SJRRP Flow Bench Evaluation

March 10, 2011

The March 7th flow schedule from the Restoration Administrator recommends increasing releases at Friant Dam from 700 cfs to 900 cfs on March 8, 2011. A flow bench evaluation on March 8th identified several monitoring wells at risk of exceeding the groundwater thresholds that avoid seepage impacts. Reclamation performed site visits and found groundwater levels at the thresholds in Reach 2A. Reclamation will limit Interim Flow releases from Friant Dam to 700 cfs. The most current information indicates Interim Flows will not cause groundwater levels to cross thresholds in Reach 3 and releases from Sack Dam may resume at 50 cfs.

As of March 10, 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. The site visit confirmed that releases of 50 cfs below Sack Dam can resume.

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

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

    b. MW-10-75 (Reach 3) – site visit determined groundwater levels are high due to flood irrigation

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 continue to decrease in response to stopping Interim Flow releases below Mendota Pool on March 7th. Little Dry and Cottonwood Creeks add approximately 75 cfs downstream of Friant Dam. The Army Corps has requested a flood release on Little Dry Creek.

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

a. MW-09-47 – site visit showed groundwater levels very near thresholds

b. MW-09-55B – site visit showed groundwater levels very near thresholds

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

8. The LSJLD will not be contacted as proposed changes have not passed prior evaluation steps.

9. The CCID will not be contacted as proposed changes have not passed prior evaluation steps.

10. The SLCC will not be contacted as proposed changes have not passed 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. Reach 3 currently contains 50 cfs of Interim Flows, for a total flow of 600 cfs when combined with San Luis Canal Company deliveries. Reclamation determined at the site visit conducted on March 8, 2011 that groundwater levels show a response to adjacent flood irrigation. Flood releases of 2000 cfs in January caused a 0.5 foot rise in groundwater levels to 9.5 feet below the ground surface. Interim Flows did not cause the observed rise in groundwater levels. Planned releases of 50 cfs below Sack Dam may occur. Please see additional analysis in the Seepage Hotline Site Visit Form.

Real-time monitoring well 54B (Reach 2B) showed depths to groundwater in the field at the field threshold. Telemetry shows a depth below ground surface at the well of 15.8 feet. Based on additional information collected at the site visit on March 9, Reclamation computed a ground surface buffer of 7.9 feet, minimum lateral gradient buffer of 5.5 feet from 2010 flows, and a field threshold of 10 feet. Reclamation calculates a groundwater depth in the field of 12.66 feet, below the threshold of 10 feet. This well does not restrict planned releases .

Real-time monitoring well 10-92 (Reach 4A) shows groundwater elevations above thresholds. A recently installed tile drain protects 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. The SMP includes a field threshold of 7 feet below ground surface. Reclamation conducted a site visit on March 8, and confirmed that tile drains exist. Reclamation measured groundwater levels at the site visit at approximately 7.5 feet and 8 feet below the ground surface. Reclamation will contact the landowner to confirm that tile drains will intercept an increase in groundwater levels and not impact farming operations. The proposed increase may not occur.

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. The SMP includes a field threshold of 7 feet below ground surface. Reclamation conducted a site visit on March 9 and measured groundwater levels in the field at approximately 8.9 feet and 7.0 feet below the ground surface. Groundwater levels do not show any room for additional rise below thresholds. The planned increase cannot occur.

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. The SMP includes a field threshold of 5 feet below ground surface. Reclamation expects to complete a license agreement for the property soon. This well does not restrict planned releases.

Data

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/flows/Groundwater/Groundwater.html. Table 1 shows the manual measurements from field staff as reported in the weekly groundwater report. To calculate field depths, Reclamation subtracts ground surface buffers from measured groundwater depths in the well and adds lateral gradient buffers.

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

Well	Measured Groundwater Depth in Well (feet)	Ground Surface Buffer (feet)	Lateral Gradient Buffer (feet)	Field Depth (feet)	Field Threshold (feet)	Comment
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 assumes limited flows to allow drainage 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

