CDFW - Sites 60 day Evaluation Meeting No. 9 (extended): Meeting Agenda and Action Items

Sites Reservoir Project

Date: *July 23, 2019*

Location: *Jacobs Office: 2485 Natomas Park Drive, Suite 600, or Skype with conference call: (866) 203-7023*
Code: 2150376387

Time: 9:30 am – 1:00 pm

Purpose: Continue 60 day evaluation of Operational Scenarios.

Invitees:

Rob Thomson, Sites Authority	Ken Kundargi- CDFW	Felipe La Luz – CDFW
Kevin Spesert, Sites Authority	Johnathan Williams, CDFW	Chris Fitzer, ESA Associates
Ali Forsythe, Sites Authority	Lenny Grimaldo, ICF	Rob Tull, Jacobs
Duane Linander, CDFW	Marin Greenwood, ICF	Reed Thayer, Jacobs
Kristal Davis Fadtke, CDFW	Jim Lecky, ICF	Chad Whittington, Jacobs
Ian Boyd, CDFW	Mike Dietl, Reclamation	John Spranza, HDR
		Jelica Arsenijevic, HDR

Action Item		Owner	Deadline	Notes
1	Schedule presentation on CalSim and DSM2 and how Delta is performing.	CH2	7/23/2019	Current Presentation
2	Sutter Bypass Analysis	Authority/CH	7/23/2019	TBD –
3	Initiate discussions with CDFW, River Partners and other NGO's to talk about possible effects of projects.	Authority	After July	Ongoing task item
4	Potential Sturgeon analysis	Jacobs/ICF	TBD	At RBDD and GCID – to talk as team
5	Send out Presentation	HDR	7/18/19	Complete

Agenda:

Discussion Topic	Topic Leader	Est Time
1. Roll Call a. Opeing statements	Ali Forsythe Kristal Davis Fadtke	5 min
2. Review of Action Items from Previous Meeting	Ali Forsythe	10 min

3.	Delta CalSim and DSM2 Analysis Part 1	Rob Tull	60 min
4.	Break		10 min
5.	Delta CalSim and DSM2 Anlysis Part 2	Rob Tull	60 min
6.	Discuss Results of Operational Scenarios	Group discussion	30 min
7.	Next steps for 60 day schedule	Group discussion	15 min

Sites Project: Daily Model Analysis

Flow Availability Tool Assumptions

2009 - 2018

California Department of Fish and Wildlife

July 23, 2019

Flow Availability Tool

- Determines daily flow available for diversion to Sites Reservoir, subject to hydrology and regulations outside the scope of Sites Project operations for October 1st, 2008 – May 31st, 2018
  - Period consistent with implementation of NMFS's RPA from the 2009 BiOp
- Flow availability is computed using historical records and accounting for current flow requirements
  - Delta balance conditions from COA reports
  - Term 91 conditions
  - Delta outflow requirements
  - Export/Inflow ratio constraint
  - San Joaquin River exports
  - Health and safety requirements
  - Fall X2
  - Spring X2
  - Jersey Point, Emmaton, Rio Vista water quality standards

Historical Data Compilation for the Flow Availability Tool

- USGS Daily Flow
  - American River at Fair Oaks
  - Sacramento tributary flow (inputs for USRDOM)
- CDEC Daily Data
  - San Luis storage from WY 2007 through May 2018
  - Feather River flow
- Reclamation Data (inputs for USRDOM)
- Outputs from the USRDOM HindCast Model
- CVO COA Reports from WY 2008 through November 2017
- Dayflow from WY 2008 through WY 2017

Historical Data Compilation for the Flow Availability Tool

- Delta Operations for Salmonids and Sturgeon (DOSS) meeting summaries from January 2009 through June 15th 2018
- Smelt Working Group (SWG) meeting summaries from January 2009 through June 15th 2018
- Delta Assessment Team (DAT) Summaries from January 2009 through June 15th 2018
- Water Operations Management Team (WOMT) from January 2009 through June 15th 2018
- SWRCB Term 91 indicator data from January 2007 through May 2018

Flow Availability Constraints

Delta Balance Conditions

- Flow is unavailable when the Delta is in “Balanced” conditions, as defined by CVO COA
- Conversely, flow is available when the Delta is in “Excess” conditions

Term 91 Conditions

- Flow is unavailable when Term 91 is in effect
- A Term 91 Curtailment Notice is triggered when:
  1. Supplemental Project Water is needed to meet water quality objectives
  2. The Delta is in "Balanced Condition"

Start Date	End Date
8/2/2012	8/31/2012
5/7/2013	9/20/2013
10/30/2013	12/31/2013
1/12/2014	3/14/2014
5/20/2014	11/16/2014
4/30/2015	12/14/2015
6/2/2016	10/14/2016
6/1/2018	11/30/2018

Term 91 Effective Dates (SWRCB, 2019).

