South Delta Null Zone Study – Preliminary Results

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Overview

- Background
- Purpose
- Modeling Analysis Approach
- Preliminary Results and Findings
- Next Steps

Background

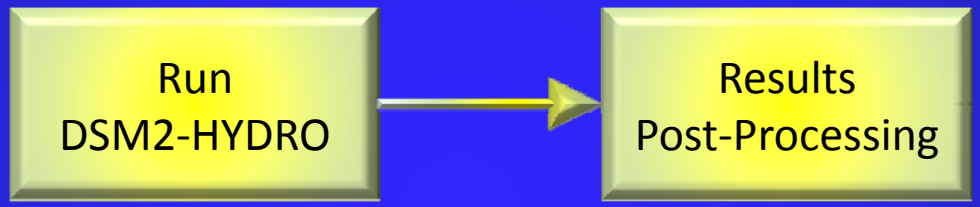
- SWRCB's review regarding the 2006 Bay-Delta Plan.
  - Potential amendments to the South Delta salinity objectives.
    - Assuming the poor water circulation (null zone) contributes to bad water quality.
    - Assuming SWP and CVP are fully responsible for the impacts on water circulation.

Purpose

- To analyze whether and to what extent SWP and CVP exports, and the Ag temporary barriers, actually influence the null zones and poor water circulation in South Delta.
  - Where are null zones?
  - How often do null zones occur?
  - How CVP/SWP and barriers affect null zones?
  - What are the stage impacts due to CVP/SWP and barriers?

Modeling Analysis Approach

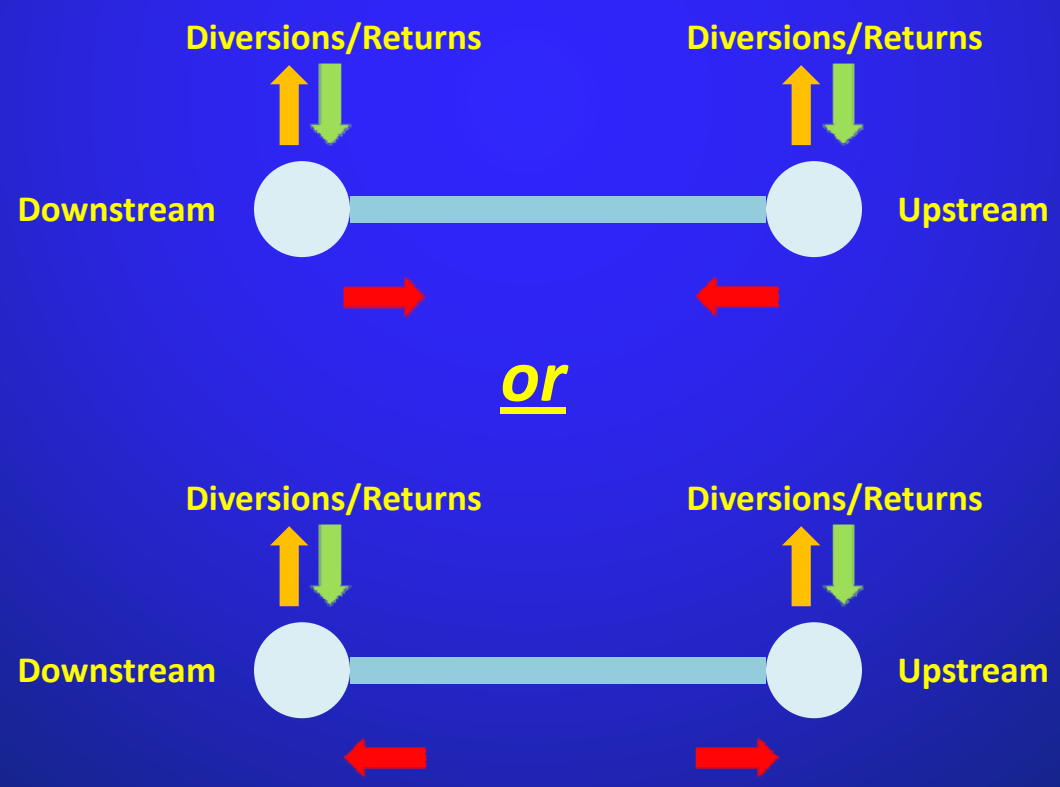
- Modeling tool: DSM2



- Simulation periods: Jan. 1990 to Dec. 2010
  - 6 Wet year
  - 4 Above Normal year
  - 2 Below Normal year
  - 4 Dry year
  - 5 Critical year

Modeling Analysis Approach (Contd.)

- What is null zone?
- Assumed null zone definition:



Modeling Analysis Approach (Contd.)

- Modeling scenarios: DSM2 historical and modified historical simulations.

Scenarios	SWP	CVP	Ag. Barriers
NO_CVP_SWP_BARRIERS	-	-	-
NO_BARRIERS	√	√	-
NO_SWP_BARRIERS	-	√	-
NO_CVP_BARRIERS	√	-	-
HISTORICAL	√	√	√

√: Included -: Not Included

Modeling Analysis Approach (Contd.)

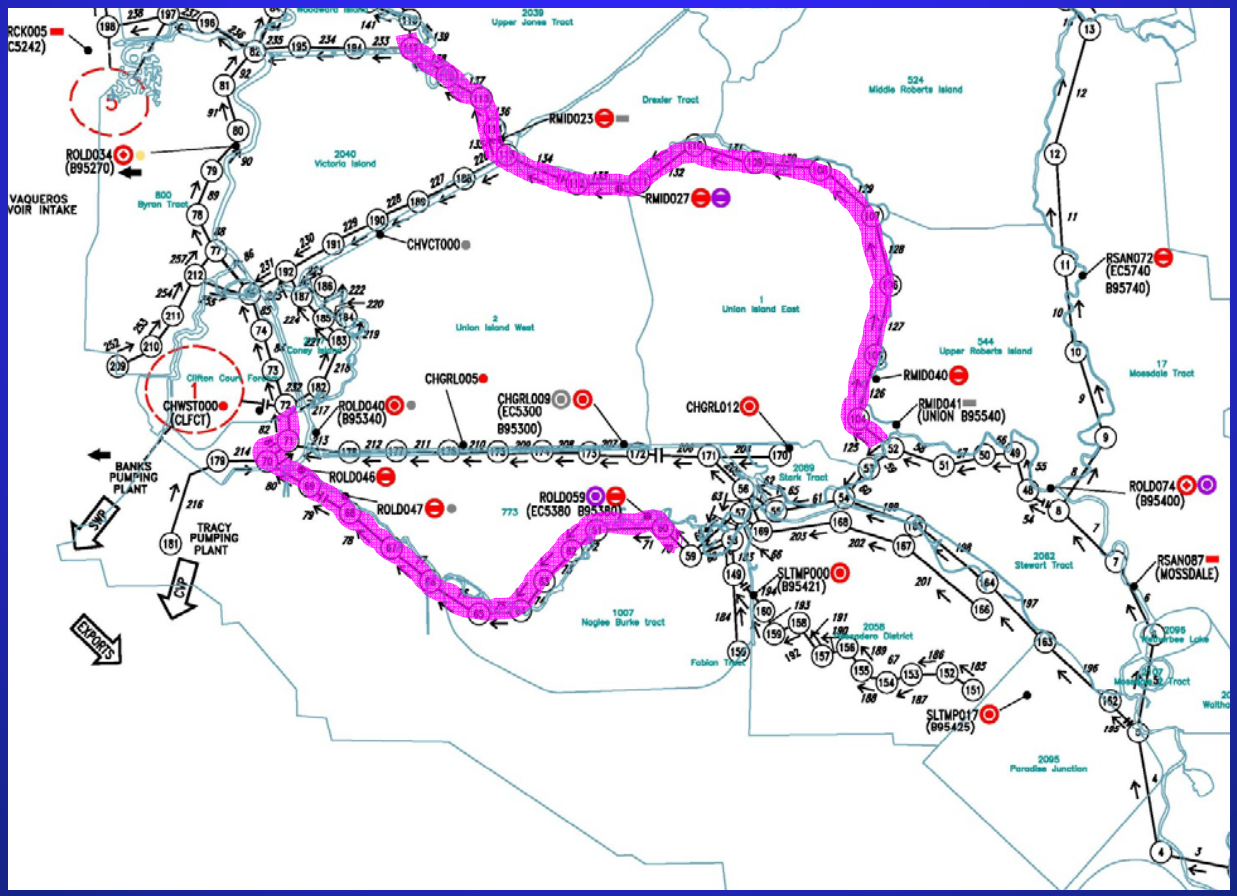
- Considerations
  - The no-exports simulations do not incorporate the possible changes in reservoir releases or other operations as a result of cutting exports.
  - DSM2 is limited by sparse knowledge of In–Delta diversions and returns. This will affect the null zone calculations.

