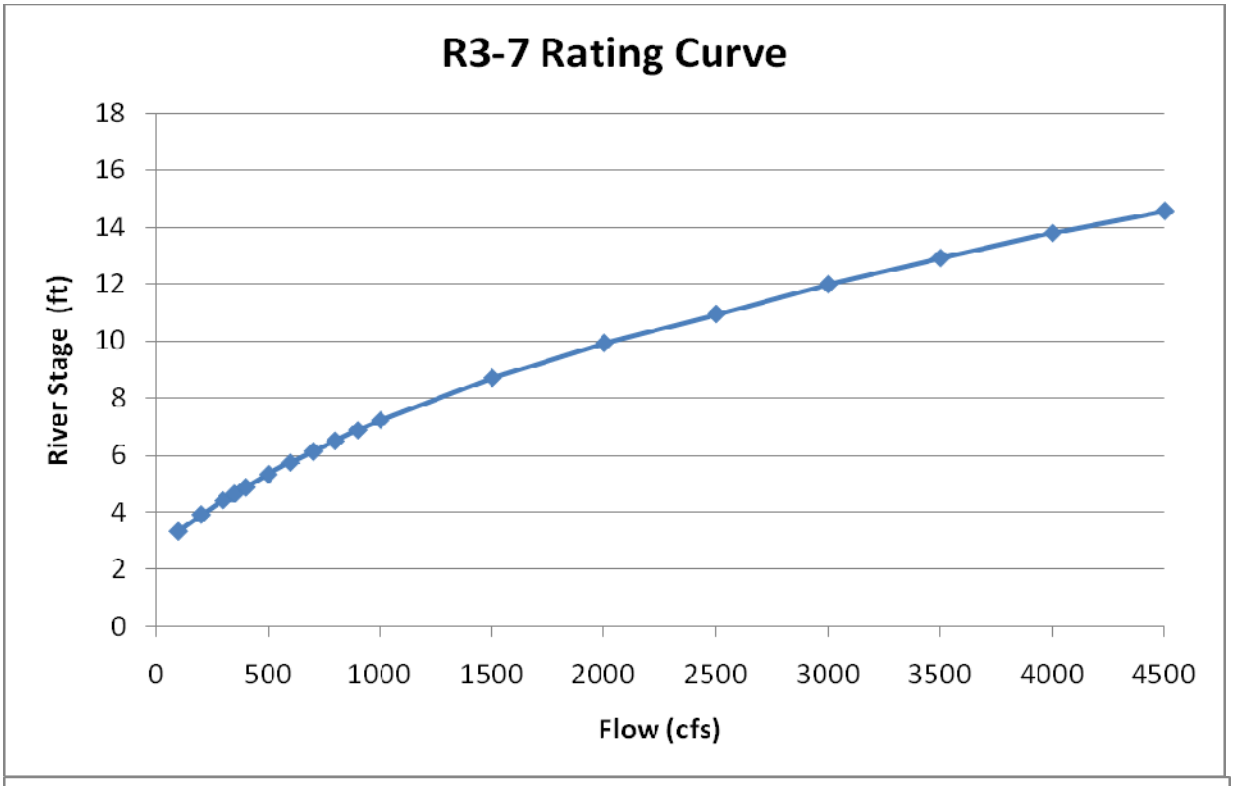

MW-55B Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)