Delta Outflow Requirements

- SWRCB's D1641 Delta outflow objectives:

	Minimum Delta Outflow D1641 Objectives (Flow; cfs)				
Month	W	AN	BN	D	C
1	4,500	4,500	4,500	4,500	4,500
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	8,000	8,000	6,500	5,000	4,000
8	4,000	4,000	4,000	3,500	3,000
9	3,000	3,000	3,000	3,000	3,000
10	4,000	4,000	4,000	4,000	3,000
11	4,500	4,500	4,500	4,500	3,500
12	4,500	4,500	4,500	4,500	3,500

Delta Outflow Requirements from D1641 by month (Jan – Dec) and by WYT

Delta Outflow Requirements

- If the Delta Outflow monthly requirement is less than 5,000 cfs, then the 7-day running average Delta Outflow must be within 1,000 cfs of the standard for flow to be available for Sites diversion
- If the monthly standard is greater than 5,000 cfs, then the 7-day running average Delta Outflow must be greater than 80% of the standard

Delta Outflow Requirements

- If $DO_{MinReq} <= 5{,}000$ cfs:
  - $DO_{avail} = DO_{7da} - DO_{MinReq} + 1{,}000$
- If $DO_{MinReq} > 5{,}000$ cfs:
  - $DO_{avail} = DO_{7da} - 0.8 * DO_{MinReq}$
    - Where:
      - DO_{7da} = Delta Outflow 7-day running average (cfs)
      - DO_{MinReq} = D1641 minimum flow requirement for Delta Outflow (cfs)

Rio Vista Flow Requirement

- Monthly flow objectives for the Sacramento River at Rio Vista are prescribed by D1641:

	Minimum Rio Vista D1641 Objectives (Flow; cfs)				
Month	W	AN	BN	D	C
1	None	None	None	None	None
2	None	None	None	None	None
3	None	None	None	None	None
4	None	None	None	None	None
5	None	None	None	None	None
6	None	None	None	None	None
7	None	None	None	None	None
8	None	None	None	None	None
9	3,000	3,000	3,000	3,000	3,000
10	4,000	4,000	4,000	4,000	3,000
11	4,500	4,500	4,500	4,500	3,500
12	4,500	4,500	4,500	4,500	3,500

Rio Vista Flow Requirements from D1641 by month (Jan – Dec) and by WYT

Rio Vista Flow Requirement

- The 7-day running average of Sacramento River flow at Rio Vista shall not be less than 1,000 cfs below the monthly objective
- $RV_{avail} = RV_{7da} - \left(RV_{MinReq} - 1{,}000\right)$
  - Where:
    - RV_{flow} =7-day running average of Sacramento River flow at Rio Vista (cfs)
    - RV_{MaxReq} = D1641 minimum flow requirement at Rio Vista (cfs)

Export/Inflow (E/I) Ratio

Month	Export/Inflow Ratio Standards
1	0.65
2	Varies based on January 8RI
3	0.35
4	0.35
5	0.35
6	0.35
7	0.65
8	0.65
9	0.65
10	0.65
11	0.65
12	0.65

Export/Import Ratio Standards from D1641 by month (Jan – Dec)

January Eight River Runoff	February E/I Ratio
0	0.45
1	0.45
1.5	0.35
99	0.35

February Export/Import Ratio based on the January 8RI Scale

Water Year	January Eight River Runoff	February E/I Ratio
2008	1.7	0.35
2009	0.96	0.45
2010	2.48	0.35
2011	2.1	0.35
2012	0.96	0.45
2013	1.34	0.38
2014	0.36	0.45
2015	0.79	0.45
2016	3.67	0.35
2017	8.53	0.35
2018	8.53	0.35

February Export/Import Ratio Standard

Export/Inflow (E/I) Ratio

- $EI_{avail} = Delta_{Inflow} - \frac{(Banks_P + Jones_P)}{EI_{Standard}}$
  - Where:
    - $Delta_{Inflow}$ = Delta Inflow (cfs)
    - $Banks_P$ = Banks Pumping (cfs)
    - $Jones_P$ = Jones Pumping (cfs)
    - $EI_{Standard}$ = Export/Inflow standard (from table on previous slide)

Spring X2

- From February through June, flow available under the Spring X2 requirement, using the Kimmerer-Monismith equation:
  - $X2_{S,avail} = Delta_{Outflow} - MAX\left(MIN\left(10^{-\frac{\left(X2_{S,Req}-10.16-0.945*X2_D\right)}{1.487}}, 11{,}400\right), X2_{PMI}\right)$
    - Where:
      - $Delta_{Outflow}$ = Delta Outflow (cfs)
      - $X2_{S,Req}$ = Spring X2 requirement based on number of days when maximum daily average EC of 2.64 mmhos/cm must be maintained at Chipps Island
      - $X2_D$ = Estimated distance from Golden Gate to 2 ppt salinity (per D1641)
      - In May or June and the Previous Month Index (PMI) is less than 81,000, then:
        - $X2_{PMI} = 4{,}000\ cfs$
      - Else:
        - $X2_{PMI} = 7{,}100\ cfs$

Fall X2

- From September through October, USFWS BiOp Action 4 requires an average X2 no greater than 74 kilometers following wet years and 81 kilometers following above normal years
- $X2_{F,avail} = Delta_{Outflow} - MAX\left(MIN\left(10^{-\frac{\left(X2_{F,Req}-10.16-0.945*X2_D\right)}{1.487}}, 11{,}400\right), 0\right)$
  - Where:
    - $X2_D$ = Estimated distance from Golden Gate to 2 ppt salinity (per D1641)
    - In September – October:
      - $X2_{F,Req}$ = 74km in Wet Years
        = 81km in Above Normal Years
    - In November – August:
      - $X2_{F,Req}$ = 0km