Preliminary Results and Findings

- At this point, results are interpreted mainly for comparison purpose.
- Results analyzed:
  - Flow (null zone)
  - Stage

Preliminary Results and Findings (Contd.)

- Flow: tidally averaged



# of days of null zone occurrence (January 1990 ~ December 2010)

Based on current assumptions, CVP/SWP increase null zones in part of Middle River; for Old River, no significant increase in null zones.

Scenario 1: No_CVP_SWP_Barriers

Legend
< 20
20 ~ 40
40 ~ 60
60 ~ 80
80 ~ 100
> 100

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
Total # of days:	2	22	23	11	13	34	12	20	8	12	5	8	4

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
Total # of days:	8	23	19	7	13	84	134	54	26	41	14	0	0	0	0

Scenario 2: No_Barriers

Legend
< 20
20 ~ 40
40 ~ 60
60 ~ 80
80 ~ 100
> 100

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
Total # of days:	0	0	13	15	12	17	8	5	4	4	6	4	3

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
Total # of days:	4	4	2	1	5	105	141	76	70	62	72	39	11	9	7

Difference between Scenario 1 and Scenario 2 (i.e. Scenario 2 minus Scenario 1)

Legend
< 40
-40 ~ -20
-20 ~ 0
0 ~ 20
20 ~ 40
> 40

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
Total # of days:	-2	-22	-10	4	-1	-17	-4	-15	-4	-8	1	-4	-1

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
Total # of days:	-4	-19	-17	-6	-8	21	7	22	44	21	58	39	11	9	7

Downstream *(Not to Scale)* *Upstream*

Key Locations: Temporary Barriers; Old River at Tracy Road; Middle River at Old River

Preliminary results, subject to change.

Perecntage of null zone occurrence (January 1990 ~ December 2010)

Scenario 1: No_CVP_SWP_Barriers

Legend
0 ~ 0.5%
0.5 ~ 1.0%
1.0 ~ 1.5%
1.5 ~ 2.0%
2.0 ~ 2.5%
> 2.5%

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
% of total days:	0.03%	0.29%	0.30%	0.14%	0.17%	0.44%	0.16%	0.26%	0.10%	0.16%	0.07%	0.10%	0.05%

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
% of total days:	0.10%	0.30%	0.25%	0.09%	0.17%	1.10%	1.75%	0.70%	0.34%	0.53%	0.18%	0.00%	0.00%	0.00%	0.00%

Scenario 2: No_Barriers

Legend
0 ~ 0.5%
0.5 ~ 1.0%
1.0 ~ 1.5%
1.5 ~ 2.0%
2.0 ~ 2.5%
> 2.5%

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
% of total days:	0.00%	0.00%	0.17%	0.20%	0.16%	0.22%	0.10%	0.07%	0.05%	0.05%	0.08%	0.05%	0.04%

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
% of total days:	0.05%	0.05%	0.03%	0.01%	0.07%	1.37%	1.84%	0.99%	0.91%	0.81%	0.94%	0.51%	0.14%	0.12%	0.09%

Downstream *(Not to Scale)* *Upstream*

Key Locations: Temporary Barriers; Old River at Tracy Road; Middle River at Old River

Preliminary results, subject to change.

of days of null zone occurrence - July (1990 ~ 2010)

Scenario 1: No_CVP_SWP_Barriers

Legend
< 20
20 ~ 40
40 ~ 60
60 ~ 80
80 ~ 100
> 100

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
# of days:	2	1	2	3	2	14	5	8	2	4	2	5	4

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
# of days:	0	1	3	0	2	0	5	2	0	0	4	0	0	0	0

Scenario 2: No_Barriers

Legend
< 20
20 ~ 40
40 ~ 60
60 ~ 80
80 ~ 100
> 100

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
# of days:	0	0	2	5	5	4	2	2	1	1	2	2	2

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
# of days:	0	0	0	0	0	0	1	1	1	0	1	5	2	0	0

Difference between Scenario 1 and Scenario 2 (i.e. Scenario 2 minus Scenario 1)

Legend
< 40
-40 ~ -20
-20 ~ 0
0 ~ 20
20 ~ 40
> 40

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
# of days:	-2	-1	0	2	3	-10	-3	-6	-1	-3	0	-3	-2

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
# of days:	0	-1	-3	0	-2	0	-4	-1	1	0	-3	5	2	0	0

Downstream *(Not to Scale)* *Upstream*

Key Locations: Temporary Barriers; Old River at Tracy Road; Middle River at Old River

Preliminary results, subject to change.

Percentage of null zone occurrence - July (1990 ~ 2010)

Scenario 1: No_CVP_SWP_Barriers

Legend

- 0 ~ 0.5%
- 0.5 ~ 1.0%
- 1.0 ~ 1.5%
- 1.5 ~ 2.0%
- 2.0 ~ 2.5%
- > 2.5%

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
% of days:	0.31%	0.15%	0.31%	0.46%	0.31%	2.15%	0.77%	1.23%	0.31%	0.61%	0.31%	0.77%	0.61%

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
% of days:	0.00%	0.15%	0.46%	0.00%	0.31%	0.00%	0.77%	0.31%	0.00%	0.00%	0.61%	0.00%	0.00%	0.00%	0.00%

Scenario 2: No_Barriers

Legend

- 0 ~ 0.5%
- 0.5 ~ 1.0%
- 1.0 ~ 1.5%
- 1.5 ~ 2.0%
- 2.0 ~ 2.5%
- > 2.5%

Old River

DSM2 Channel #:	82	81	80	79	78	77	76	75	74	73	72	71	70
% of days:	0.00%	0.00%	0.31%	0.77%	0.77%	0.61%	0.31%	0.31%	0.15%	0.15%	0.31%	0.31%	0.31%

Middle River

DSM2 Channel #:	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125
% of days:	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.15%	0.15%	0.15%	0.00%	0.15%	0.77%	0.31%	0.00%	0.00%