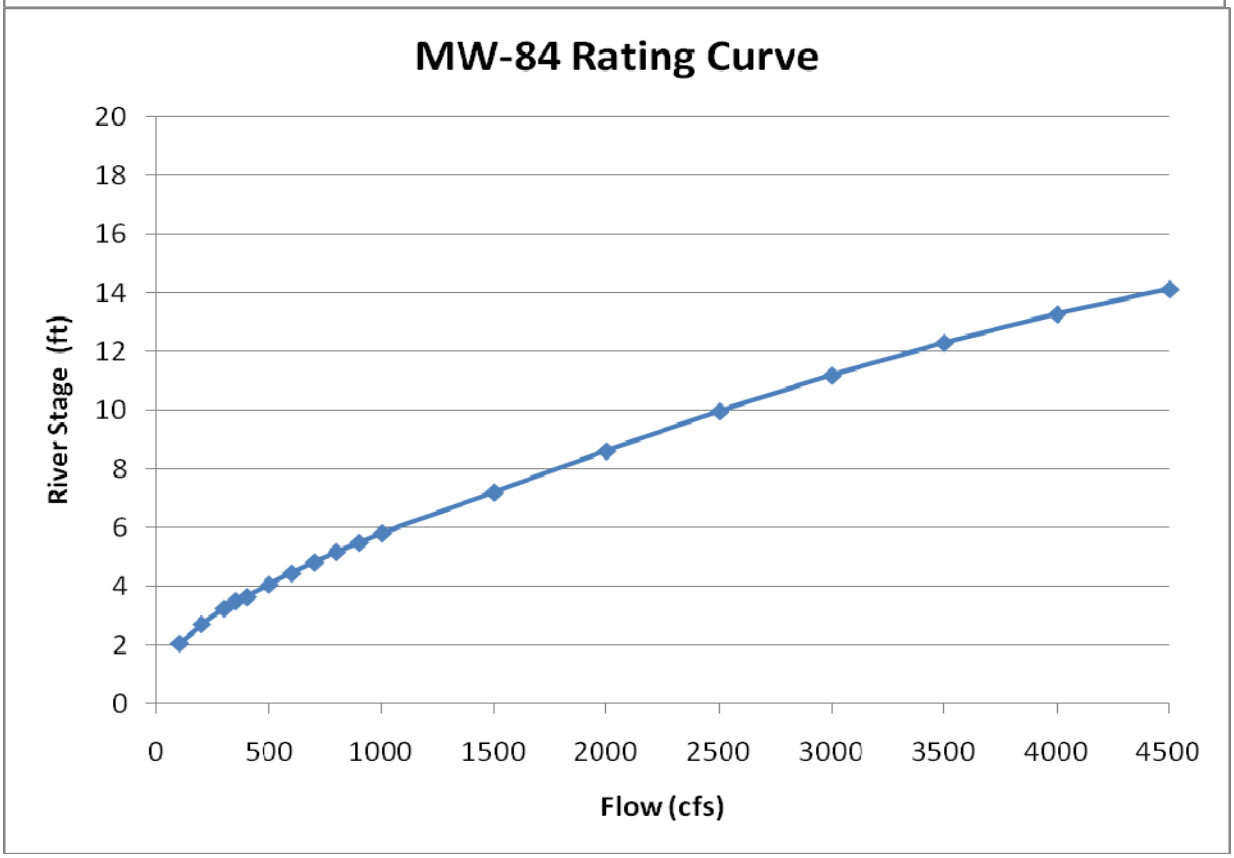

R2B-1 Rating Curve
River Stage (ft)
0
1
2
3
4
5
6
7
8
9
10
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)

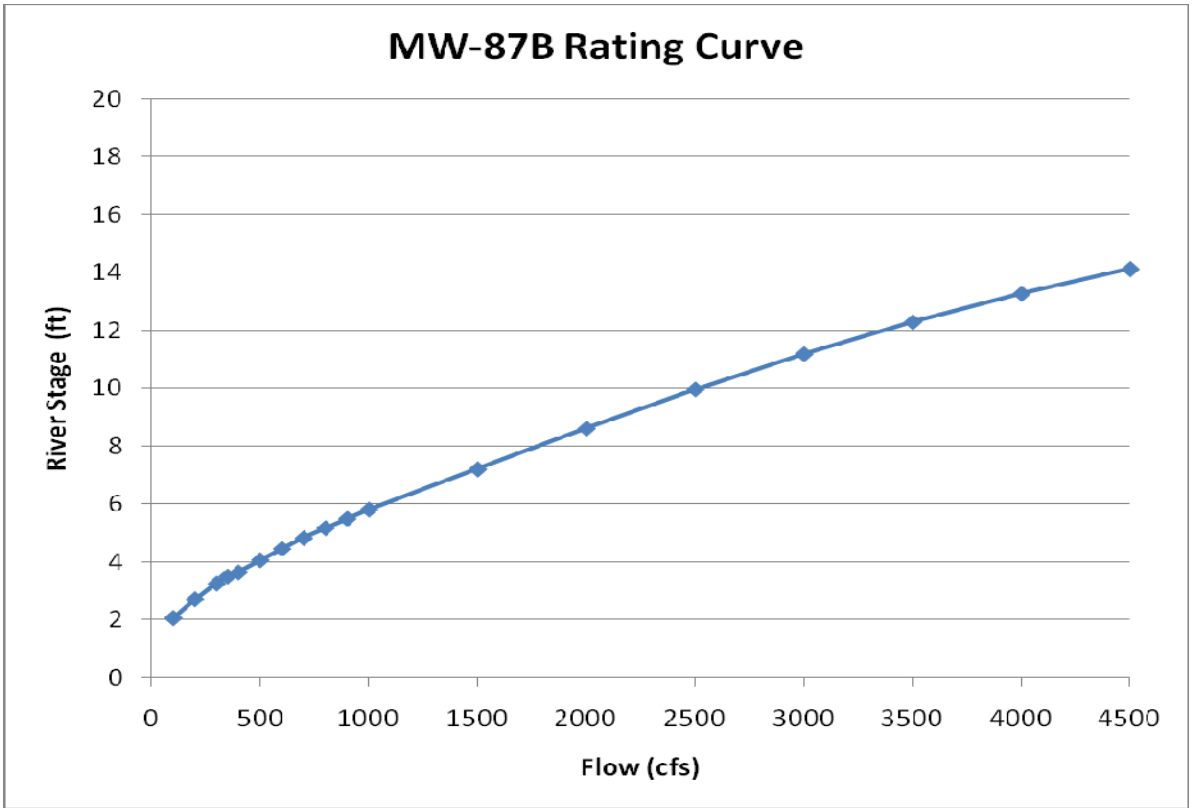

R2B-2 Rating Curve
River Stage (ft)
0
1
2
3
4
5
6
7
8
9
10
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)

