Seepage and Conveyance Technical Feedback Group Meeting

March 2, 2017

Patti Ransdell

INTRODUCTION

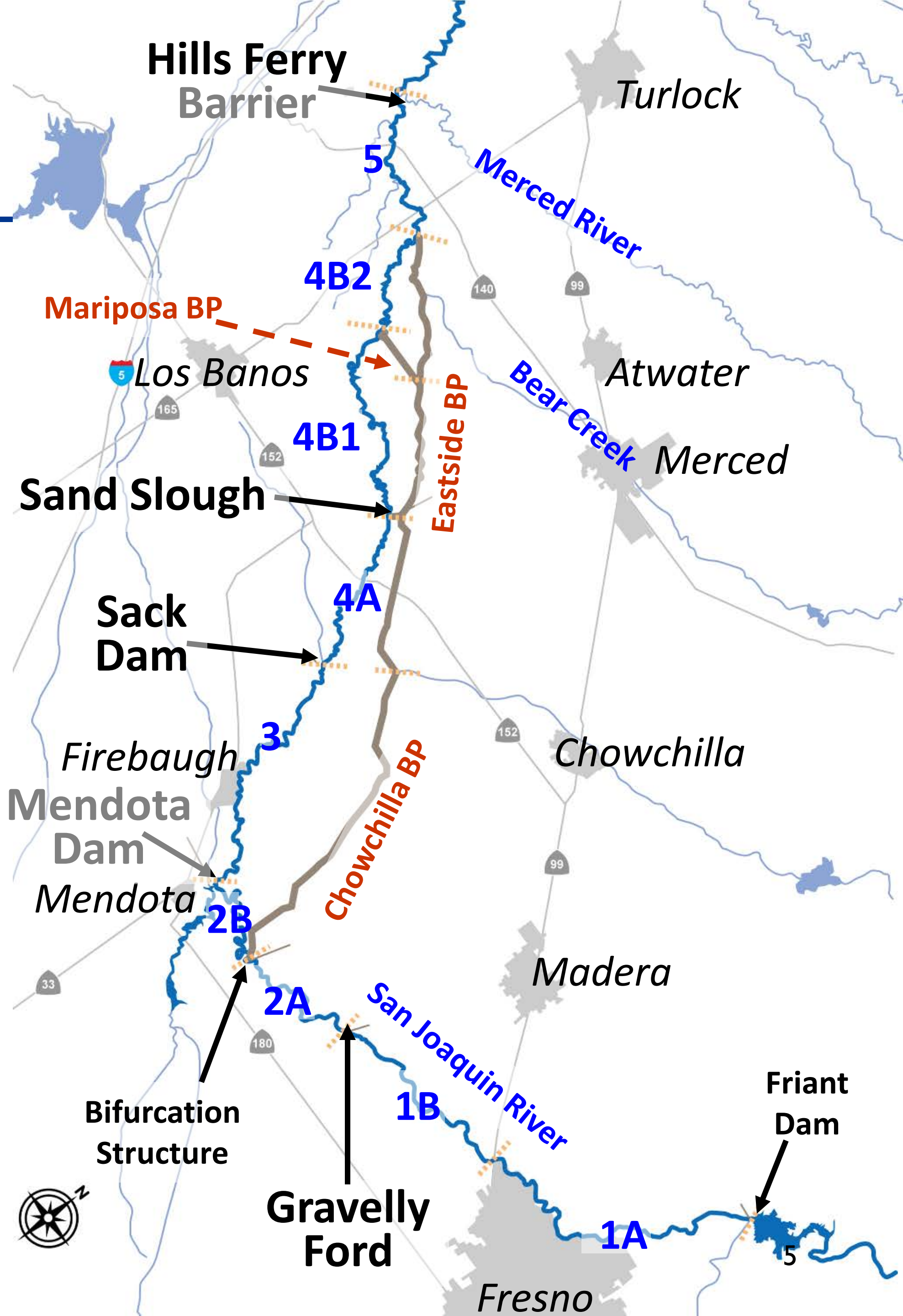
Agenda

- Introductions, Meeting Agenda
- SJRRP Updates
- January 23 Meeting Recap
- Capillary Fringe Buffer, Almond Root Zone
- Lateral Gradient Buffers
- Historical Groundwater Method Thresholds
- Questions, Wrap-Up, Action Items

Emily Thomas

RESTORATION FLOWS UPDATE

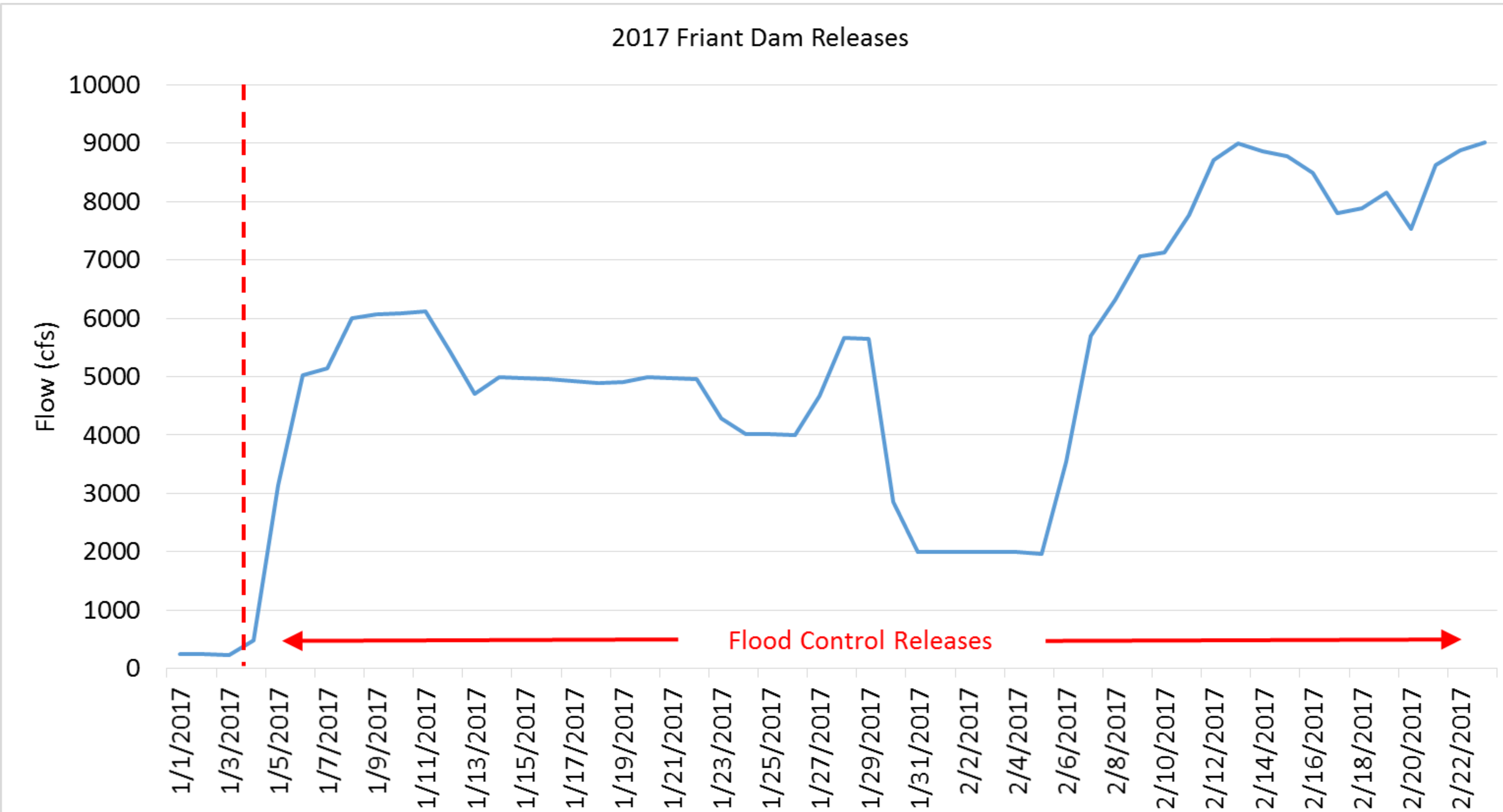
- Water Year 2017: Wet Year Type
  - Flood control releases
  - Flood control releases may extend into June 2017
  - Restoration Flows after flood releases stop