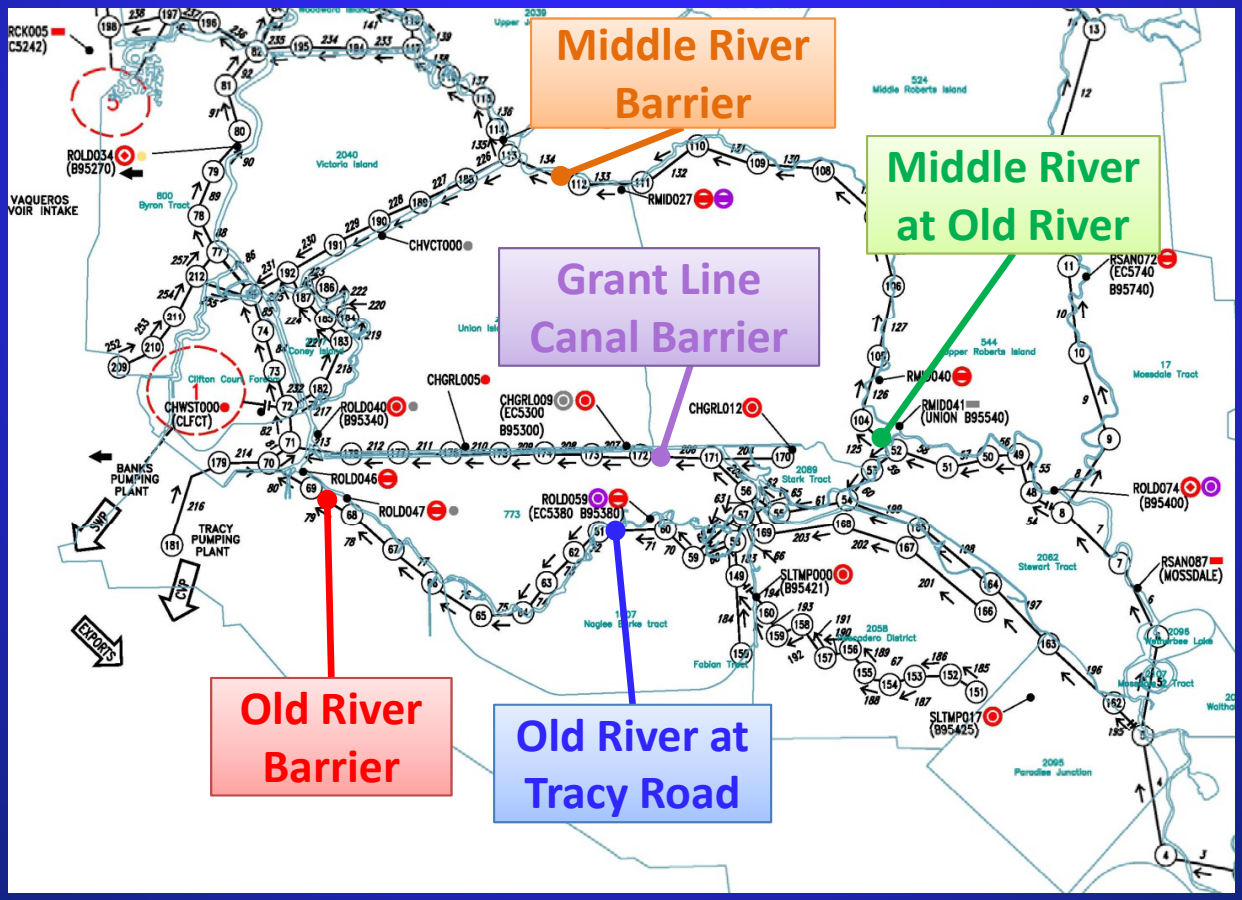
Downstream *(Not to Scale)* *Upstream*

Key Locations: Temporary Barriers; Old River at Tracy Road; Middle River at Old River

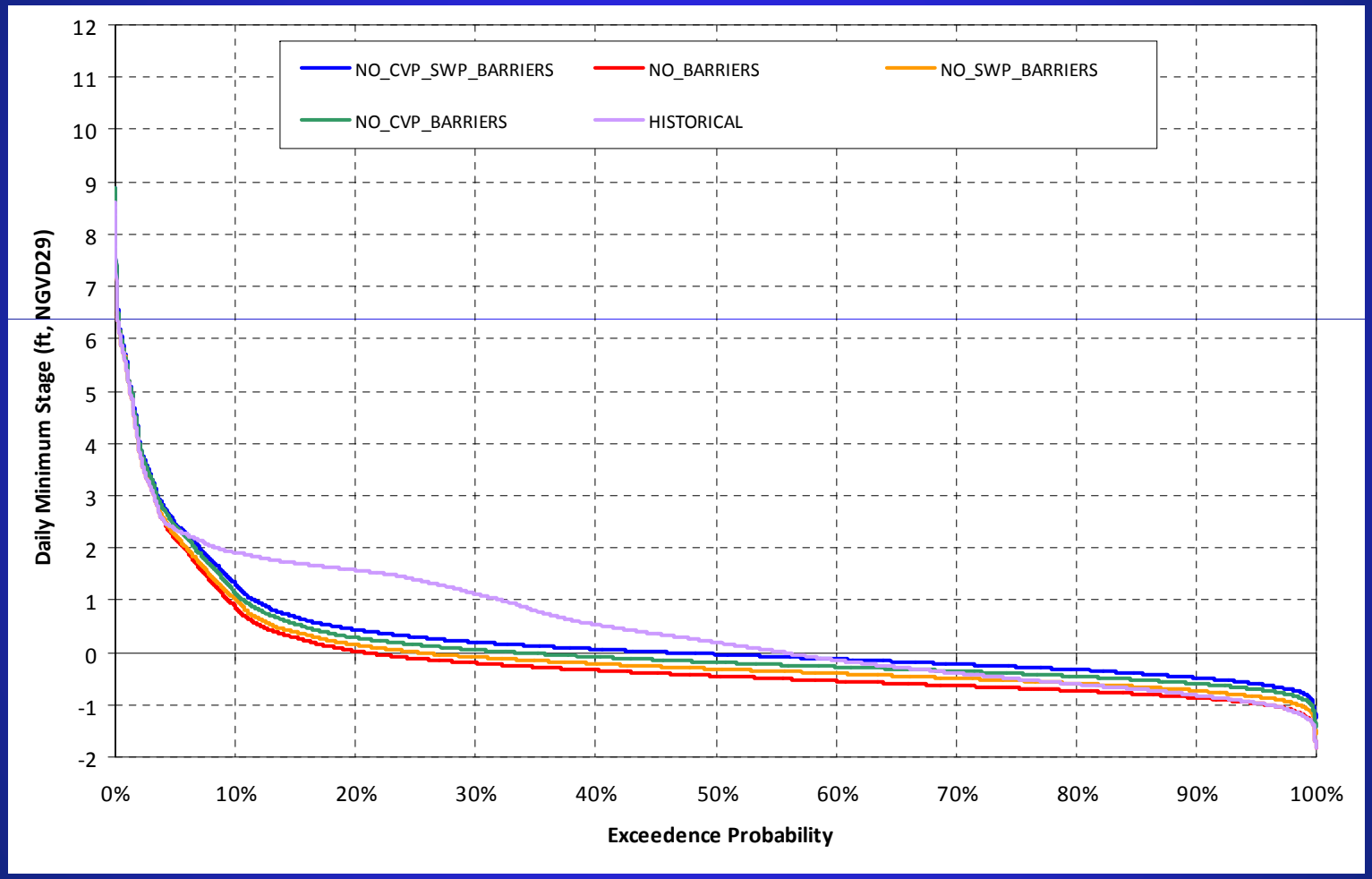
Preliminary results, subject to change.

Preliminary Results and Findings (Contd.)