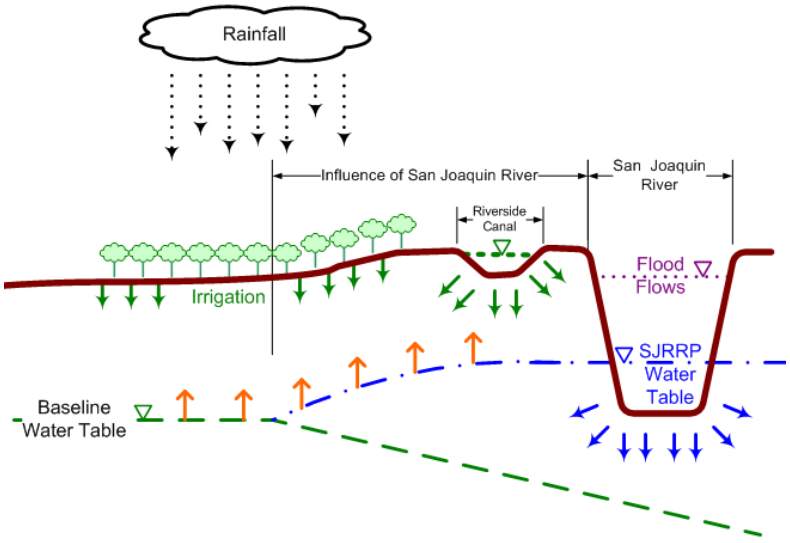
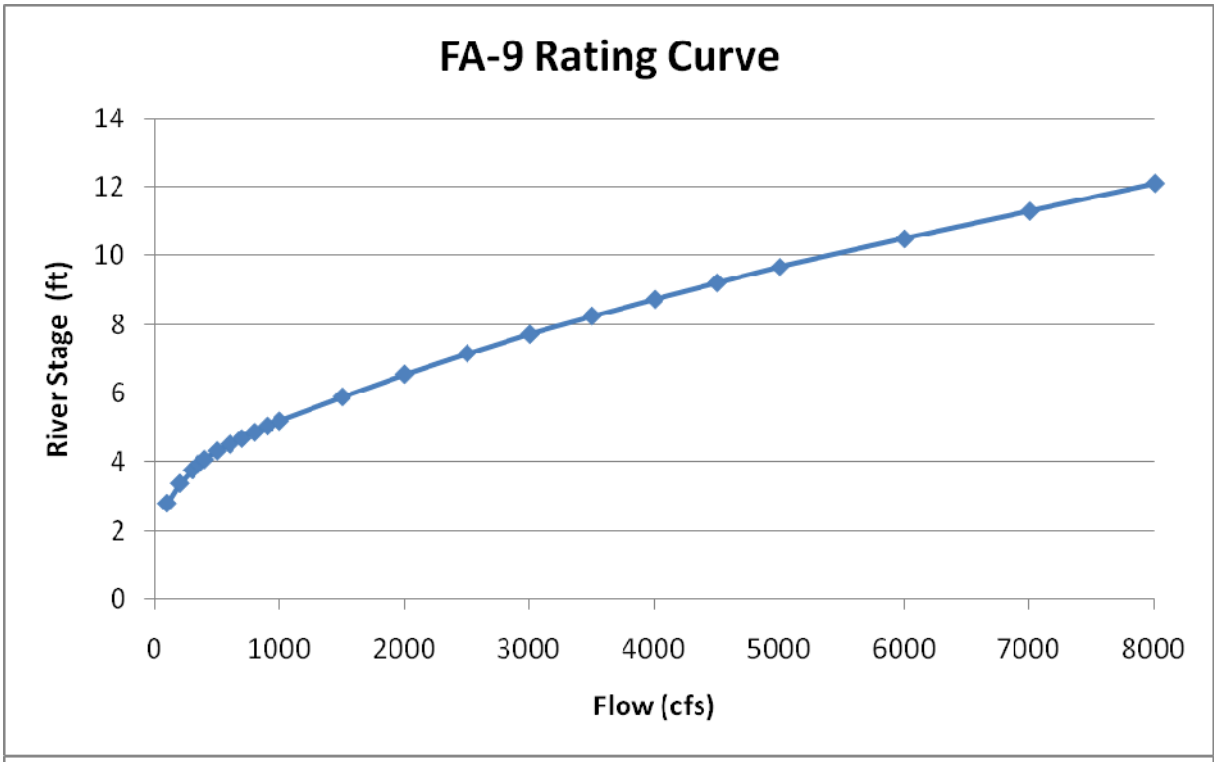
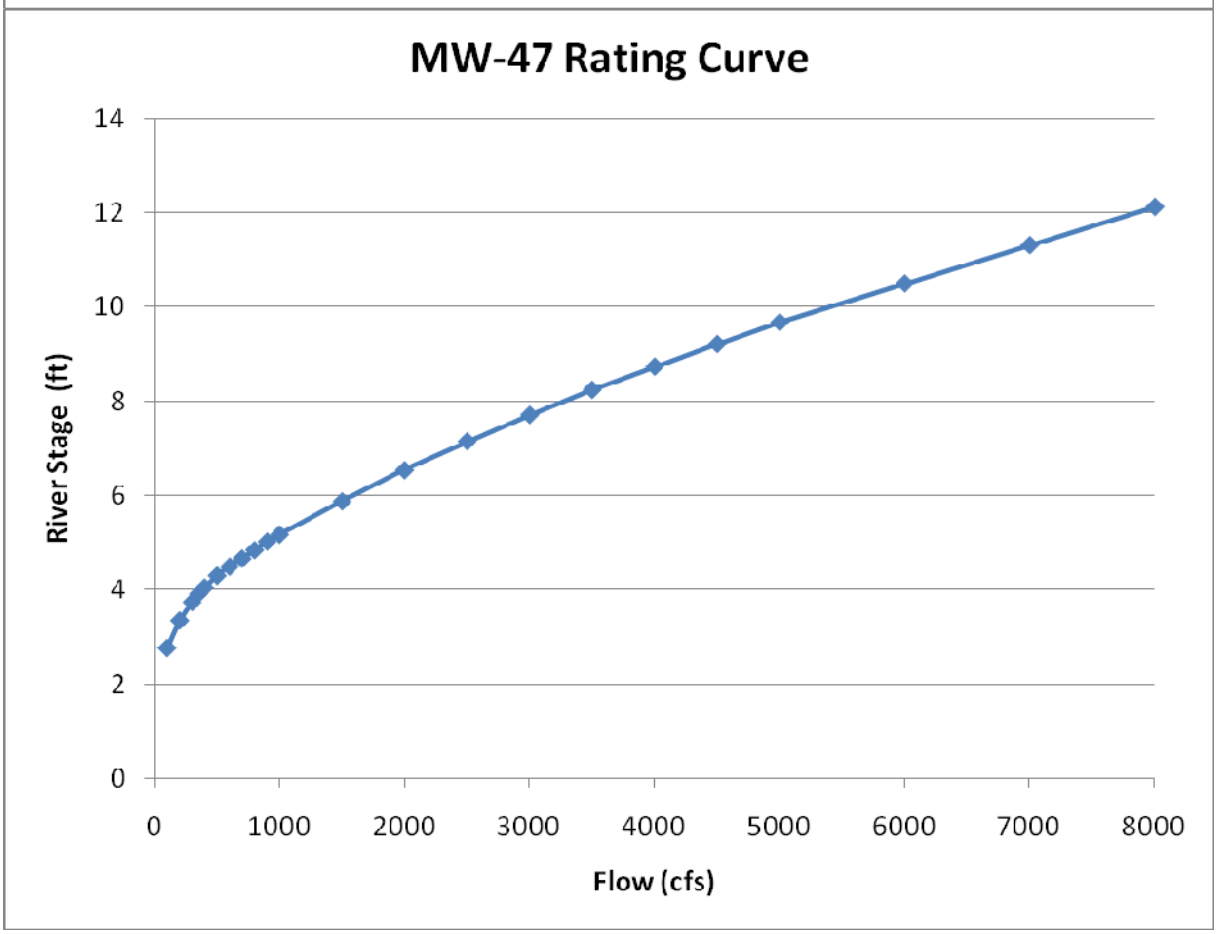
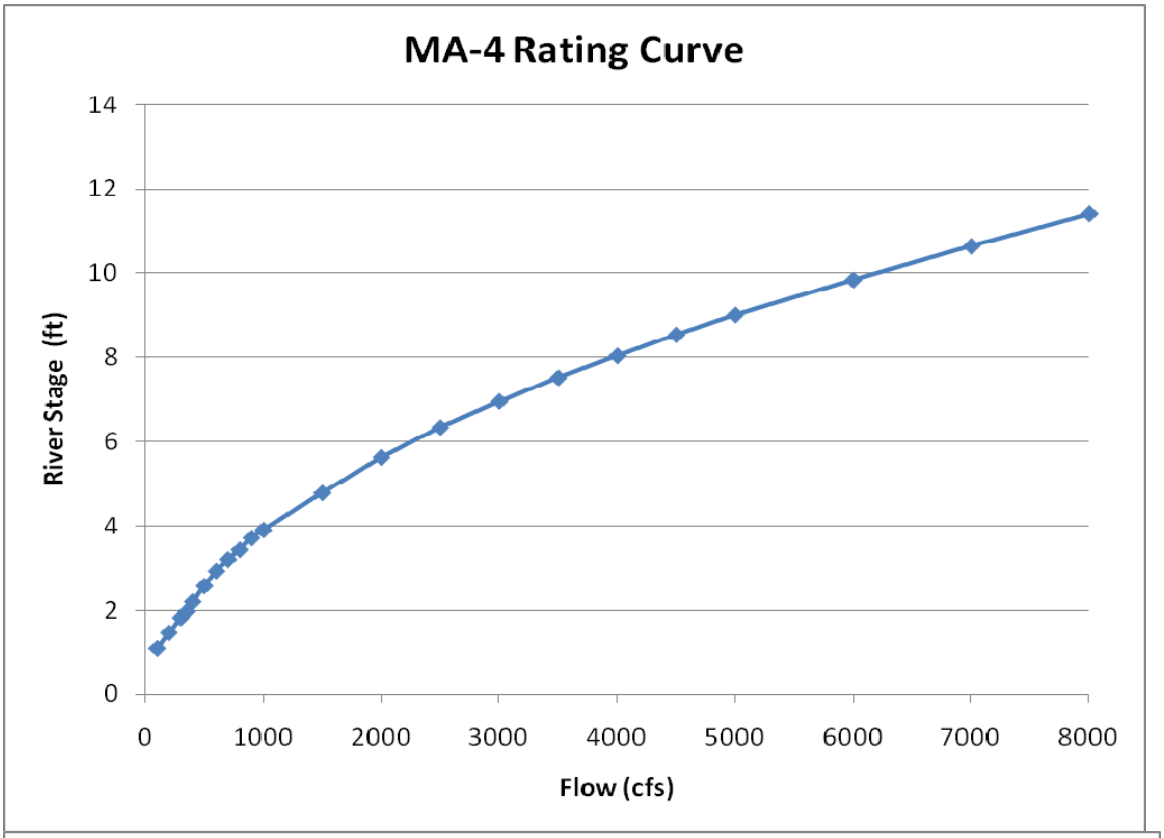
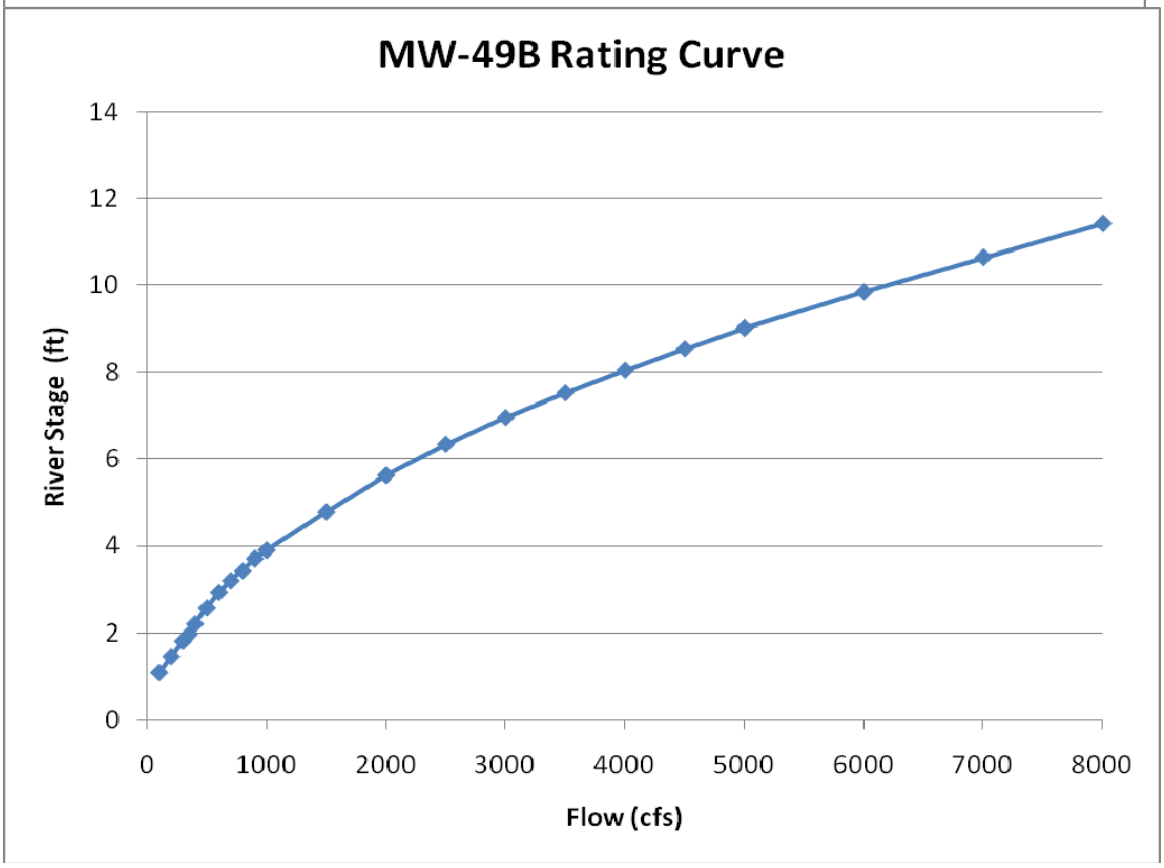