Preliminary draft – subject to change

Restoration Flows

- Flood flows released from Millerton starting January 4, 2017 – no Restoration Flows



Preliminary draft – subject to change

Appendix J (Operations) Update

- How do we transition from flood flows to Restoration Flows?
  - Ensure groundwater levels are draining, through either the 1:1 stage method or the drainage method
  - Monitor groundwater levels more frequently to make sure they are decreasing
  - Section J.3 added to the Seepage Management Plan

Katrina Harrison

JANUARY MEETING AND COMMENTS RECAP

Purpose of Today

- Describe how we addressed your input on proposed groundwater seepage threshold changes

- Capillary Fringe
- Lateral Gradient Buffers
- Historical Groundwater Method

Seepage Realty Actions EA

- Draft EA posted for public comment on December 22, 2016
  - Environmental compliance for seepage easements
  - Environmental compliance coverage of the Seepage Management Plan changes we will discuss today
  - Comment responses on the EA will come soon
- Comments due February 6, 2017
  - Four comment letters received – FWA, RA, Exchange Contractors, Wonderful Orchards

1/23 Meeting Feedback

- Almond Root Zone and Capillary Fringe
  - Site-specific information needed
- Lateral Gradient Buffers
  - No input
- Historical Groundwater Method
  - Consider removing irrigation and precipitation events

Comments Received

- Why didn't you include all the acres out to 4,500 cfs?
  - Uncertainty in the area that will be impacted
- Why does the EA only include realty actions?
  - Most landowners impacted at flows less than 1,300 cfs prefer realty actions
- Is the SJRRP backing away from doing physical seepage projects?
  - No!

Comments Received

- How can you protect lands further away from the river? Sand stringers bring water far.
  - Network of over 200 wells, we operate to the most restrictive ones regardless of location.
  - Text added to Appendix E to clarify that a new priority well is selected after a project completed.
- How can a seepage easement be next to an interceptor line?
  - The interceptor line can extend parallel to the property boundary, perpendicular to the SJR.

Comments Received

- How can you make sure easements protect the right area?
  - We are conservative in identifying the easement area given the greater future flows. If we are wrong, we will need to purchase an additional easement.
- There is a lot of site-specifics to defining the capillary fringe.
  - We agree. We have added language into the SMP to address this and allow for site-specific field studies to determine the capillary fringe in addition to the table.

SMP Comments Received

- How can you be sure the capillary fringe is large enough to avoid root zone salinity effects?
  - Experts agreed on a 5 foot almond root zone. We propose 6 feet. We also are increasing the depth of the capillary fringe buffer to avoid water encroaching into the anoxic portion of the capillary fringe.