- Stage



Old River at Tracy Road



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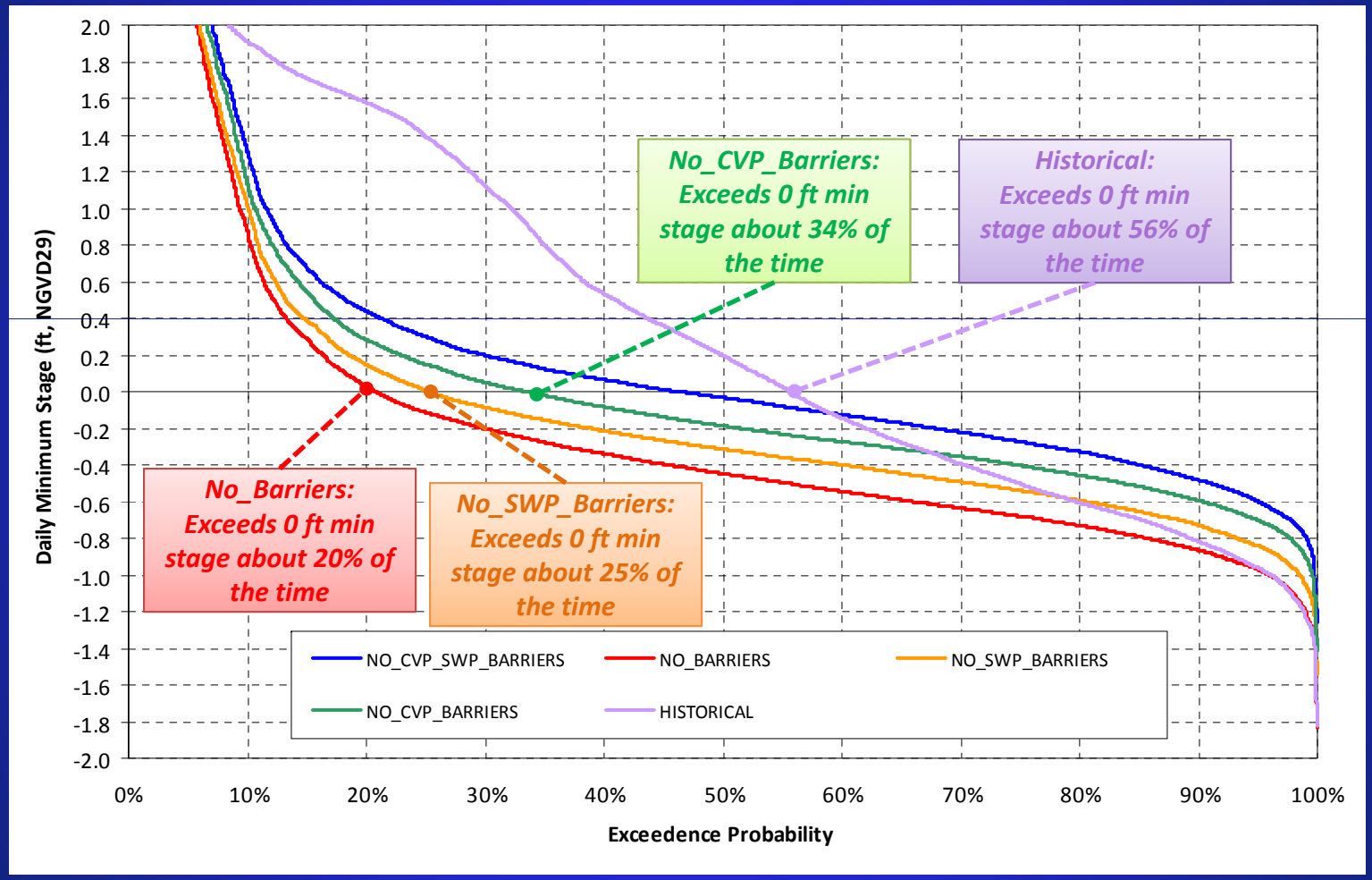
Old River at Tracy Road



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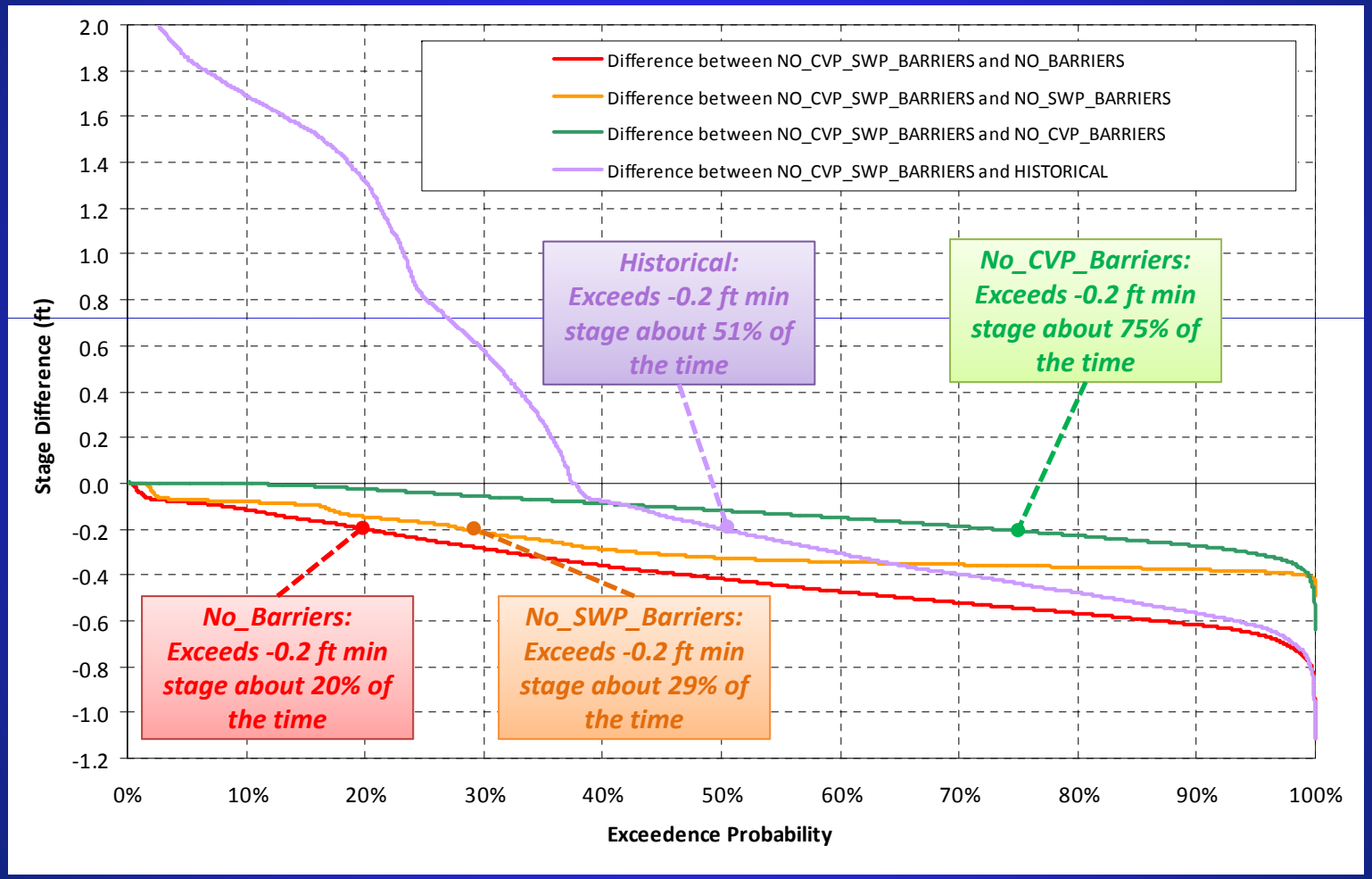
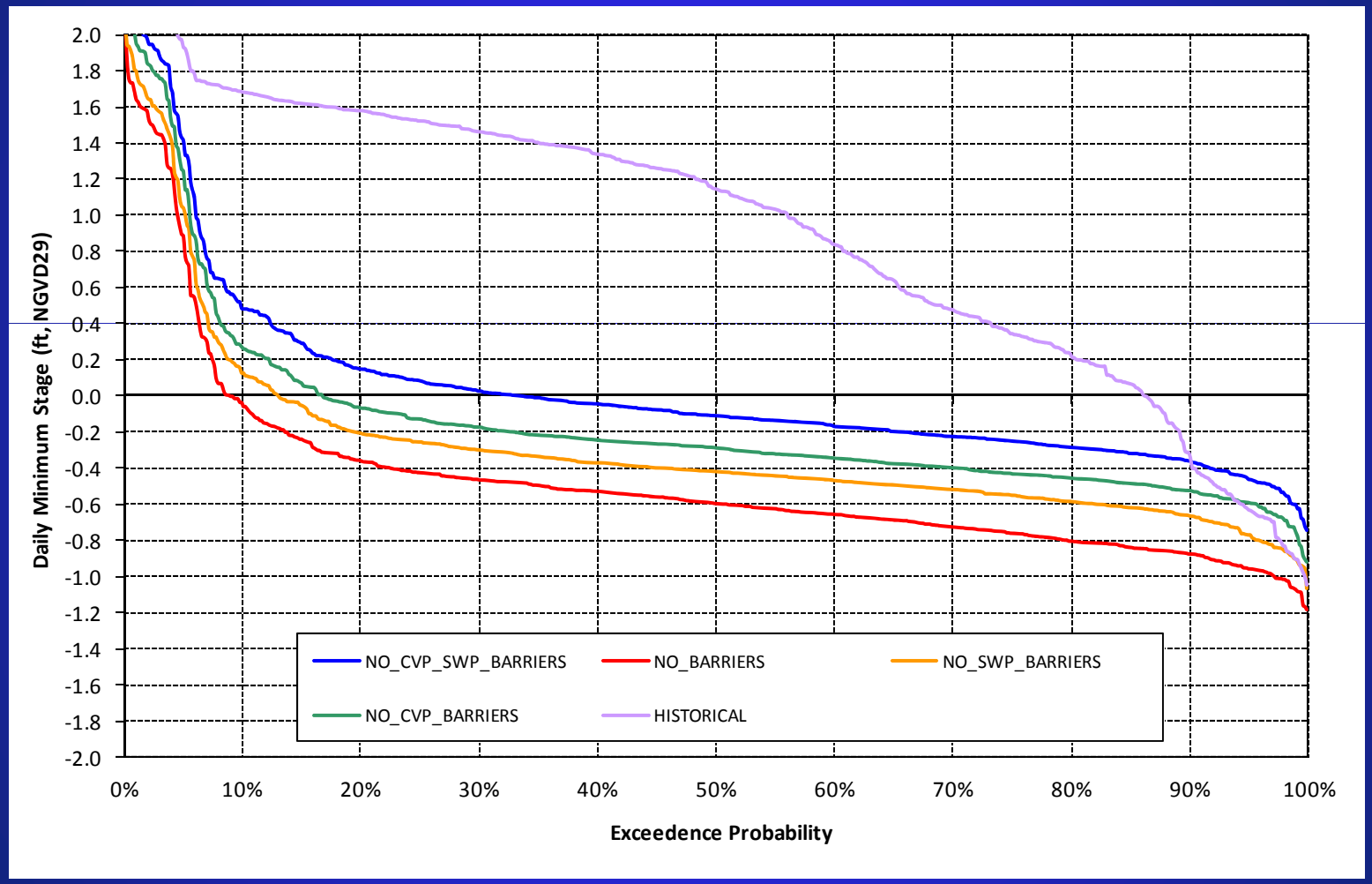
Old River at Tracy Road