Salinity Control

- Flow is unavailable for the seven days preceding an event when the historic EC level exceeds the maximum salinity standard (D1641) at any of the following locations:
  - Emmaton
  - Jersey Point
  - Collinsville
  - Rock Slough

Emmaton EC Standards (based on D1641)

	Emmaton D1641 Maximum Salinity (UMHOS/CM)				
Month	W	AN	BN	D	C
1	None	None	None	None	None
2	None	None	None	None	None
3	None	None	None	None	None
4	450	450	450	450	2,780
5	450	450	450	450	2,780
6	450	450	680	1,060	2,780
7	450	630	1,140	1,670	2,780
8	1,650	1,740	1,990	2,240	2,780
9	None	None	None	None	None
10	None	None	None	None	None
11	None	None	None	None	None
12	None	None	None	None	None

Jersey Point EC Standards (based on D1641)

	Jersey Point D1641 Max Salinity (UMHOS/CM)				
Month	W	AN	BN	D	C
1	None	None	None	None	None
2	None	None	None	None	None
3	None	None	None	None	None
4	450	450	450	450	2,200
5	450	450	450	450	2,200
6	450	450	550	900	2,200
7	450	450	740	1,350	2,200
8	1,350	1,350	1,490	1,790	2,200
9	None	None	None	None	None
10	None	None	None	None	None
11	None	None	None	None	None
12	None	None	None	None	None

Collinsville EC Standards (based on D1641)

	Collinsville D1641 Maximum Salinity (UMHOS/CM)				
Month	W	AN	BN	D	C
1	12,500	12,500	12,500	12,500	12,500
2	8,000	8,000	8,000	8,000	8,000
3	8,000	8,000	8,000	8,000	8,000
4	11,000	11,000	11,000	11,000	11,000
5	11,000	11,000	11,000	11,000	11,000
6	None	None	None	None	None
7	None	None	None	None	None
8	None	None	None	None	None
9	None	None	None	None	None
10	19,000	19,000	19,000	19,000	19,000
11	15,500	15,500	15,500	15,500	15,500
12	15,500	15,500	15,500	15,500	15,500

Rock Slough EC Standards (based on D1641)

	Rock Slough D1641 Max Salinity (mg/l CL-)				
Month	W	AN	BN	D	C
1	130	225	225	172	172
2	130	130	130	130	130
3	130	130	130	130	130
4	130	130	130	130	130
5	130	130	130	130	130
6	130	130	130	130	130
7	130	130	130	130	172
8	130	151	225	225	225
9	225	225	225	225	225
10	225	225	225	225	225
11	225	225	225	225	225
12	225	225	225	225	225

Health & Safety Standards

- Flow availability requires compliance to the Borderline Health and Safety Condition that specifies that when San Luis Reservoir storage is below capacity, there must be enough inflow to support at least 1,500 cfs of Delta exports
- San Luis Reservoir storage capacity =1 MAF
- Delta exports = sum of Jones and Banks pumping

- If Delta export is less than 1,500 cfs and the current month is within January through June, then:
  - $HS_{avail} = MIN\left(Sac_F, DO_{avail}, RV_{avail}, EI_{avail}, X2_{S,avail}, X2_{F,avail}, Salinity_{avail}\right)$
- Else:
  - $HS_{avail} = 0$

Controlling Constraints

Flow Availability Controls October 1, 2008 – May 31, 2018 (number of instances)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
E/I	21	34	37	64	91	117	36	20	78	0	10	0	508
H&S	0	0	0	0	0	3	0	0	0	0	0	0	3
Delta Outflow	39	42	8	86	0	0	0	0	0	62	52	0	289
Balanced Conditions	234	197	199	103	84	40	93	130	174	217	217	235	1,923
Term 91	0	0	0	0	8	13	0	0	0	0	0	0	21
Spring X2	0	0	0	0	71	100	93	81	18	0	0	0	363
Fall X2	11	18	0	0	0	0	0	0	0	0	0	35	64
EC	0	0	23	0	0	0	4	0	0	0	0	0	27
Rio Vista Flow	5	9	31	0	0	0	0	0	0	0	0	0	45
Main Control	Balance	Balance	Balance	Balance	E/I	E/I	Balance	Balance	Balance	Balance	Balance	Balance	Balance

*This table shows the number of days that each constraint controls flow availability throughout the Daily Modeling period (October 1, 2008 – May 31, 2018)

*Main Control = constraint that most often controls flow availability

Delta Availability Calculation

- If the Delta is in Balanced Conditions (as indicated in the COA report) or Term 91 is in effect, then:
  - $Delta_{Avial} = 0$