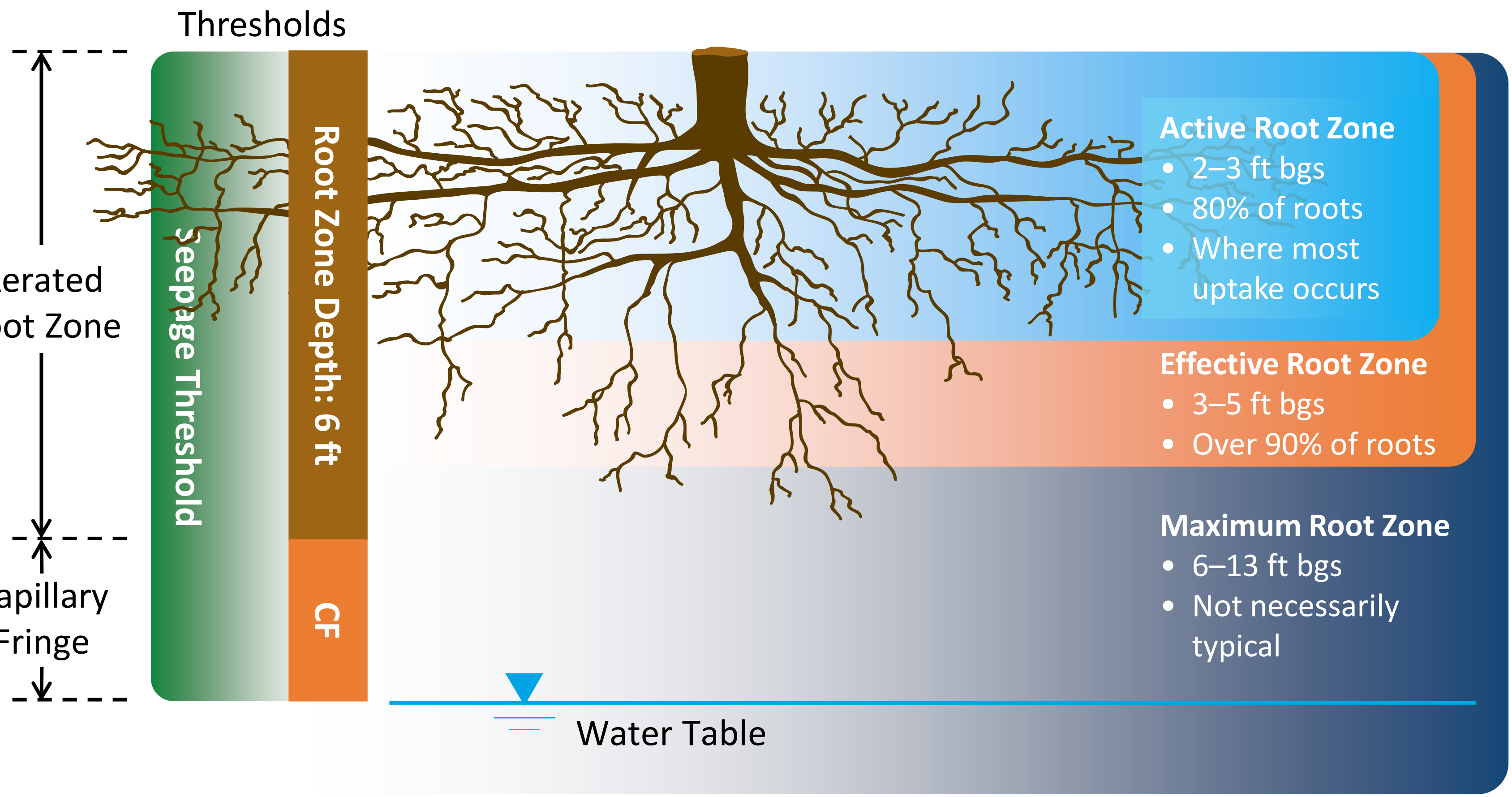
SMP Revisions

- Capillary Fringe
  - We now allow for site-specifics
- Lateral Gradient Buffers
  - One more well has a lateral gradient buffer
- Historical Groundwater Method
  - Selected method
- Appendix J
  - Transition from flood to Restoration Flows
- Appendix E: clarified priority well updates

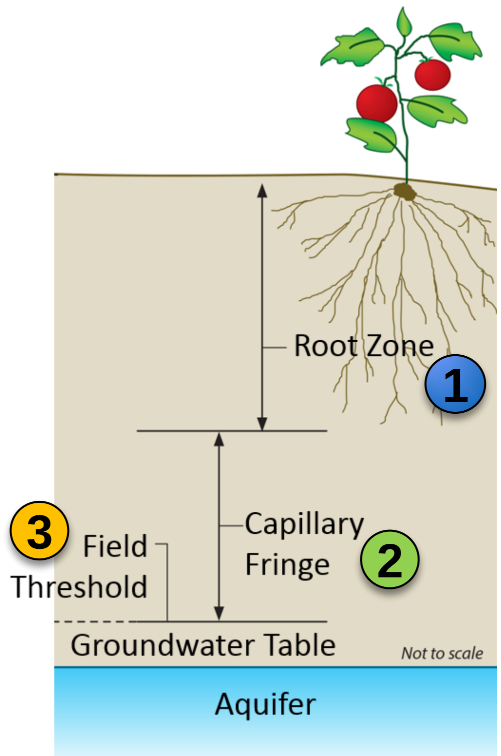
Regina Story

CAPILLARY FRINGE COMMENTS AND REVISIONS

Root Zone Threshold Terms



Threshold Calculation: Agricultural Practices Method



Root Zone Depth (1) + Capillary Fringe (2) = Seepage Threshold (3)

SCTFG Input Conclusions

- Discussed 6-foot root zone for almonds
- Should be combined with appropriate capillary fringe depending on soil-specific factors
- Capillary Fringe
  - Current SMP: capillary fringe is 6 inches or 1 foot
  - Proposed: deepest of capillary fringe table (up to 3 feet) or site-specific investigation

Capillary Fringe – Published Values

- Most widely cited values in Handbook of Soil Science (Sumner 1999)
  - Values derived from the work of Rawls and Brakensiek (1982, 1992)
  - Represent 1,320 soils in 32 states
  - Consulted 400 soil scientists
  - Various types of data
- Categorized into 11 texture-types from sand to clay
- Simplified/adapted for SMP

SAN JOAQUIN RIVER RESTORATION PROGRAM

Capillary Fringe – Proposed Values

Soil Texture	Capillary Fringe (inches)	Capillary Fringe (feet)
Sand	6	0.5
Loamy sand; very fine sand; fine sand	8	0.7
Sandy loam; loamy very fine sand; loamy fine sand	12	1.0
Very fine or fine sandy loam; silt loam; loam	20	1.7
Sandy clay loam; clay loam	24	2.0
Silty clay loam	28	2.3
Sandy clay; silty clay	32	2.7
Clay	36	3.0

Values adapted from Handbook of Soil Science. Ed. Sumner. 2000. CRC Press LLC, Boca Raton, FL. Data source: from Rawls et al. (1982) and Brakensiek and Rawls (1992).

Replaced with site-specific field data when field data shows a deeper capillary fringe