Preliminary results, subject to change.

Old River at Tracy Road (July)



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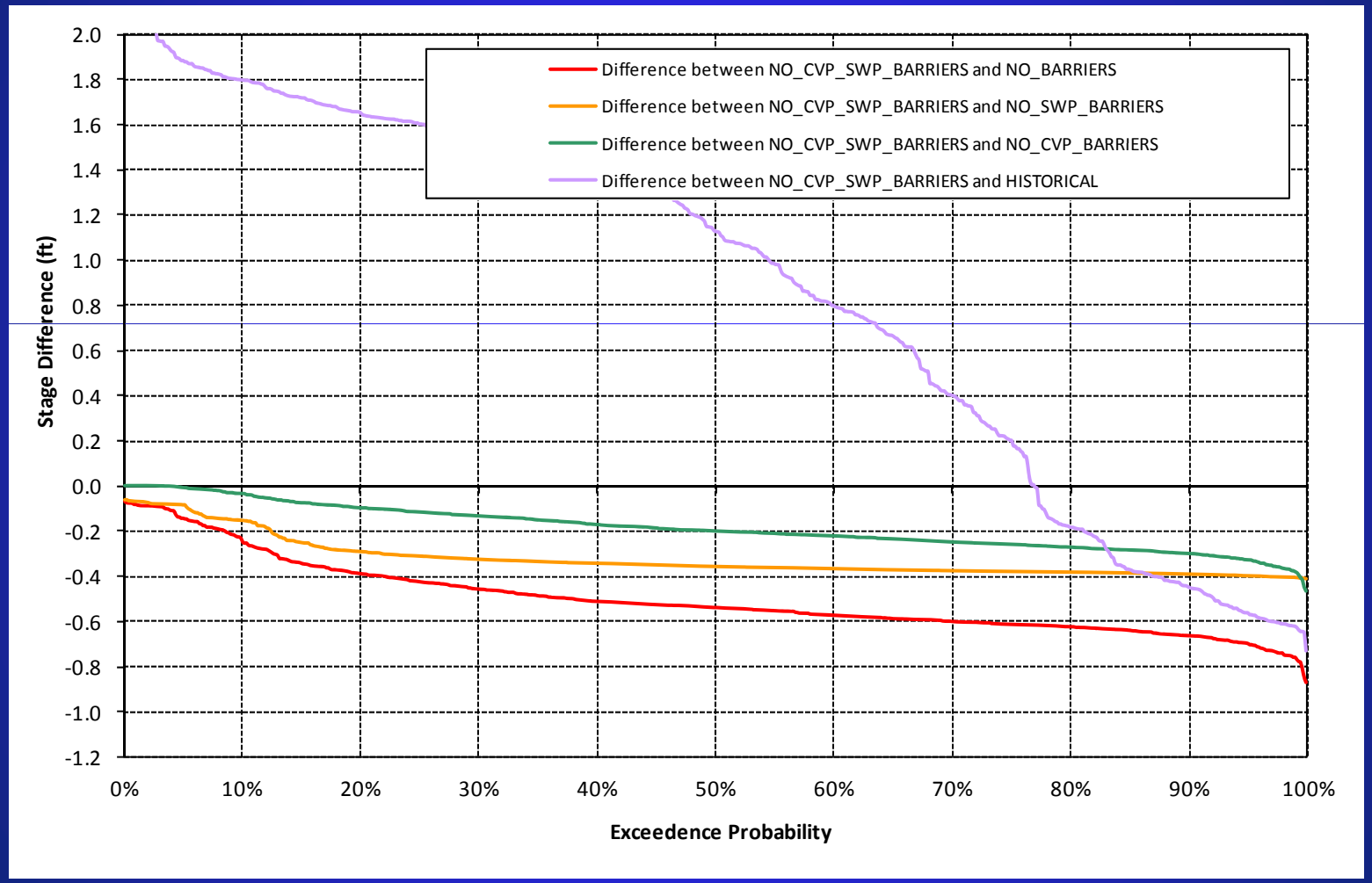
Old River at Tracy Road (July)