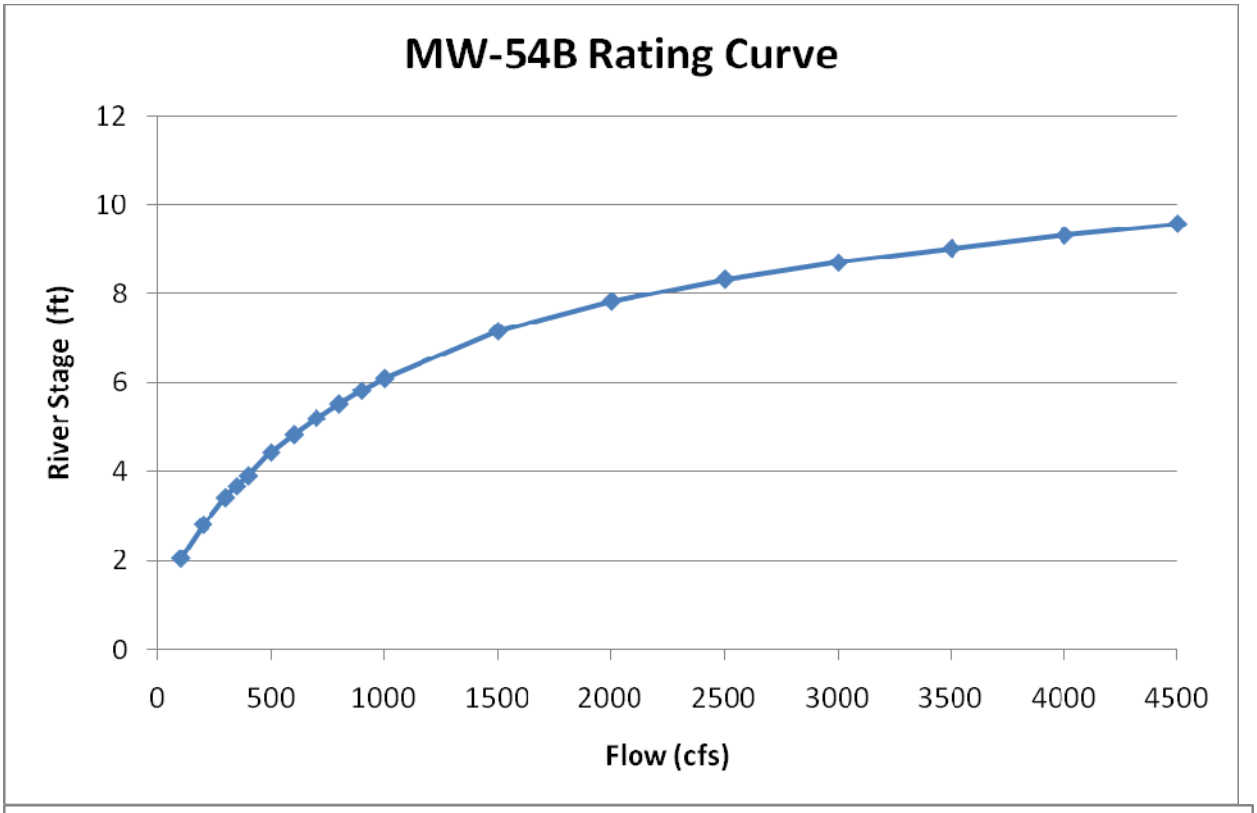
Figure 1 Conceptual Model for Flow Bench Evaluations Estimated Groundwater Depths