Regina Story

LATERAL GRADIENT BUFFERS

Purpose

- Account for slope of groundwater table away from the river

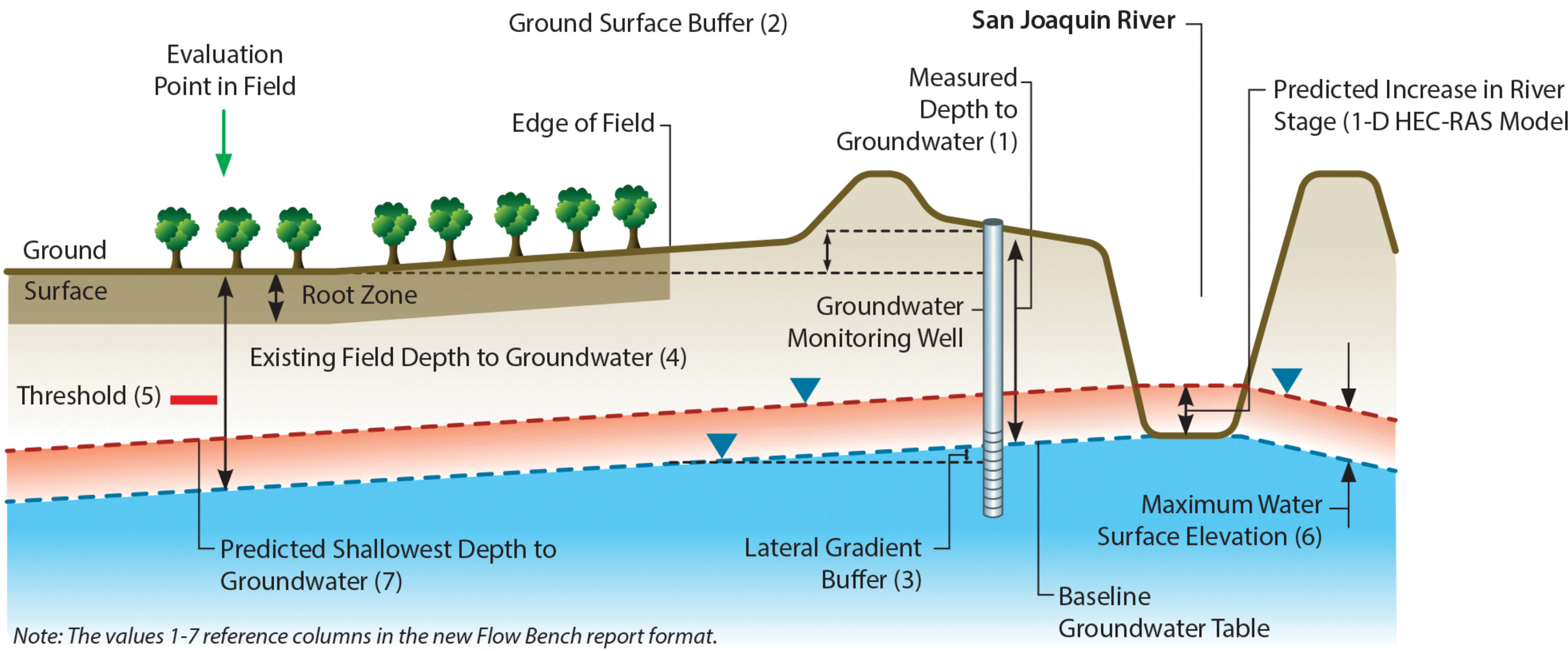
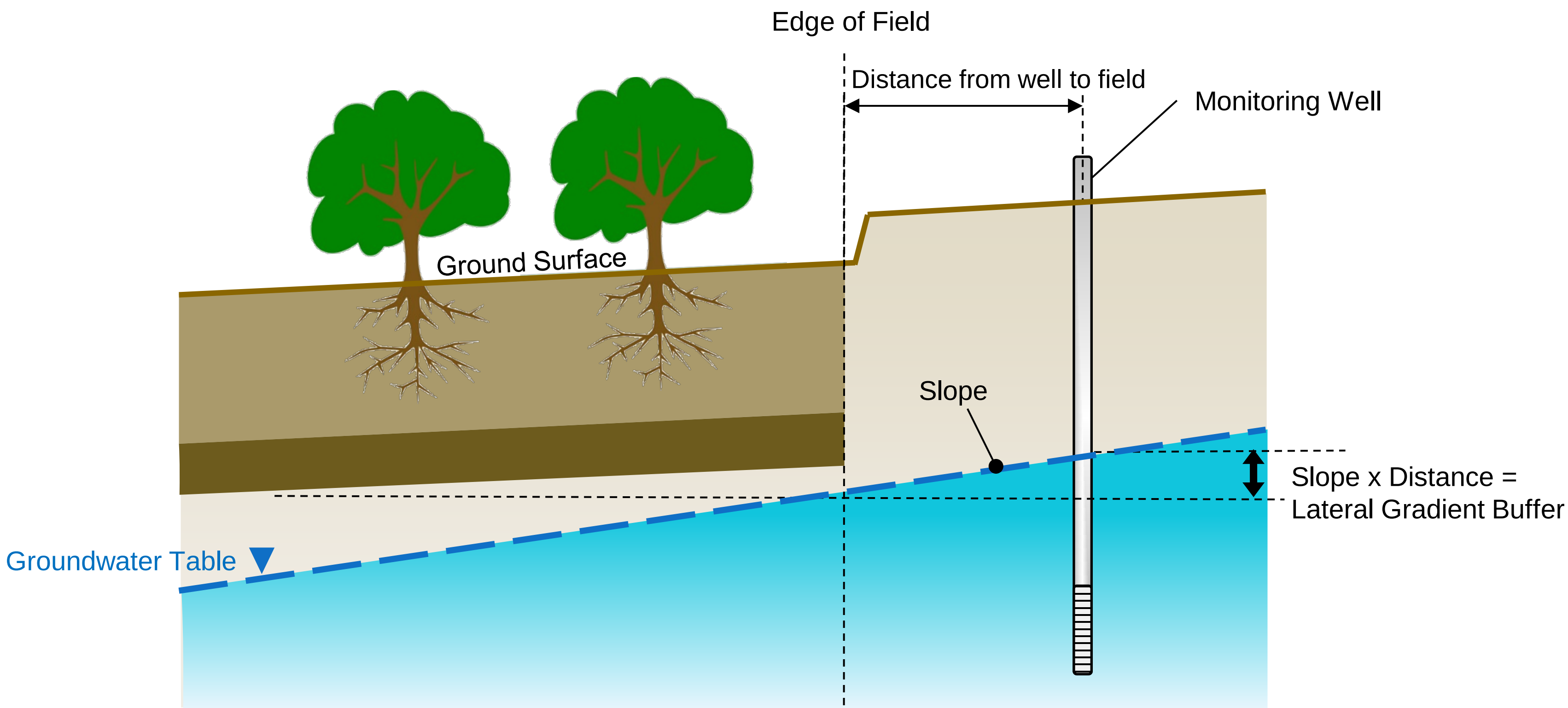


Figure J-2 from SMP Appendix J

Preliminary draft – subject to change

Calculating drop to field

Refined distance with measurements from 1:500 GIS scale



Lateral Gradient Values

Table H-1. Difference Between Well and Field Groundwater Elevations[1]