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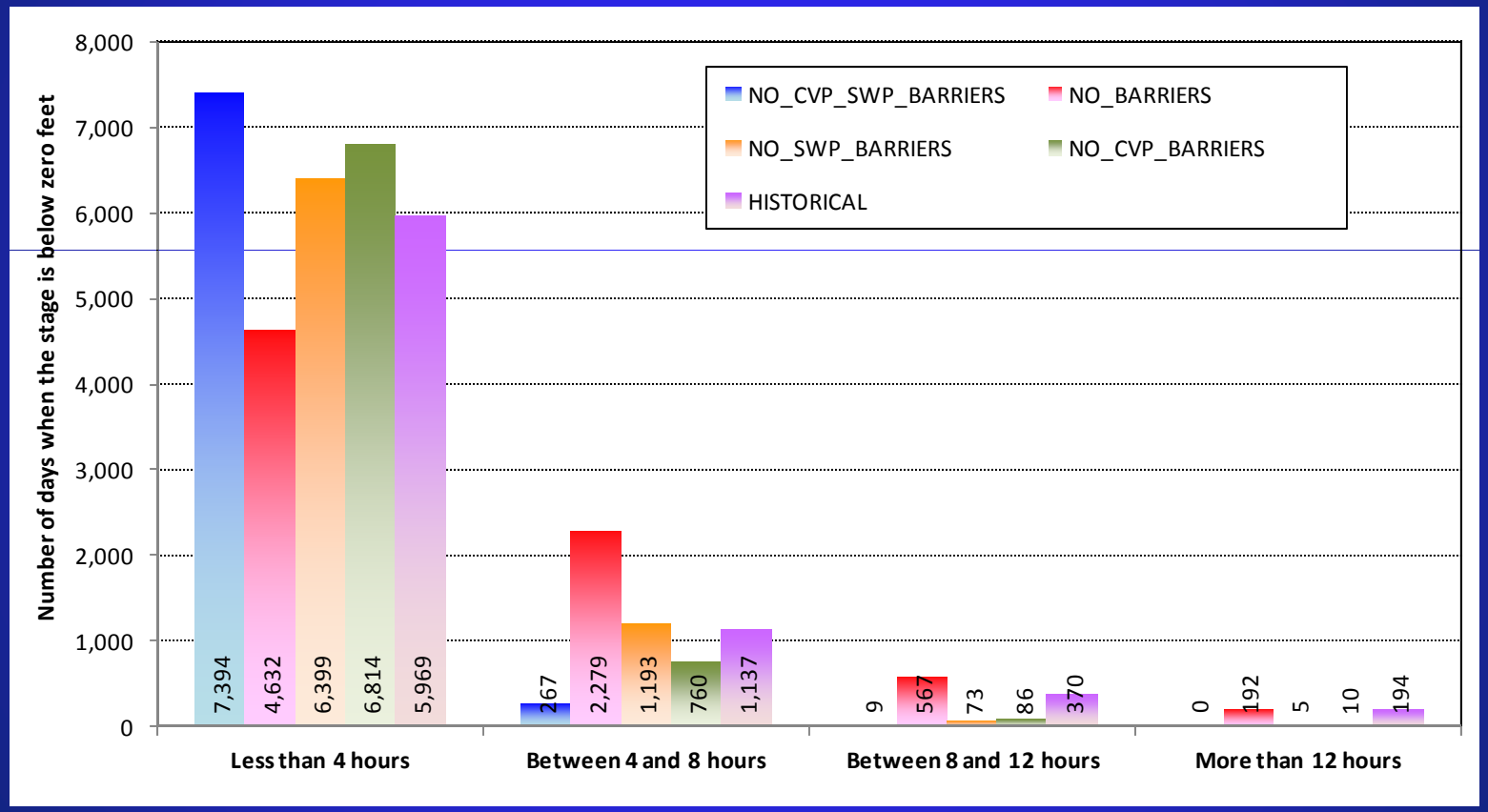
Old River at Tracy Road



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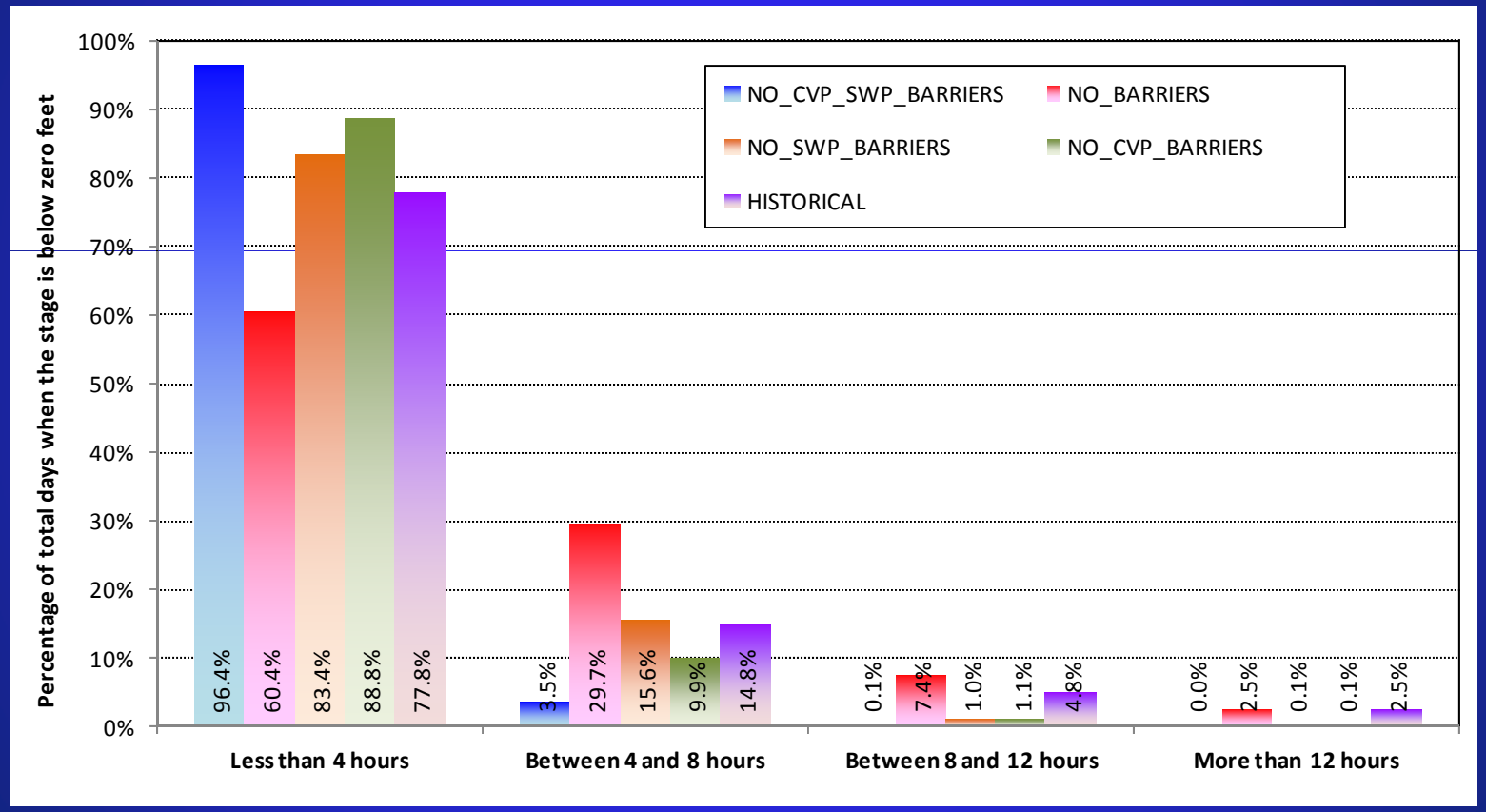
Old River at Tracy Road