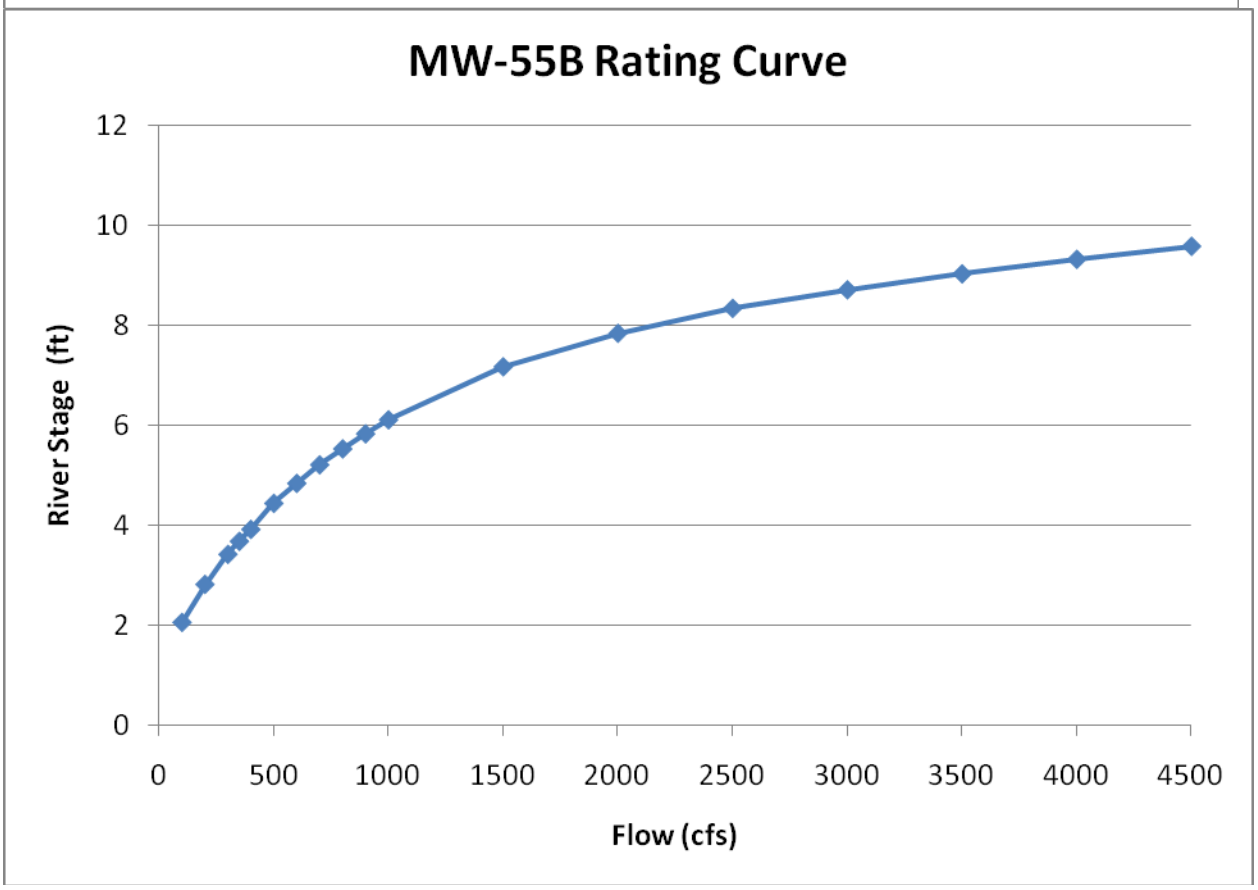

FA-9 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000
Flow (cfs)