Well	Reach	Bank	Minimum Difference (feet)	Maximum Difference (feet)	Average Difference (feet)	Lateral Gradient Buffer (feet)
FA-9	2A	Left	-1.6	3.6	-0.9	0.0
MA-4	2A	Right	-1.1	6.6	1.5	0.0
MW-09-47	2A	Right	-15.0	18.3	-7.7	0.0
MW-09-49B	2A	Left	-6.9	-0.1	-1.6	0.0
MW-09-54B	2B	Right	2.0	3.6	2.8	2.0
MW-09-55B	2B	Left	6.5	9.6	7.2	6.5
MW-10-75	3	Left	0.0	0.0	0.0	0.0
MW-10-89	4A	Right	0.0	0.0	0.0	0.0
MW-10-92	4A	Left	0.0	0.0	0.0	0.0
MW-11-130	4A	Left	0.0	0.0	0.0	0.0
MW-12-191	3	Right	-0.5	0.6	0.0	0.0
MW-14-208	4A	Right	0.0	0.0	0.0	0.0
PZ-09-R3-5	3	Right	-0.6	0.2	-0.1	0.0
PZ-09-R3-7	3	Right	-0.7	0.5	-0.2	0.0

Notes:
[1] Difference is calculated as the slope of (1) the river stage adjacent to the monitoring well to the groundwater level in the well (if there is flow in the river) or (2) the assumed water table under the river and the groundwater level in the well (no flow in the river), times the distance between the monitoring well and the adjacent field.

Table H-1

If negative, zero

Lateral Gradient Changes

- One more well has a lateral gradient with revised distance measurements
- MW-09-54B and MW-09-55B are the only wells with a proposed lateral gradient buffer
- Lateral gradients were previously in the SMP in Appendix J, now updated with more recent data and in Appendix H

Regina Story

HISTORICAL GROUNDWATER METHOD

Purpose

- Account for pre-existing shallow groundwater conditions adjacent to some parts of the river

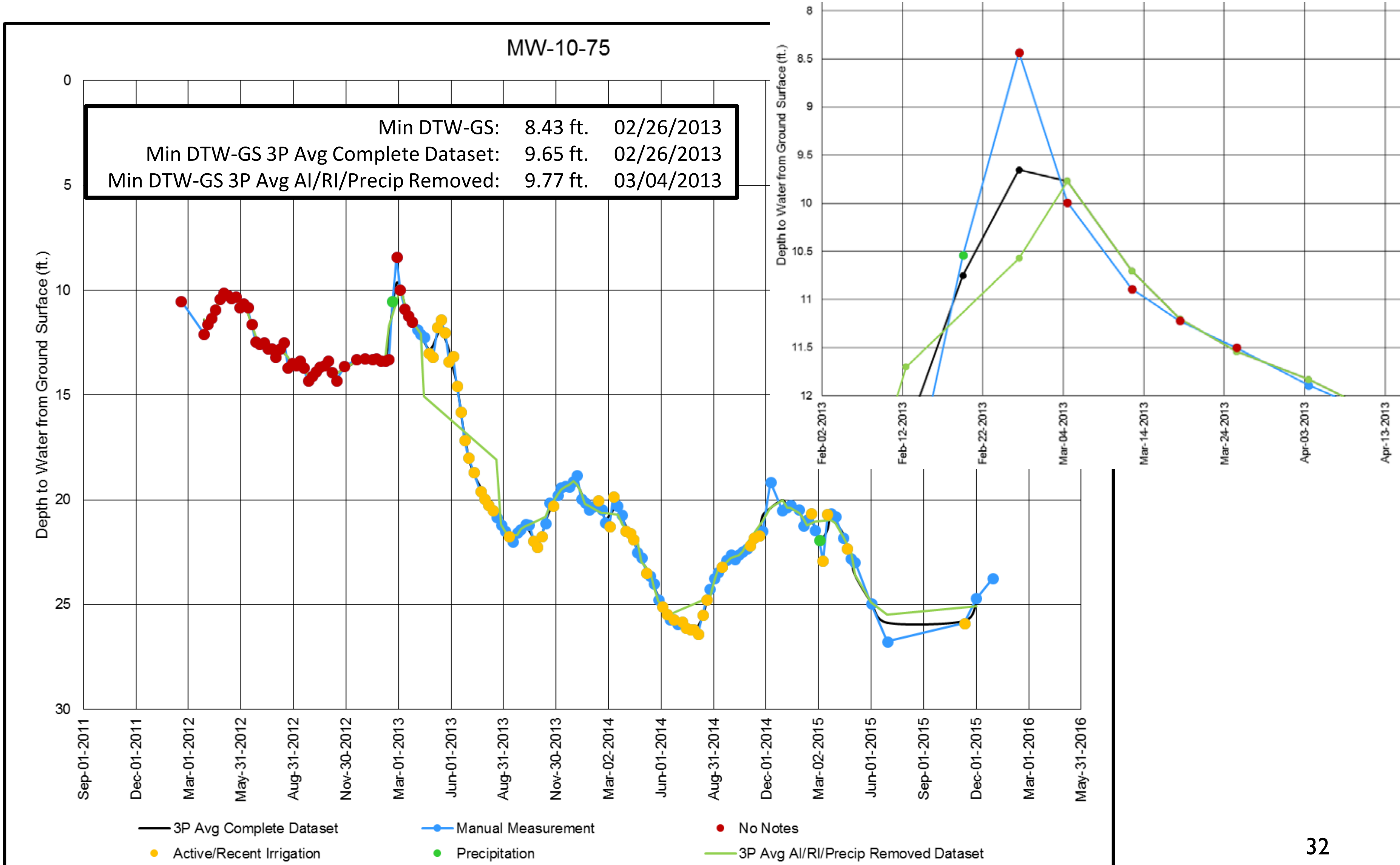
Explanation

- Restoration Program is not responsible for improving groundwater conditions that existed prior to the SJRRP
- Periods without Restoration or flood flow provide a reasonable estimate of historical conditions where pre-SJRRP data is unavailable
- Utilize best available information and update as we get more data
  - Include 4 years of data with no Restoration or flood flow in the San Joaquin River

Updates since January

- At last SCTFG, input received that we should consider removing irrigation and precipitation events
  - We did this for past or current priority wells with the best record, and found that the shallowest groundwater level observed changed an average of 2.6%
  - We chose, conservatively, to remove the top 5% of all records to account for irrigation and precipitation events