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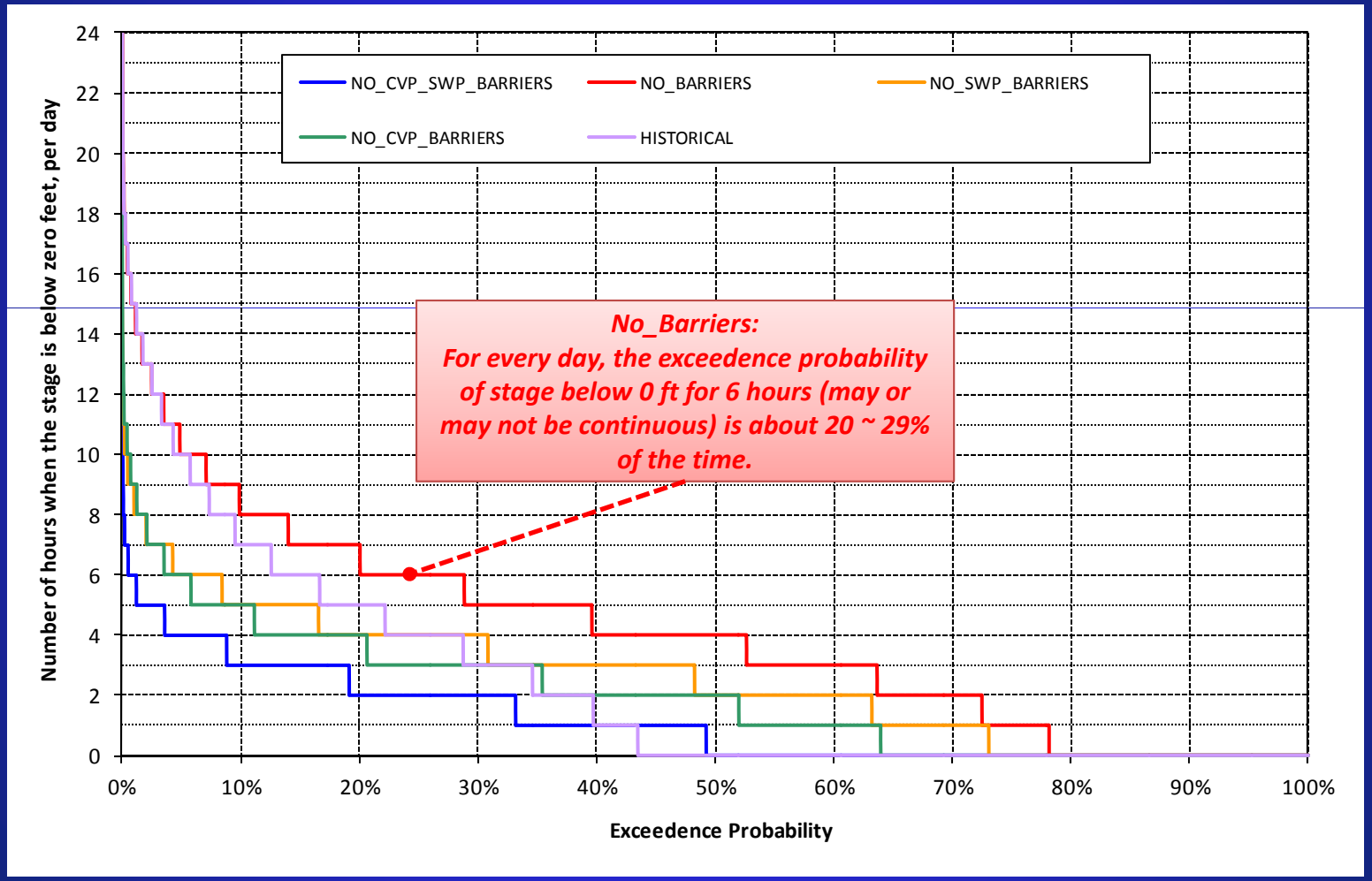
Old River at Tracy Road



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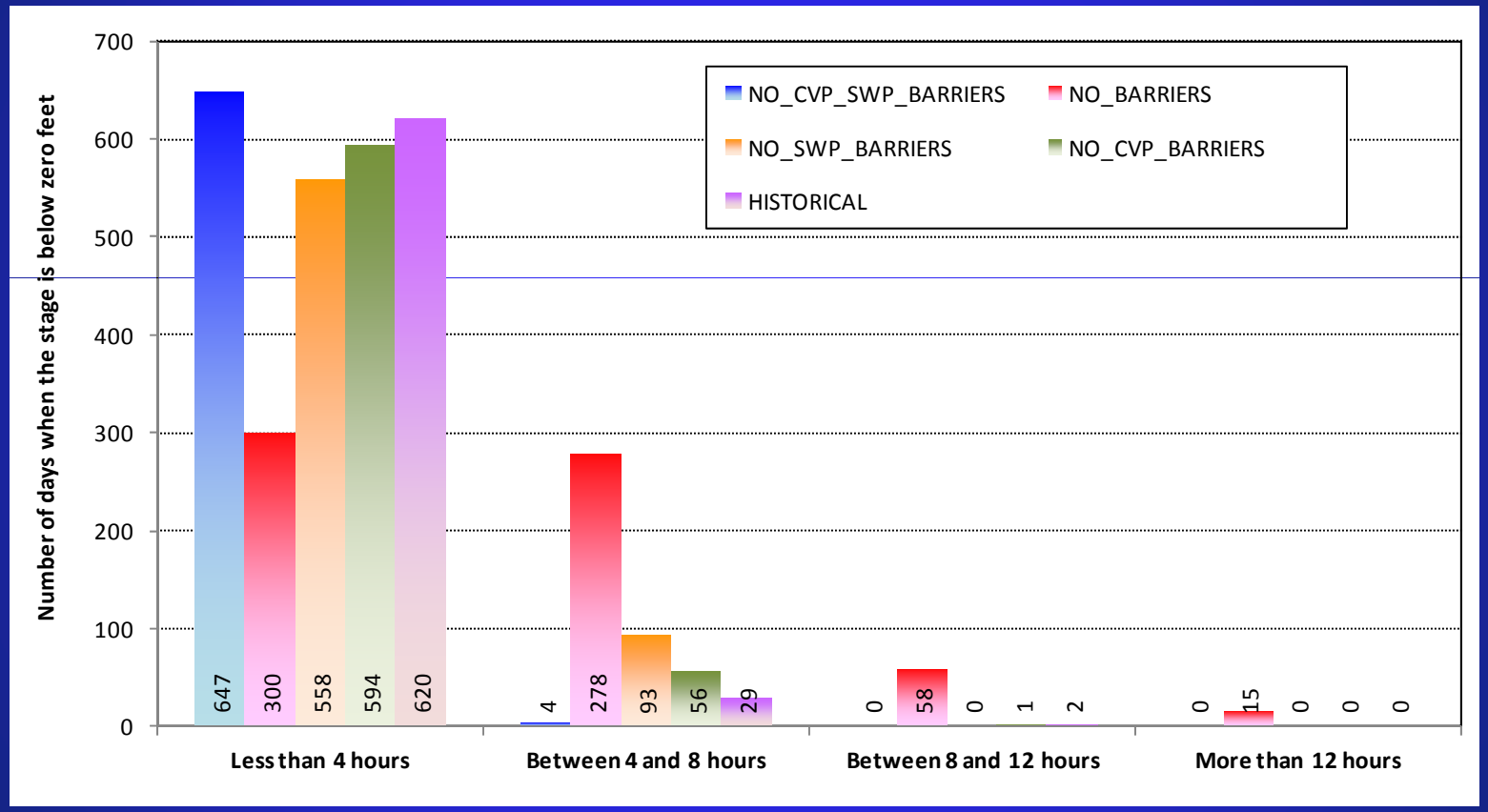
Old River at Tracy Road (July)