Delta Availability Calculation

- If the Delta is in Excess Conditions (as indicated in the COA report) and Term 91 is not in effect, then:
  - $Delta_{Avial} = Min(Sac_F + YOLO, DO_{avail}, RV_{avail}, EI_{avail}, X2_{S,avail}, Salinity_{avail}, X2_{F,avail}, HS_{avail})$
- Where:
  - Sac_F = Sacramento River at Freeport
  - *YOLO* = Yolo Bypass outflow to Delta
  - DO_{avail} = Flow available under Delta Outflow requirements (D1641)
  - RV_{avail} = Flow available under the Rio Vista minimum flow requirement (D1641)
  - EI_{avail} = Flow available constrained by the Export/Inflow Ratio (D1641)
  - $X2_{S,avail}$ = Flow available under the Spring X2 flow requirement (D1641)
  - $Salinity$ = Flow available under salinity requirements (D1641); using Emmaton, Rock Slough, Jersey Point, and Collinsville as assumed controlling stations
  - $X2_{F,avail}$ = Flow available under the Fall X2 flow requirement (RPA)

Flow Availability Calculation at Red Bluff

$$\boldsymbol{Sac_{Avail,RB} = Min[Min[Sac_{KL}, Sac_{ws}, Sac_C, Sac_{RB}, Sac_{HC}, Sac_D] - Ctrl_{ws}, Sac_{out}, Delta_{Avail}]}$$

- Definitions:
  - $Sac_{Avail,RB}$ = Sacramento River Availability at Red Bluff
  - $Ctrl_{ws} = Min(5{,}000, Sac_{WS})$ = Navigation Control Point
  - $Sac_{out} = Sac_F + Weir_{Sac} + Weir_{Fr}$ = Sacramento River at Freeport plus Sacramento Weir spill and Fremont Weir spill
  - Sac_{KL} = Sacramento River at Knights Landing
  - Sac_{WS} = Sacramento River at Wilkins Slough
  - Sac_C = Sacramento River at Colusa
  - Sac_{RB} = Sacramento River at Red Bluff
  - Sac_{HC} = Sacramento River at Hamilton City
  - Sac_D = Sacramento River at Delevan
  - Sac_F = Sacramento River at Freeport
  - $Delta_{Avial}$ = Flow availability based on constraining Delta assumptions described above

Flow Availability Calculation at Hamilton City

$$\boldsymbol{Sac_{Avail,HC} = Min[Min[Sac_{KL}, Sac_{ws}, Sac_C, Sac_{HC}, Sac_D] - Ctrl_{ws}, Sac_{out}, Delta_{Avail}]}$$

- Definitions:
  - $Sac_{Avail,HC}$ = Sacramento River Availability at Hamilton City
  - $Ctrl_{ws} = Min(5{,}000, Sac_{WS})$ = Navigation Control Point
  - $Sac_{out} = Sac_F + Weir_{Sac} + Weir_{Fr}$ = Sacramento River at Freeport plus Sacramento Weir spill and Fremont Weir spill
  - Sac_{KL} = Sacramento River at Knights Landing
  - Sac_{WS} = Sacramento River at Wilkins Slough
  - Sac_C = Sacramento River at Colusa
  - Sac_{RB} = Sacramento River at Red Bluff
  - Sac_{HC} = Sacramento River at Hamilton City
  - Sac_D = Sacramento River at Delevan
  - Sac_F = Sacramento River at Freeport
  - $Delta_{Avial}$ = Flow availability based on constraining Delta assumptions described above

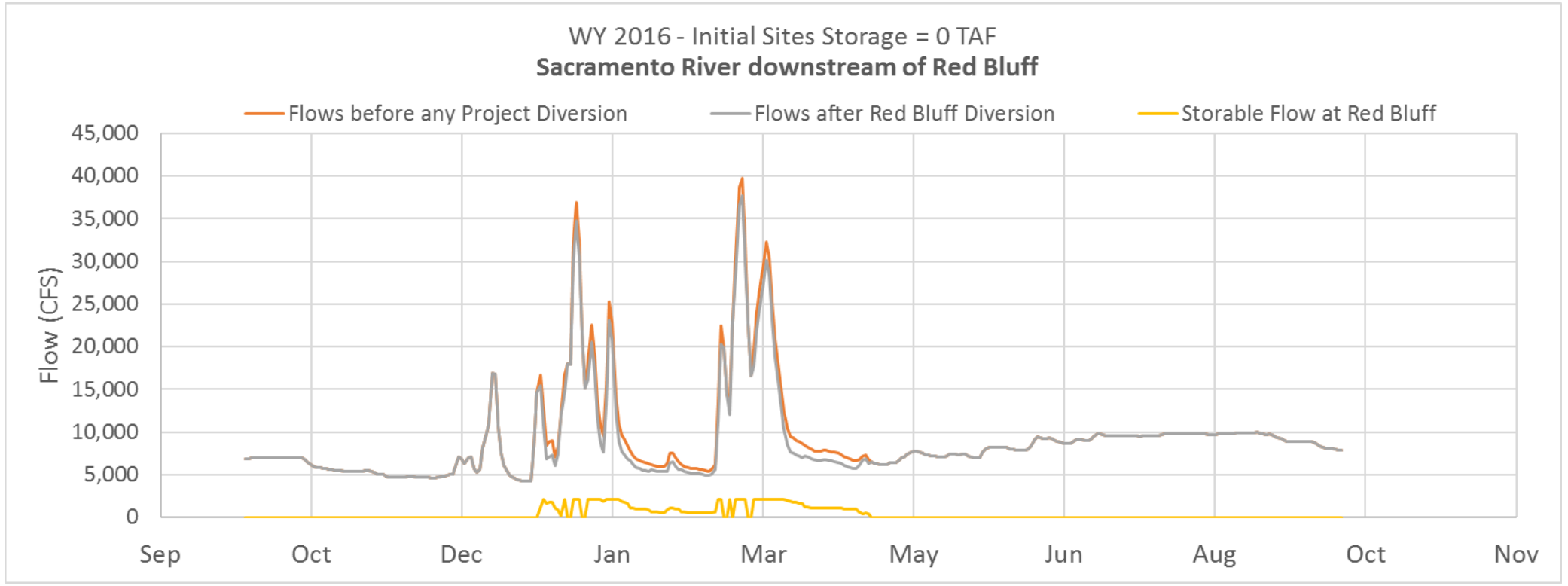
Flow Availability Calculation at Delevan