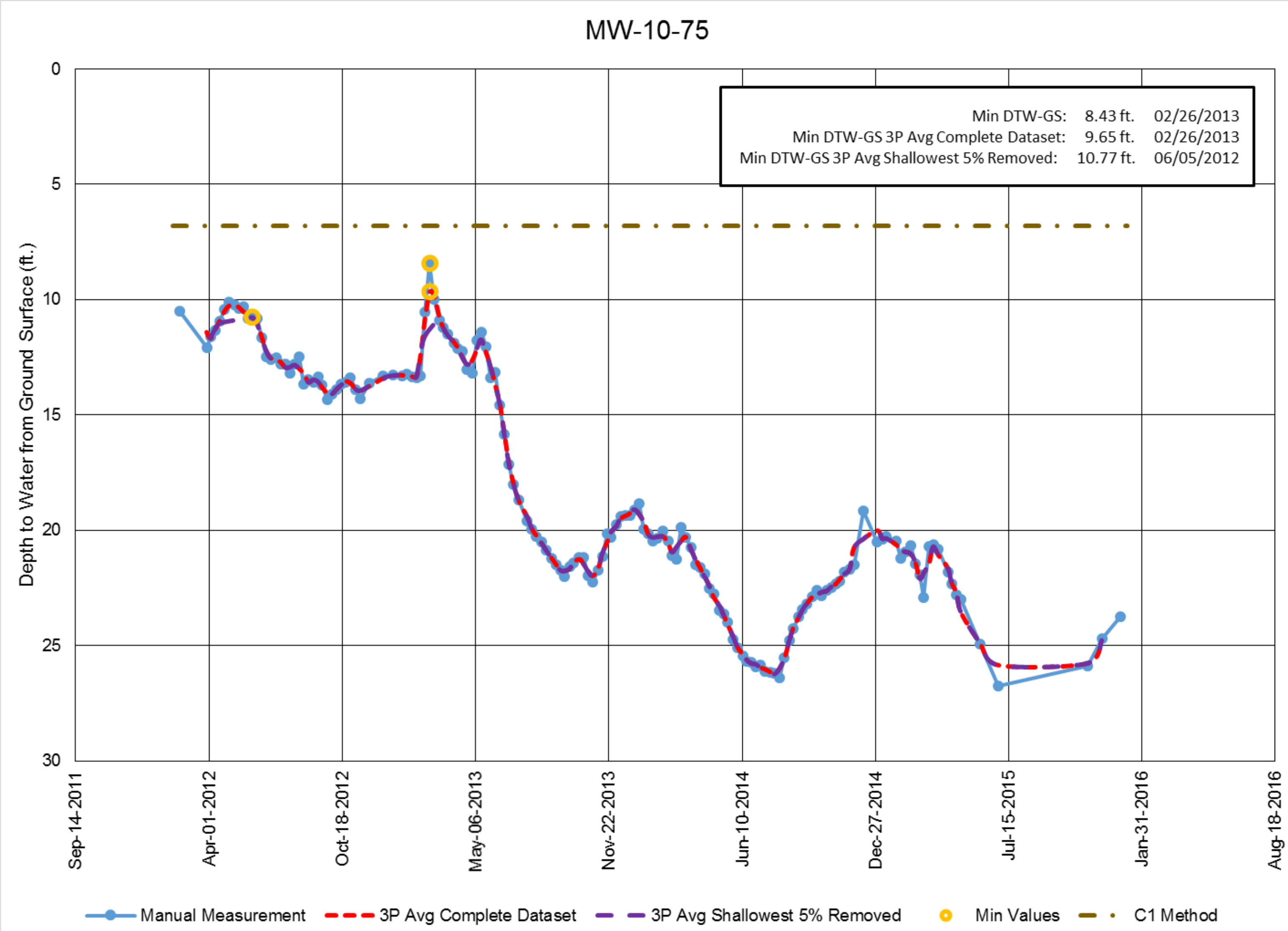
Example of Removing Irrigation



Updates since January

- Then, we compared this to the CCID historical groundwater method to determine if it was a reasonable representation of historical groundwater levels.