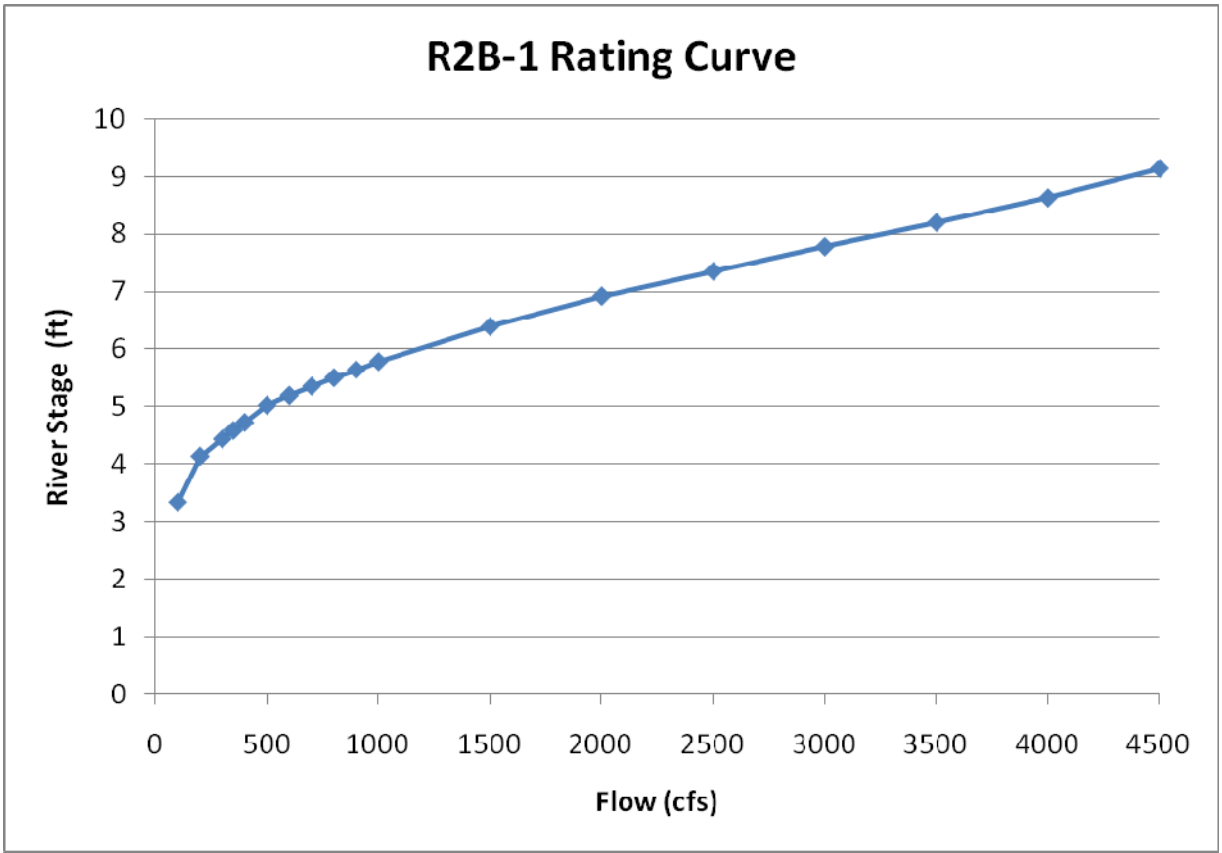

MW-47 Rating Curve
River Stage (ft)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000
Flow (cfs)

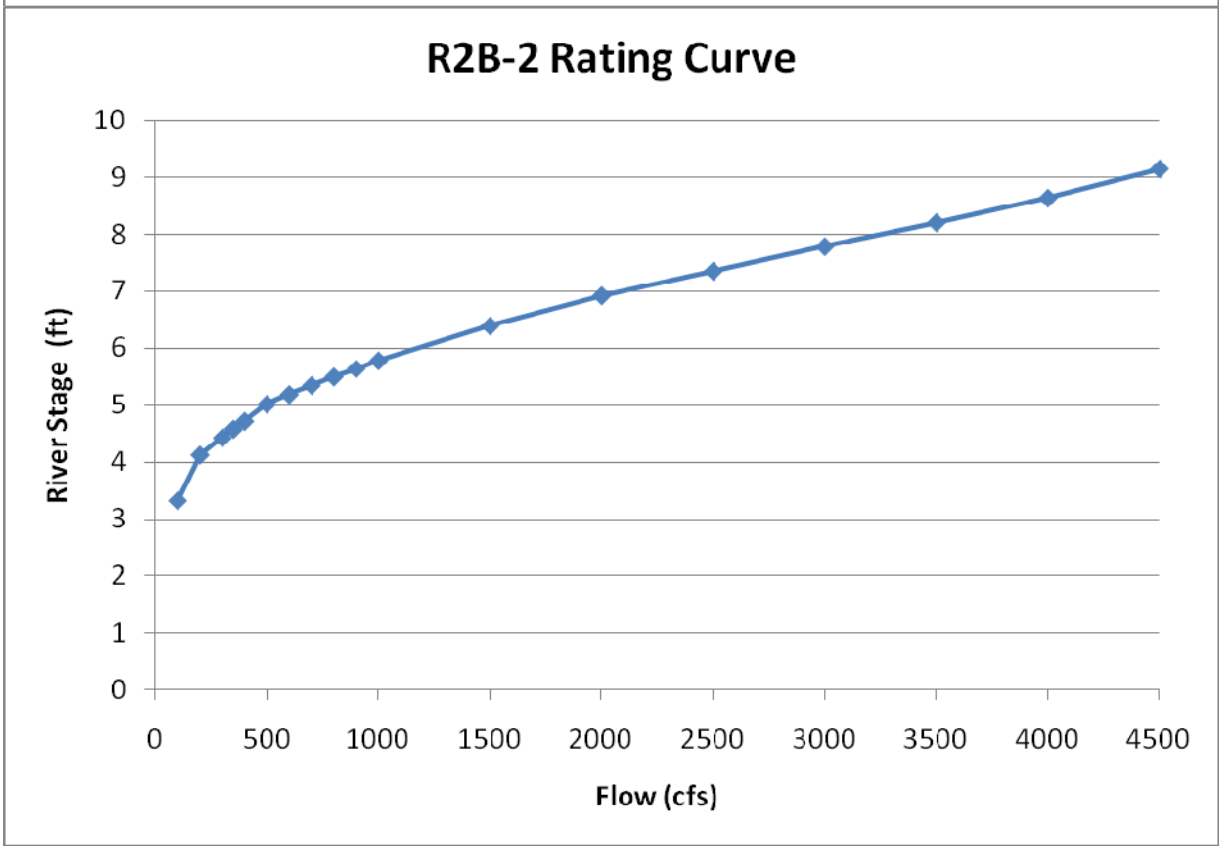

MA-4 Rating Curve
River Stage (ft)
Flow (cfs)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000