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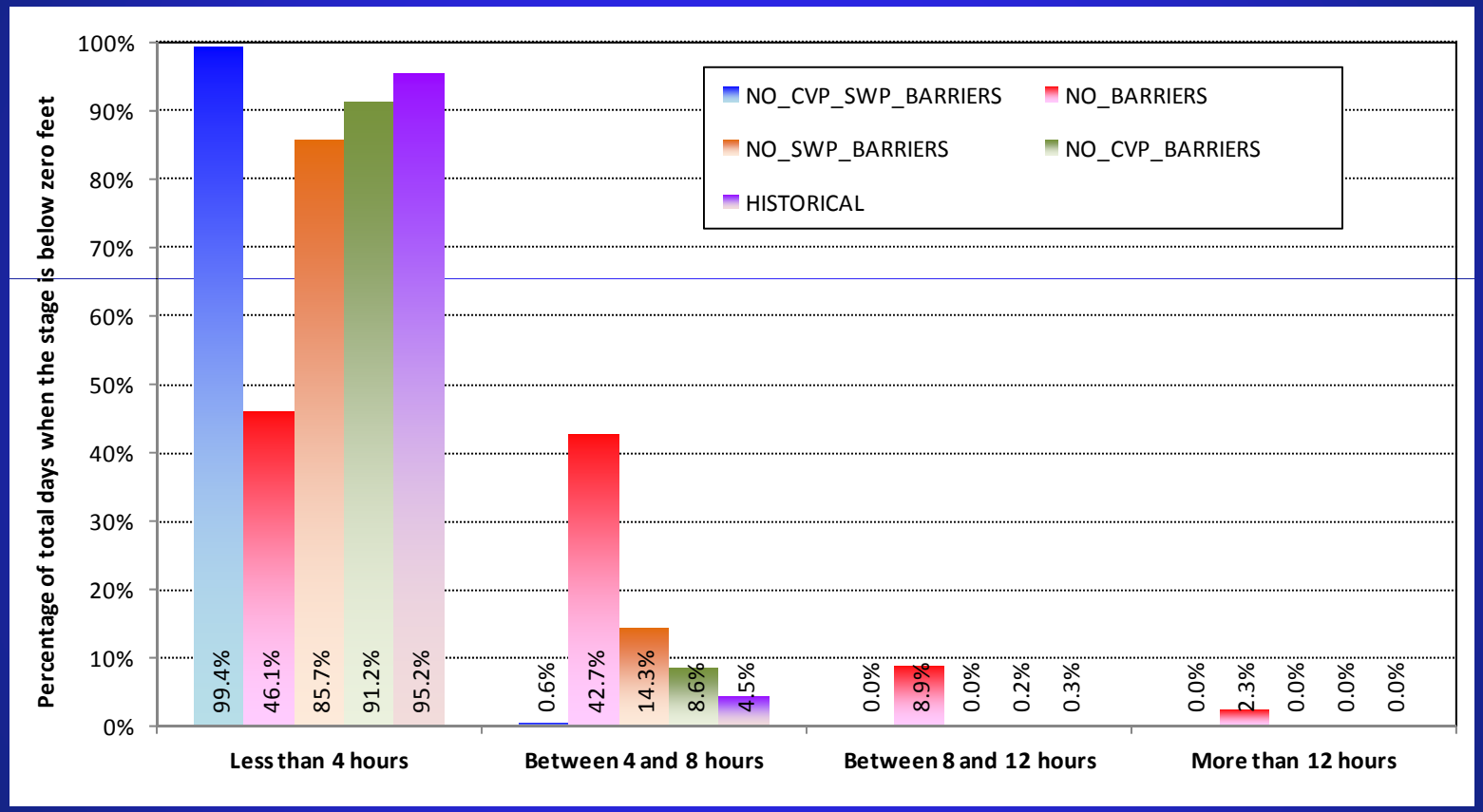
Old River at Tracy Road (July)



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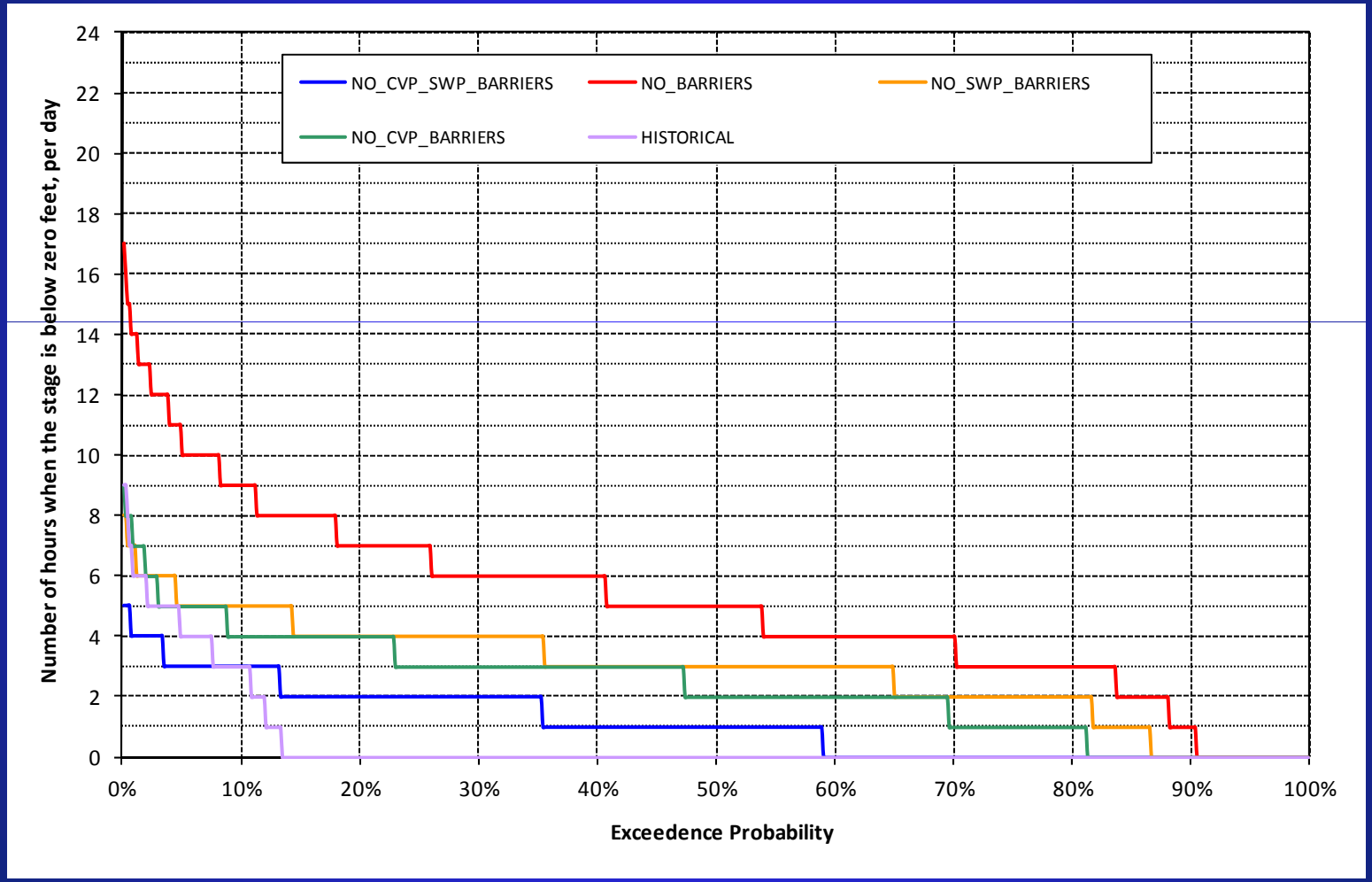
Old River at Tracy Road (July)



Preliminary results, subject to change.

Next Steps

- Continue to QA/QC the model results.
- Compare model results with the historical data.
- Develop a strategy for approaching SWRCB regarding the responsibility of SWP and CVP on the changes of stage and water circulation in South Delta.

Acknowledgement

- En-Ching Hsu, DWR
- Eli Ateljevich, DWR

Thank You!

Comments/Questions?