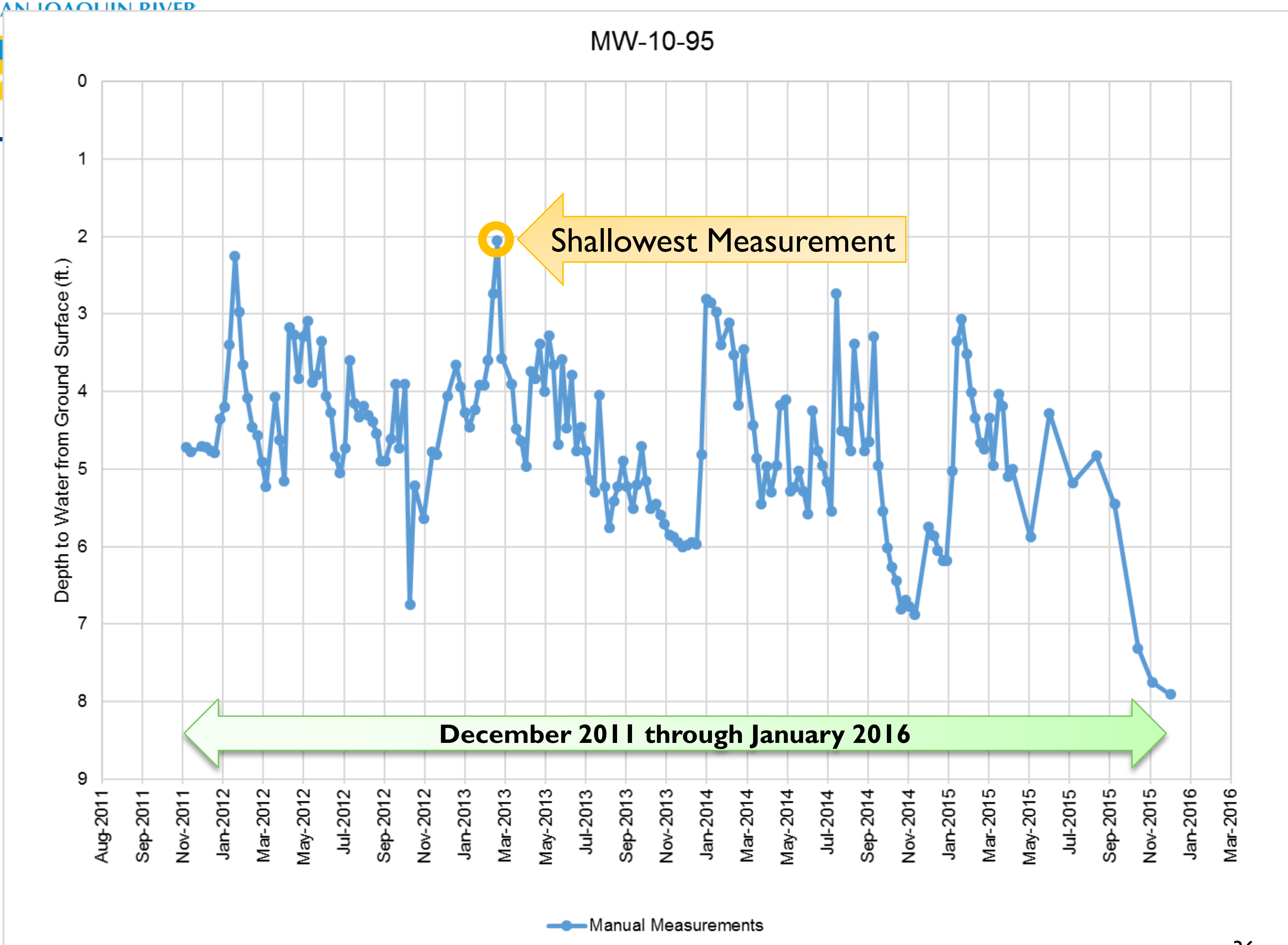
Comparison to CCID method



Comparison to CCID Method

- We found the CCID method was nearly always shallower.

Well Thresholds					
Well	**C1 - CCID (ft bgs)**	**C4 - Jan (ft bgs)** 3P Avg Complete Dataset	**C4 - Feb (ft bgs)** 3P Avg 5% Removed	**Shallower of CCID and C4 - Jan**	**Shallower of CCID and C4 - Feb**
155	9.3	9.9	10.2	C1 - CCID	C1 - CCID
191	7.9	7.0	9.3	C4 - Jan	C1 - CCID
186A	5.0	2.5	3.1	C4 - Jan	C4 - Feb
MW-09-83B	7.4	29.4	31.2	C1 - CCID	C1 - CCID
MW-09-85B	12.2	17.3	22.7	C1 - CCID	C1 - CCID
MW-09-86B	12.9	19.4	19.7	C1 - CCID	C1 - CCID
MW-09-87B	6.1	11.8	12.0	C1 - CCID	C1 - CCID
MW-09-88	4.2	3.7	4.3	C4 - Jan	C1 - CCID
MW-10-74	10.4	12.2	12.5	C1 - CCID	C1 - CCID
MW-10-75	6.8	9.7	10.8	C1 - CCID	C1 - CCID
MW-10-76	5.4	6.0	7.2	C1 - CCID	C1 - CCID
MW-10-78	5.4	7.0	8.2	C1 - CCID	C1 - CCID
MW-10-80	7.1	11.9	12.4	C1 - CCID	C1 - CCID
MW-10-89	5.0	11.7	12.0	C1 - CCID	C1 - CCID
MW-10-188	6.1	10.0	10.0	C1 - CCID	C1 - CCID
SJR W-8	6.3	4.9	5.7	C4 - Jan	C4 - Feb
SJR W-9	2.1	2.7	3.2	C1 - CCID	C1 - CCID
SJR W-10	3.8	2.9	4.2	C4 - Jan	C1 - CCID
SJR W-11	5.8	8.0	8.5	C1 - CCID	C1 - CCID