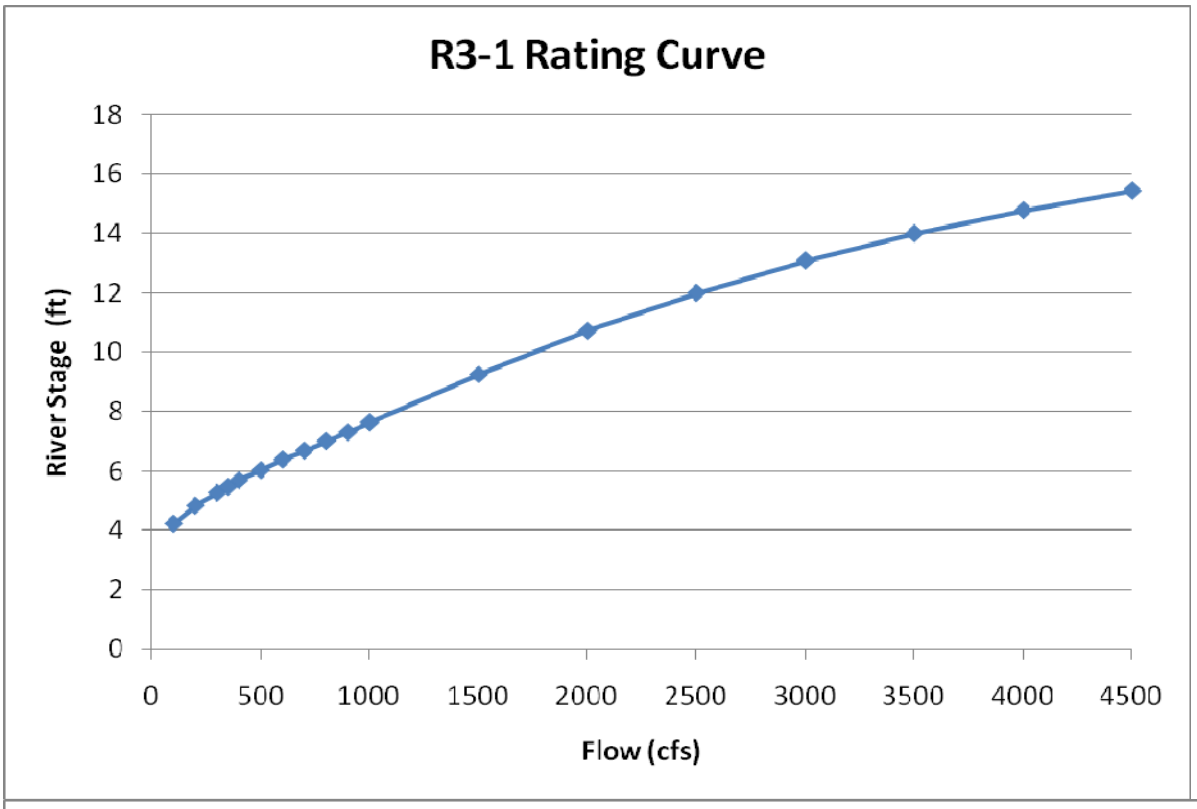

MW-49B Rating Curve
River Stage (ft)
Flow (cfs)
0
2
4
6
8
10
12
14
0
1000
2000
3000
4000
5000
6000
7000
8000

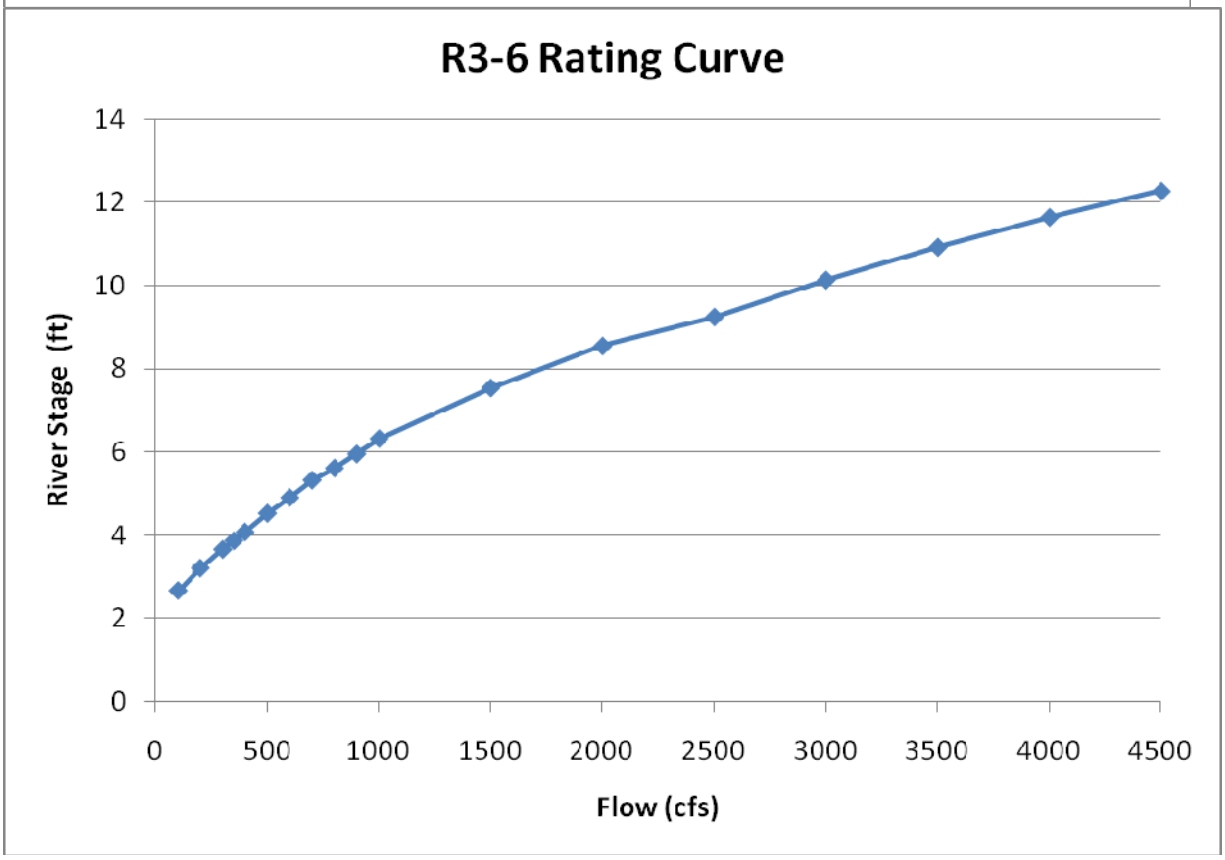

MW-54B Rating Curve
River Stage (ft)
Flow (cfs)
0
2
4
6
8
10
12
0
500
1000
1500
2000
2500
3000
3500
4000
4500