$$\boldsymbol{Sac_{Avail,D} = Min[Min[Sac_{KL}, Sac_{ws}, Sac_C, Sac_D] - Ctrl_{ws}, Sac_{out}, Delta_{Avail}]}$$

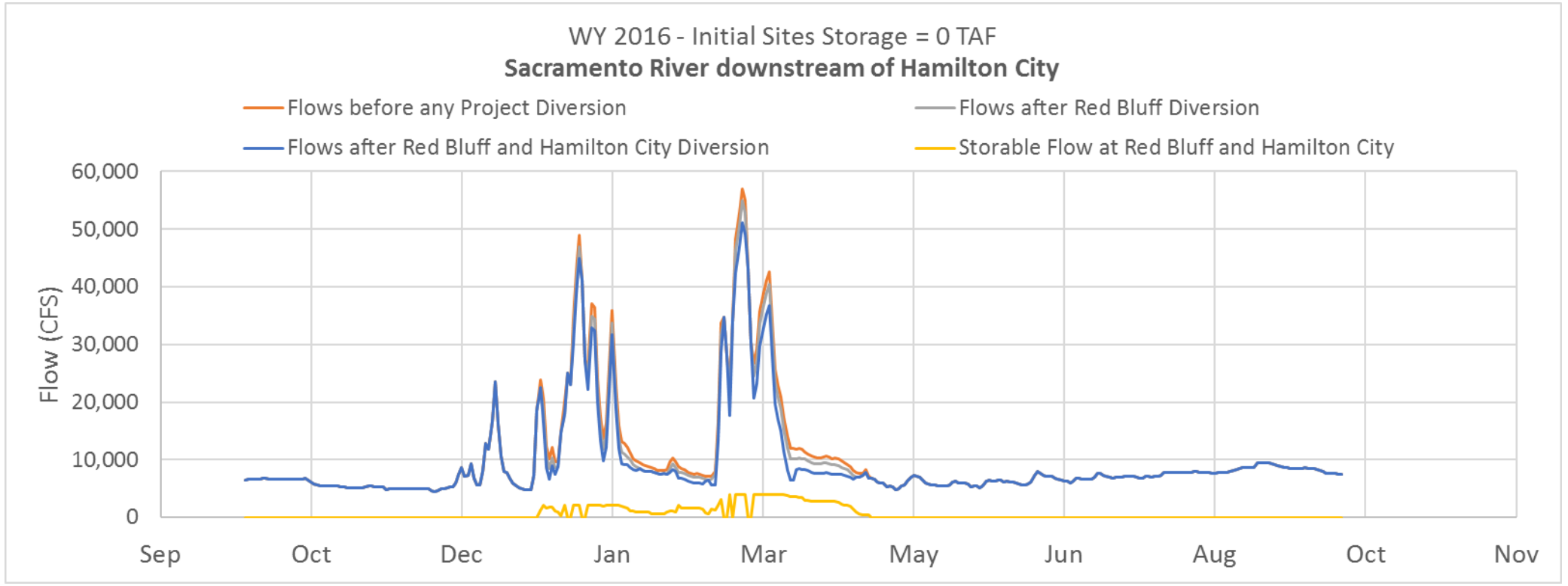
- Definitions:
  - $Sac_{Avail,HC}$ = Sacramento River Availability at Hamilton City
  - $Ctrl_{ws} = Min(5{,}000, Sac_{WS})$ = Navigation Control Point
  - $Sac_{out} = Sac_F + Weir_{Sac} + Weir_{Fr}$ = Sacramento River at Freeport plus Sacramento Weir spill and Fremont Weir spill
  - Sac_{KL} = Sacramento River at Knights Landing
  - Sac_{WS} = Sacramento River at Wilkins Slough
  - Sac_C = Sacramento River at Colusa
  - Sac_{RB} = Sacramento River at Red Bluff
  - Sac_{HC} = Sacramento River at Hamilton City
  - Sac_D = Sacramento River at Delevan
  - Sac_F = Sacramento River at Freeport
  - $Delta_{Avial}$ = Flow availability based on constraining Delta assumptions described above