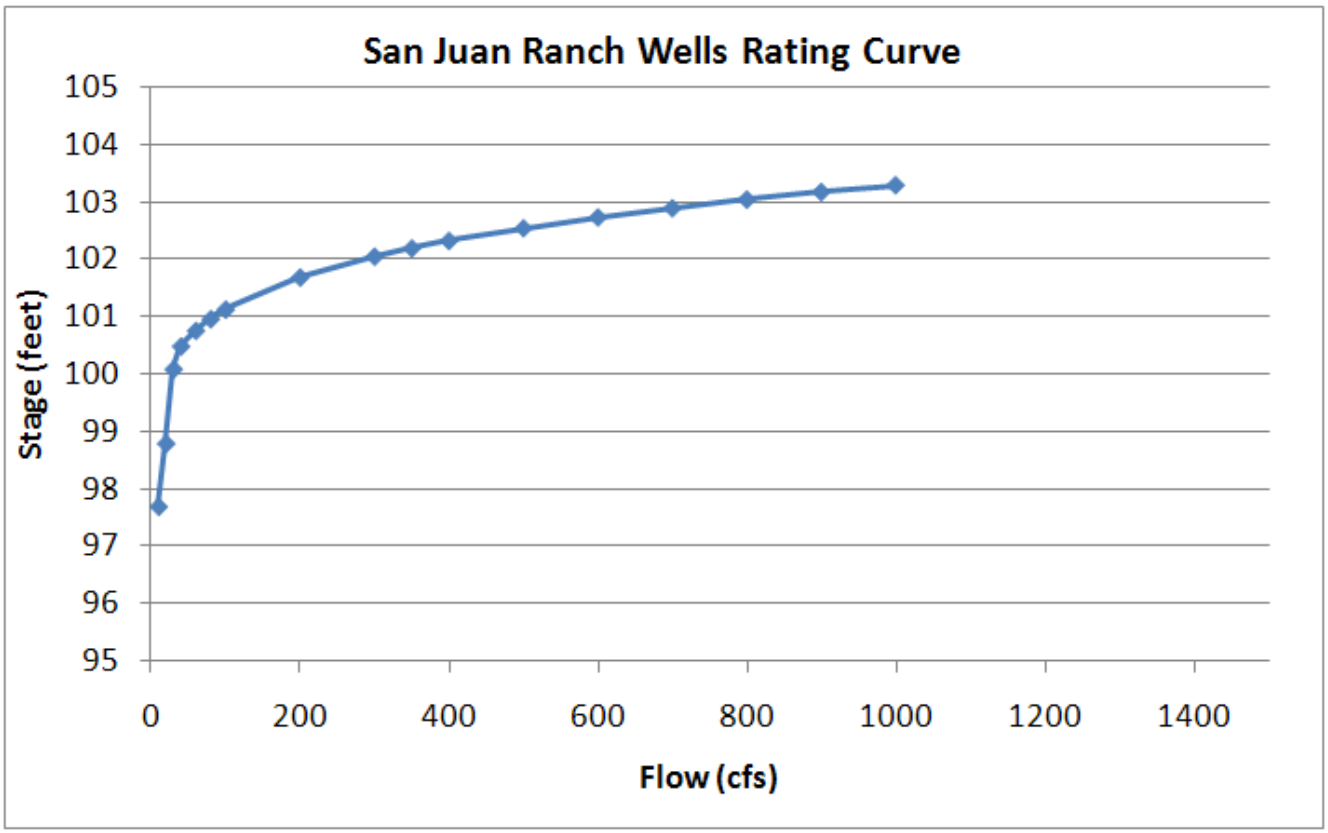

R3-1 Rating Curve
River Stage (ft)
18
16
14
12
10
8
6
4
2
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)


R3-6 Rating Curve
River Stage (ft)
14
12
10
8
6
4
2
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)


R3-7 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
16
18
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)


MW-84 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
16
18
20
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)


MW-87B Rating Curve
River Stage (ft)
20
18
16
14
12
10
8
6
4
2
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)


San Juan Ranch Wells Rating Curve
Stage (feet)
105
104
103
102
101
100
99
98
97
96
95
0
200
400
600
800
1000
1200
1400
Flow (cfs)