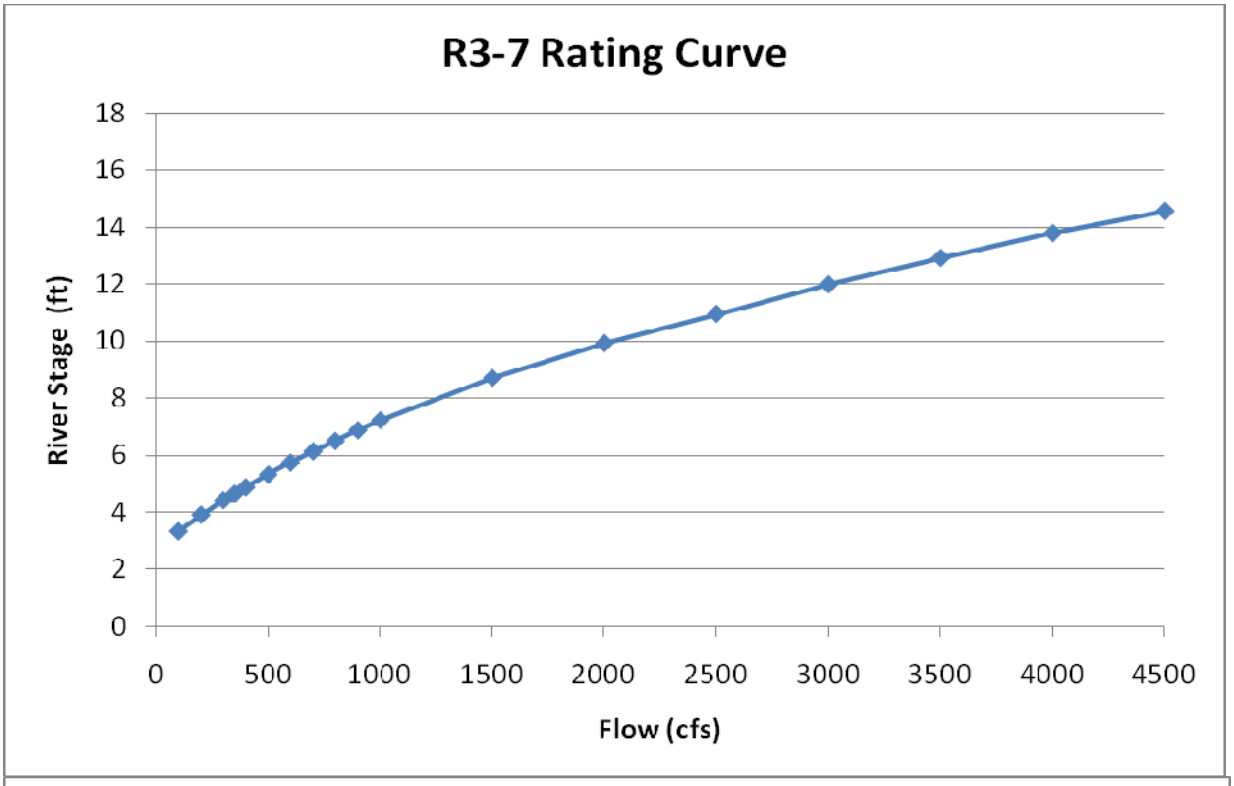

MW-55B Rating Curve
River Stage (ft)
Flow (cfs)
0
2
4
6
8
10
12
0
500
1000
1500
2000
2500
3000
3500
4000
4500

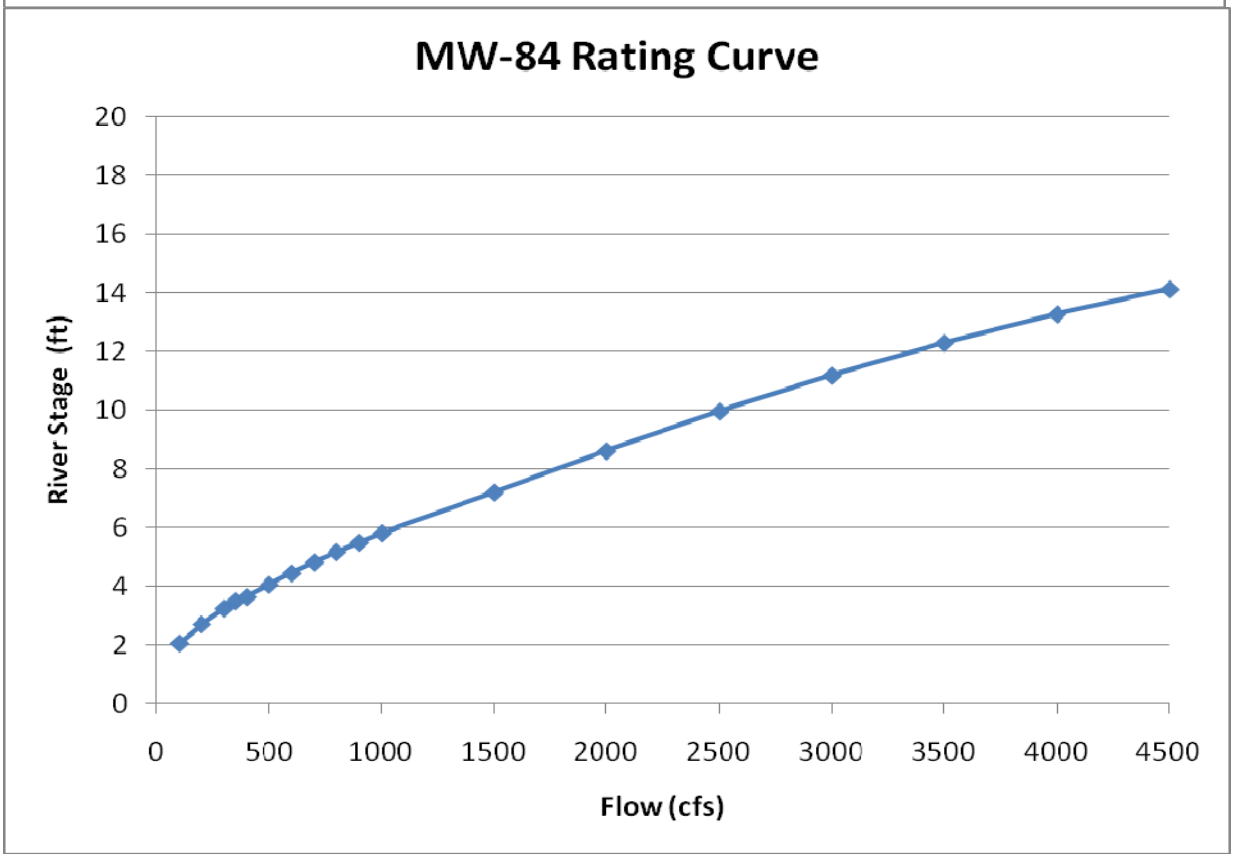

R2B-1 Rating Curve
River Stage (ft)
0
1
2
3
4
5
6
7
8
9
10
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)