Sites Diversion Effects on Sacramento River and Delta

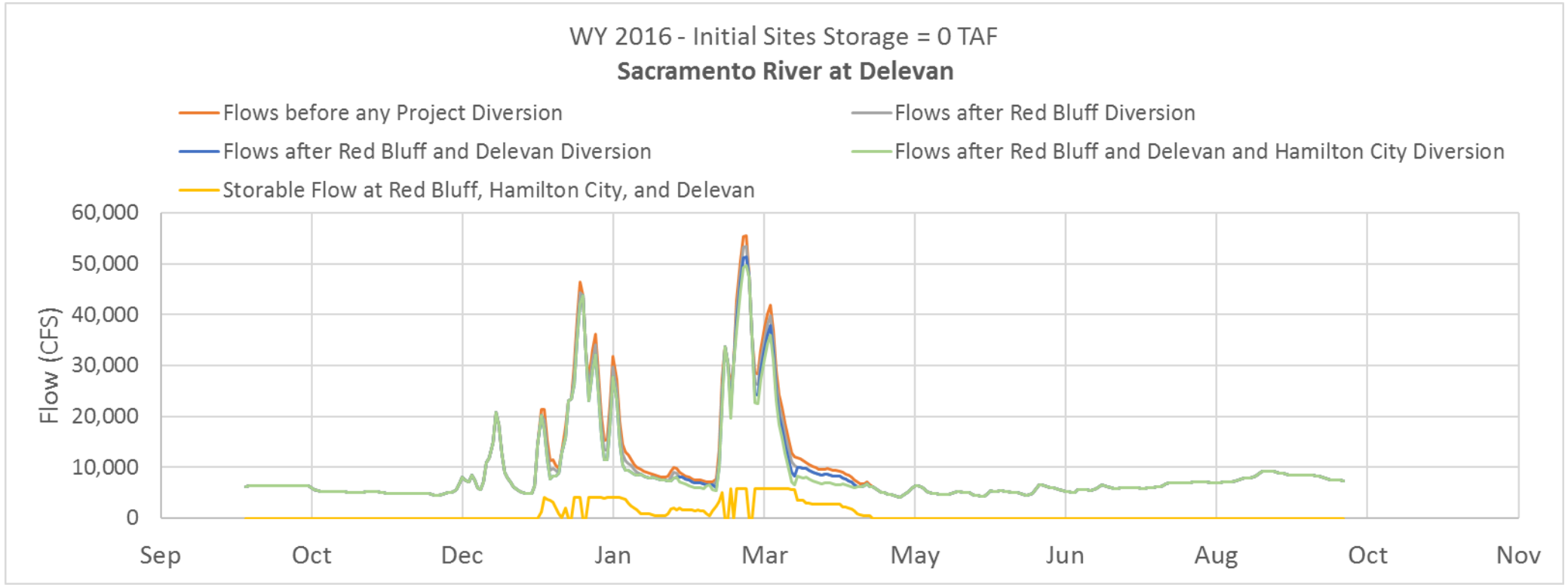
Red Bluff – WY 2016 (BN)



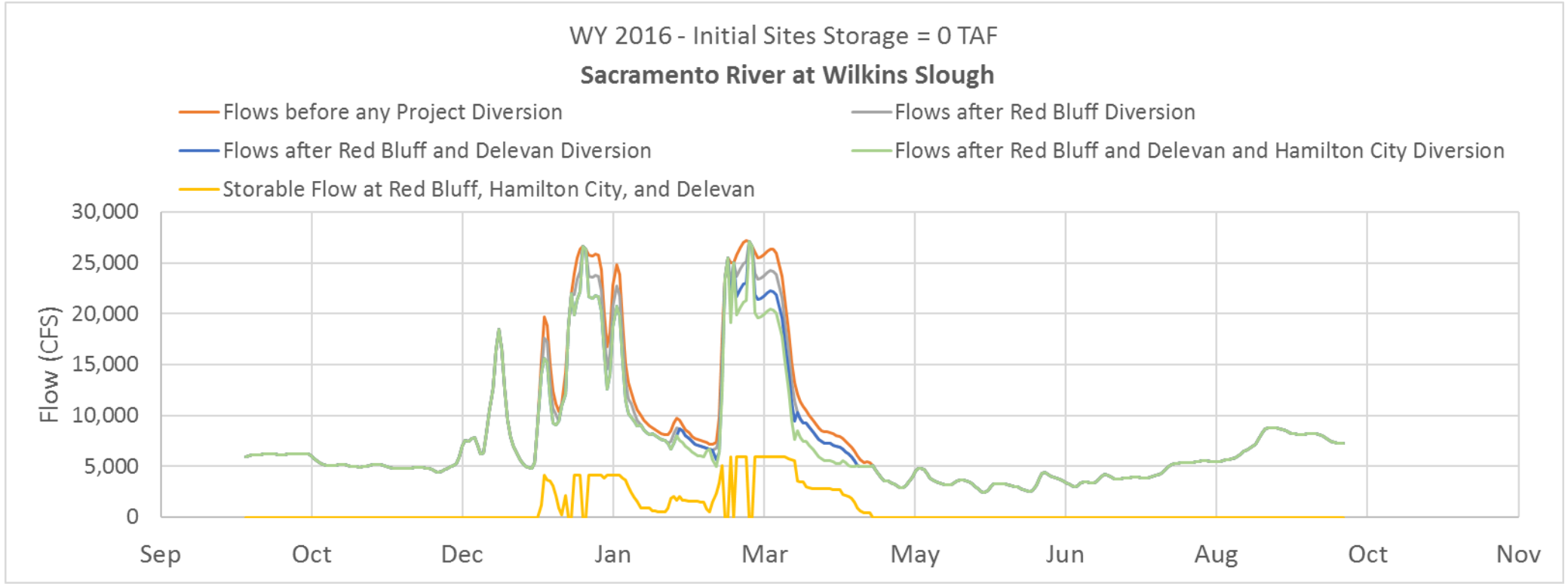
Hamilton City – WY 2016 (BN)