MW-10-95
Shallowest Measurement
December 2011 through January 2016
Depth to Water from Ground Surface (ft.)
0
1
2
3
4
5
6
7
8
9
Aug-2011
Sep-2011
Nov-2011
Jan-2012
Mar-2012
May-2012
Jul-2012
Sep-2012
Nov-2012
Jan-2013
Mar-2013
May-2013
Jul-2013
Sep-2013
Nov-2013
Jan-2014
Mar-2014
May-2014
Jul-2014
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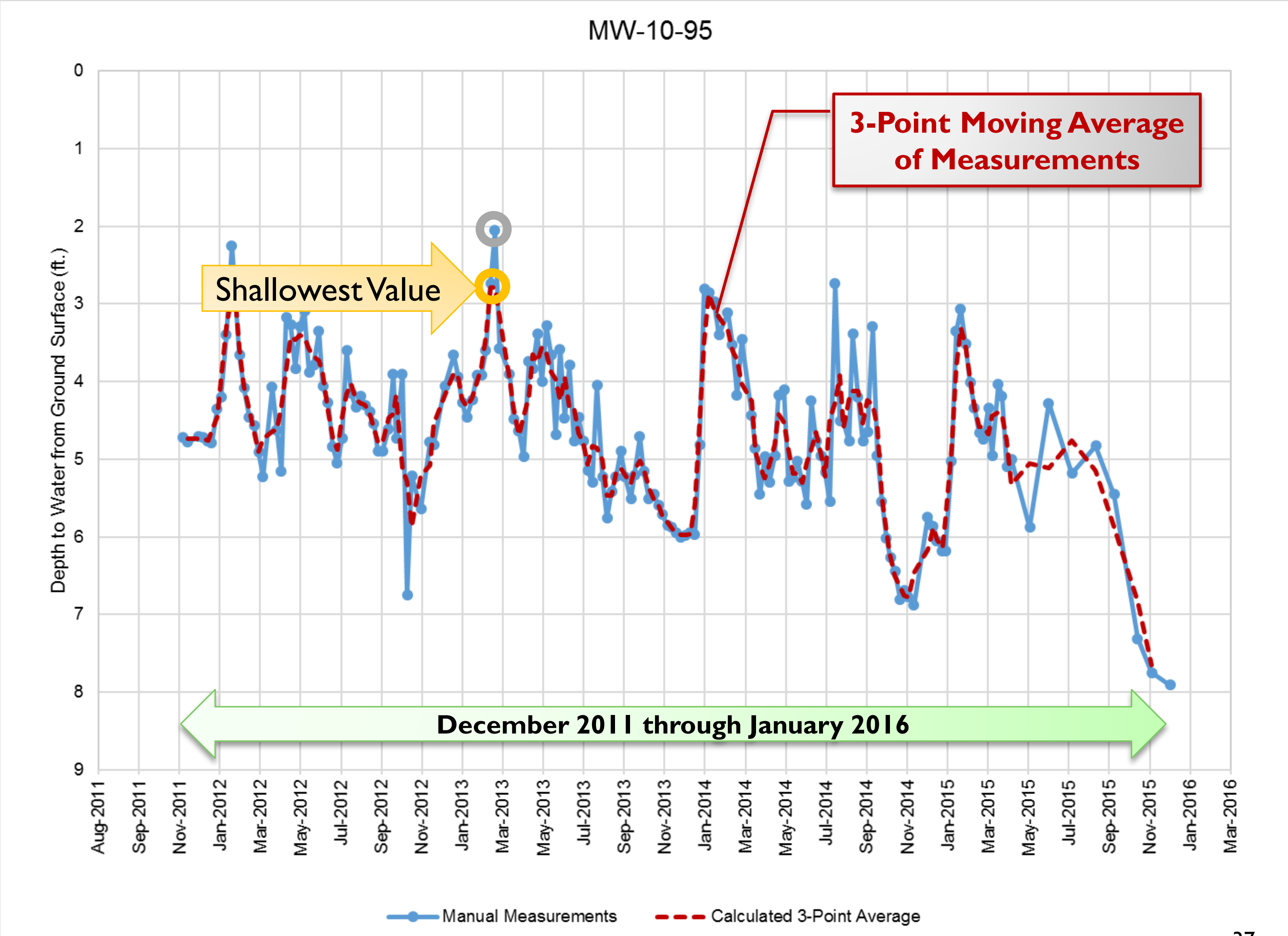
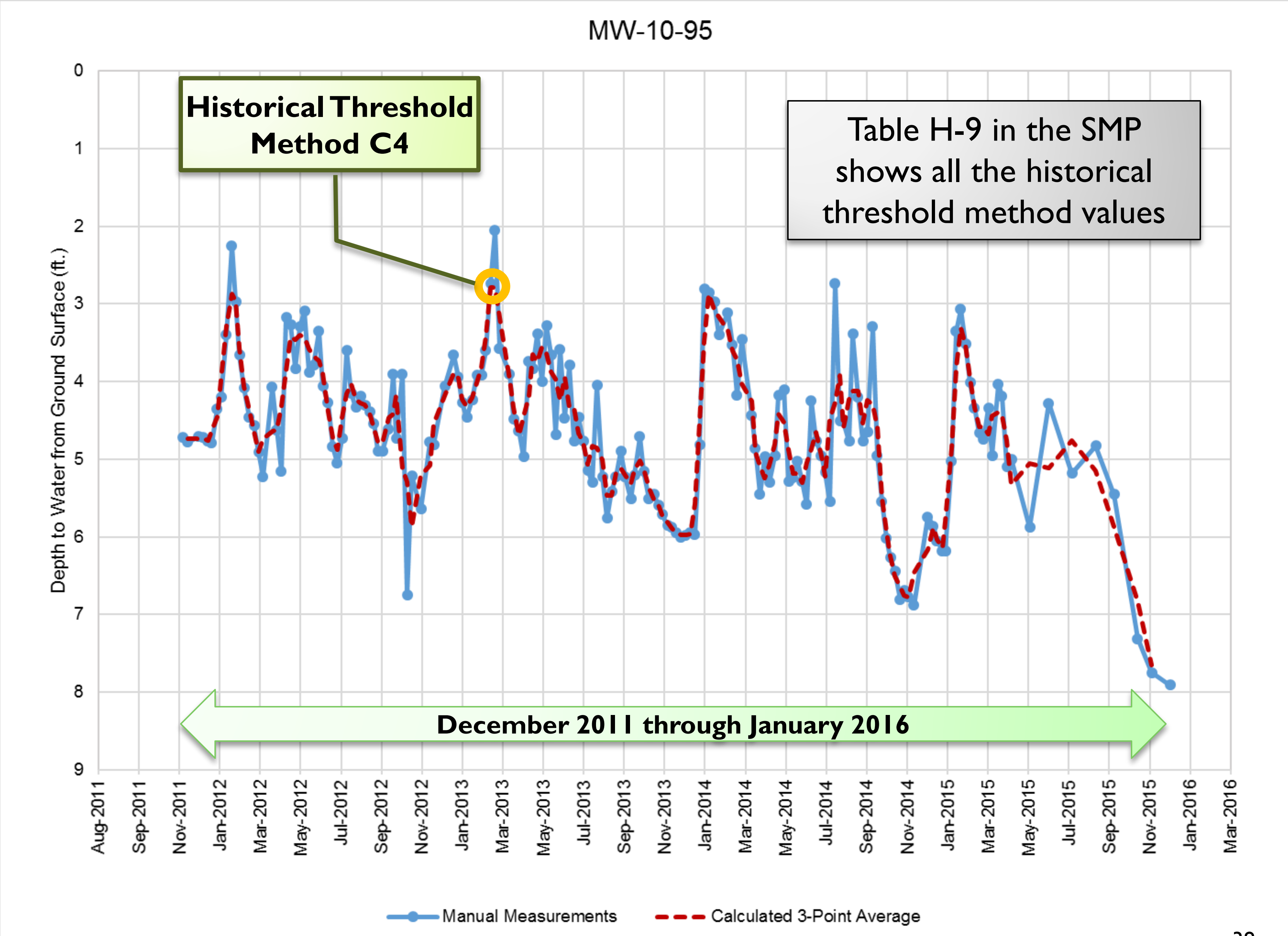
Jan-2016
Mar-2016
Manual Measurements


MW-10-95
3-Point Moving Average of Measurements
Shallowest Value
December 2011 through January 2016
Depth to Water from Ground Surface (ft.)
0
1
2
3
4
5
6
7
8
9
Aug-2011
Sep-2011
Nov-2011
Jan-2012
Mar-2012
May-2012
Jul-2012
Sep-2012
Nov-2012
Jan-2013
Mar-2013
May-2013
Jul-2013
Sep-2013
Nov-2013
Jan-2014
Mar-2014
May-2014
Jul-2014
Sep-2014
Nov-2014
Jan-2015
Mar-2015
May-2015
Jul-2015
Sep-2015
Nov-2015
Jan-2016
Mar-2016
Manual Measurements
Calculated 3-Point Average


MW-10-95
Historical Threshold Method C4
Table H-9 in the SMP shows all the historical threshold method values
December 2011 through January 2016
Depth to Water from Ground Surface (ft.)
0
1
2
3
4
5
6
7
8
9
Aug-2011
Sep-2011
Nov-2011
Jan-2012
Mar-2012
May-2012
Jul-2012
Sep-2012
Nov-2012
Jan-2013
Mar-2013
May-2013
Jul-2013
Sep-2013
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Nov-2014
Jan-2015
Mar-2015
May-2015
Jul-2015
Sep-2015
Nov-2015
Jan-2016
Mar-2016
Manual Measurements
Calculated 3-Point Average

Patti Ransdell

WRAP-UP, ACTION ITEMS

Contact

- Technical Feedback Group: Regina Story or Katrina Harrison
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  - rstory@usbr.gov or kharrison@usbr.gov
- Seepage Concerns: Seepage Hotline
  - 916-978-4398
  - RestorationFlows@restoresjr.net