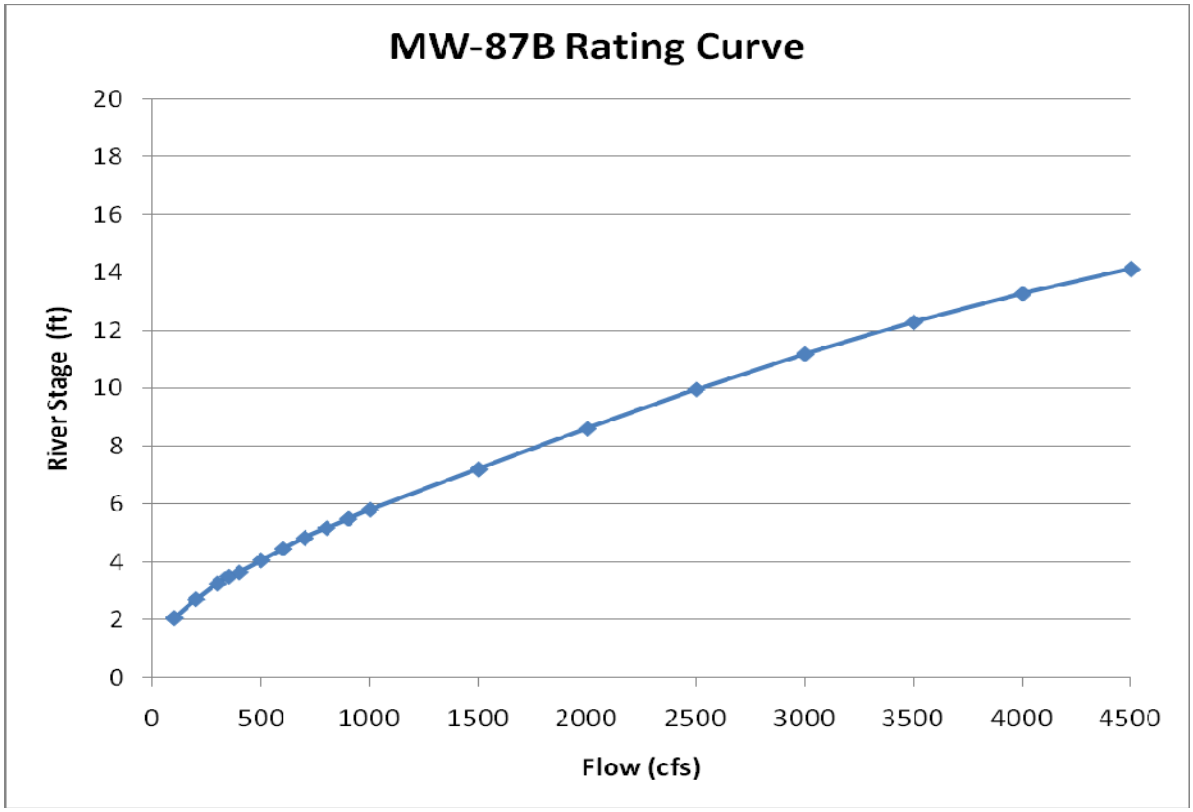

R2B-2 Rating Curve
River Stage (ft)
0
1
2
3
4
5
6
7
8
9
10
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Flow (cfs)

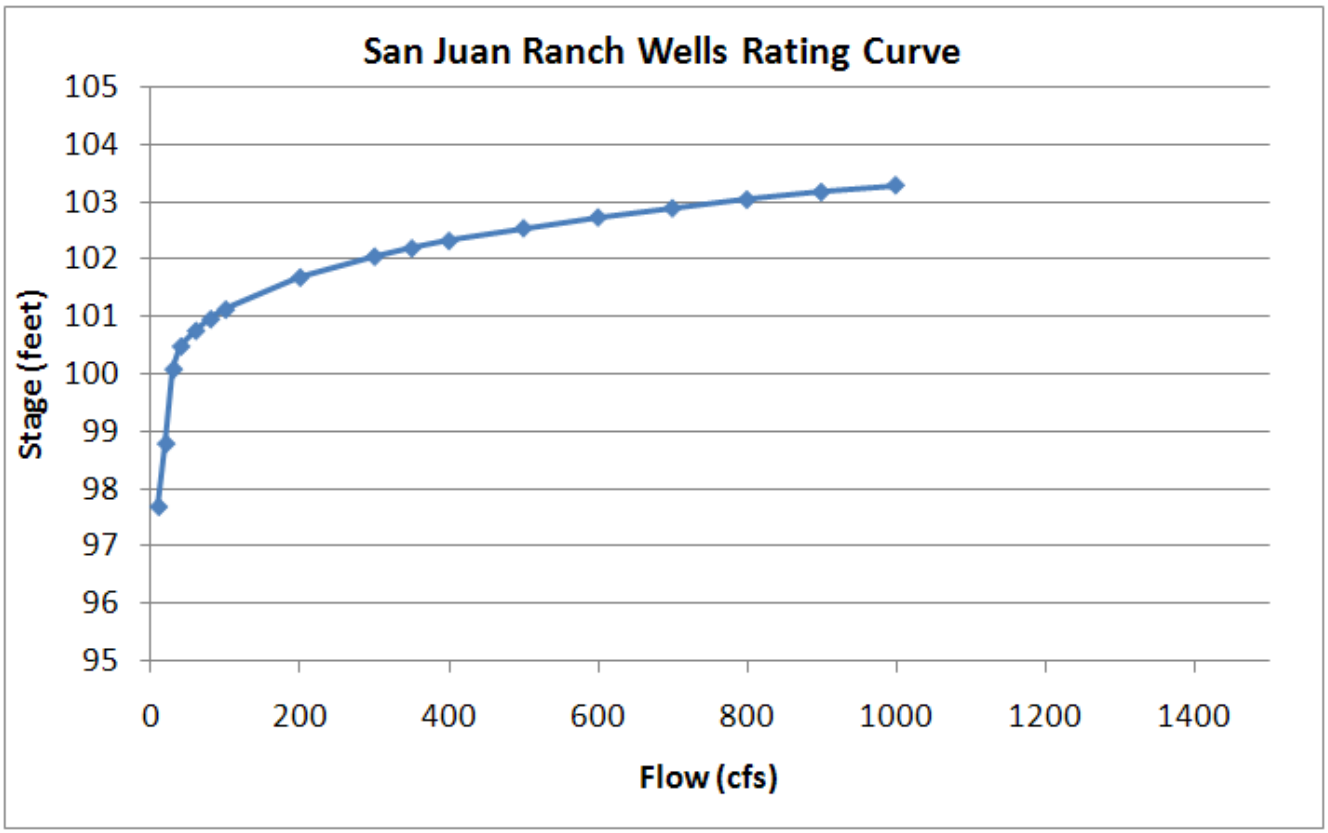

R3-1 Rating Curve
River Stage (ft)
Flow (cfs)
0
2
4
6
8
10
12
14
16
18
0
500
1000
1500
2000
2500
3000
3500
4000
4500


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


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)