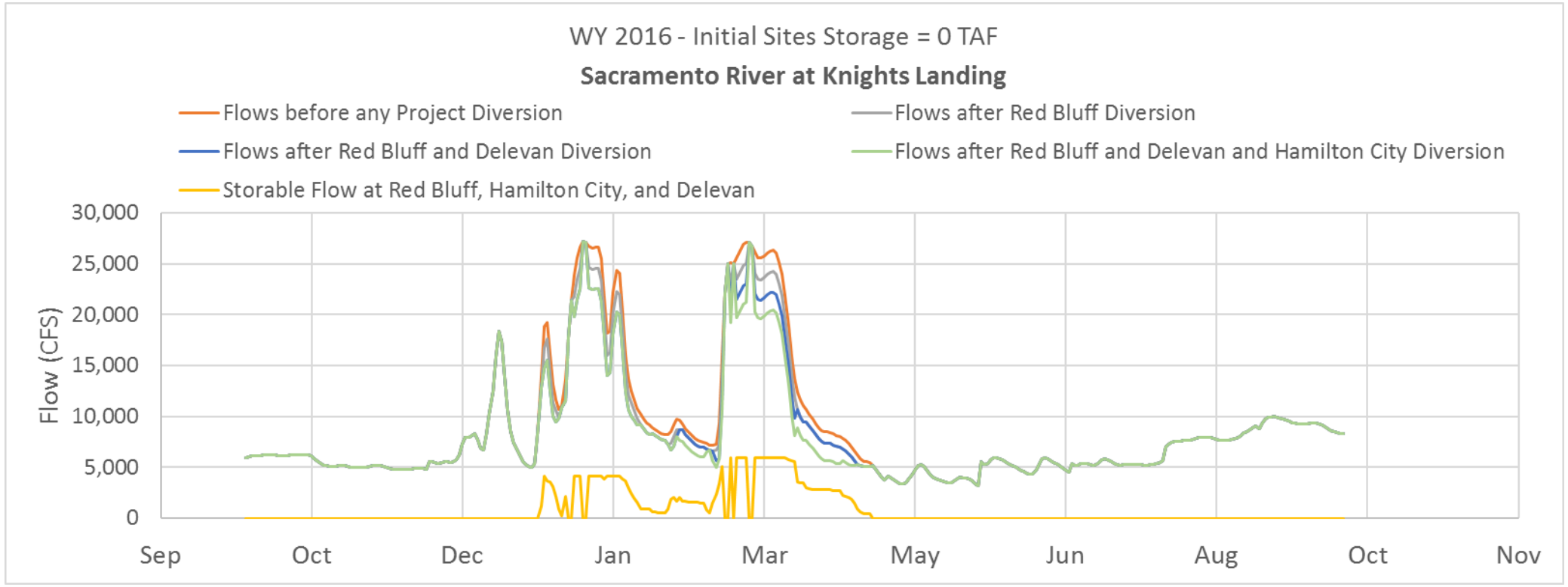
Delevan – WY 2016 (BN)



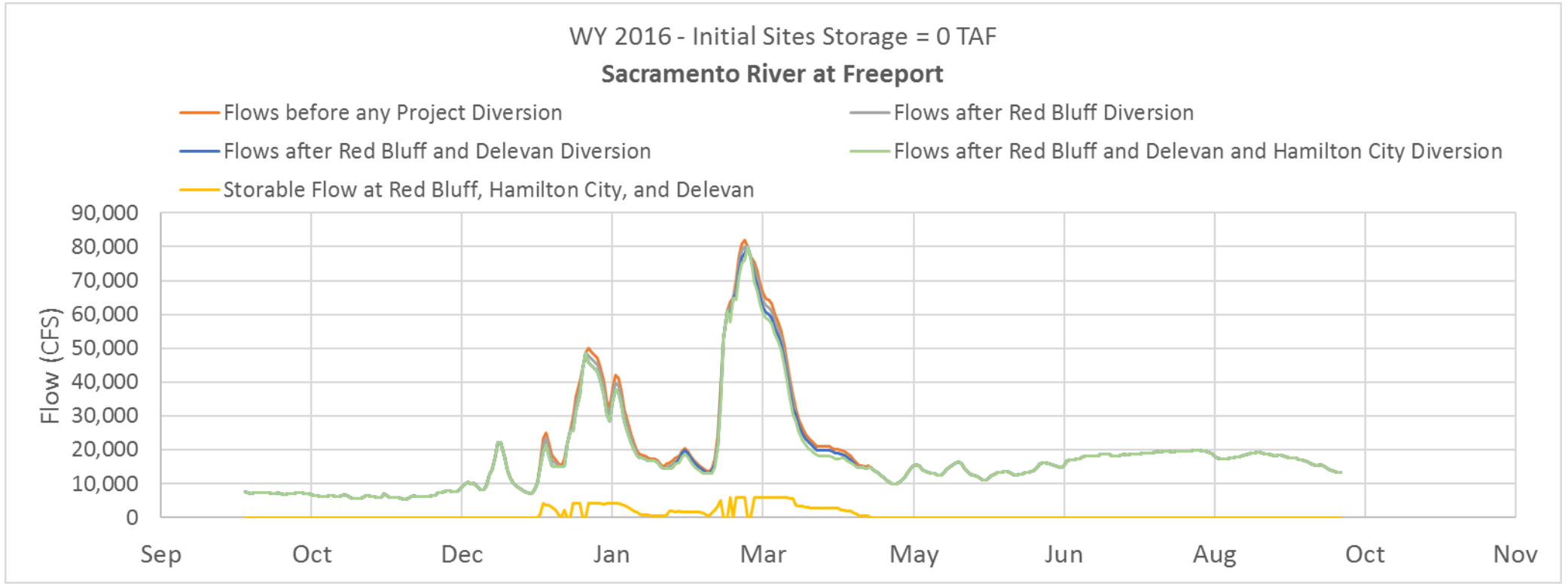
Wilkins Slough – WY 2016 (BN)



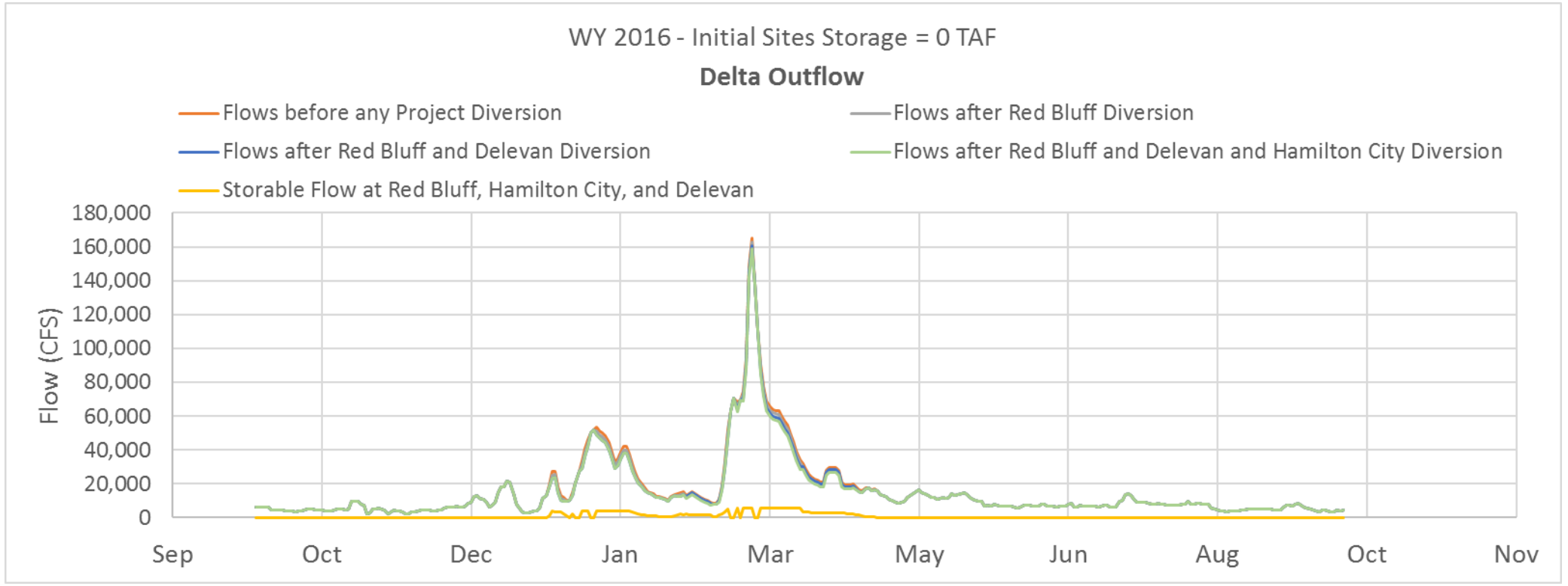
Knights Landing – WY 2016 (BN)



Freeport – WY 2016 (BN)



Delta Outflow – WY 2016 (BN)



Next Steps

- Estimation of upstream weir spills (Moulton, Tisdale, and Colusa)
- Implementation of the Fremont Weir Notch
- Calculation of Net Delta Outflow Index
- Calculation of X2 position

Sites Project: DSM2 Assumptions and Results

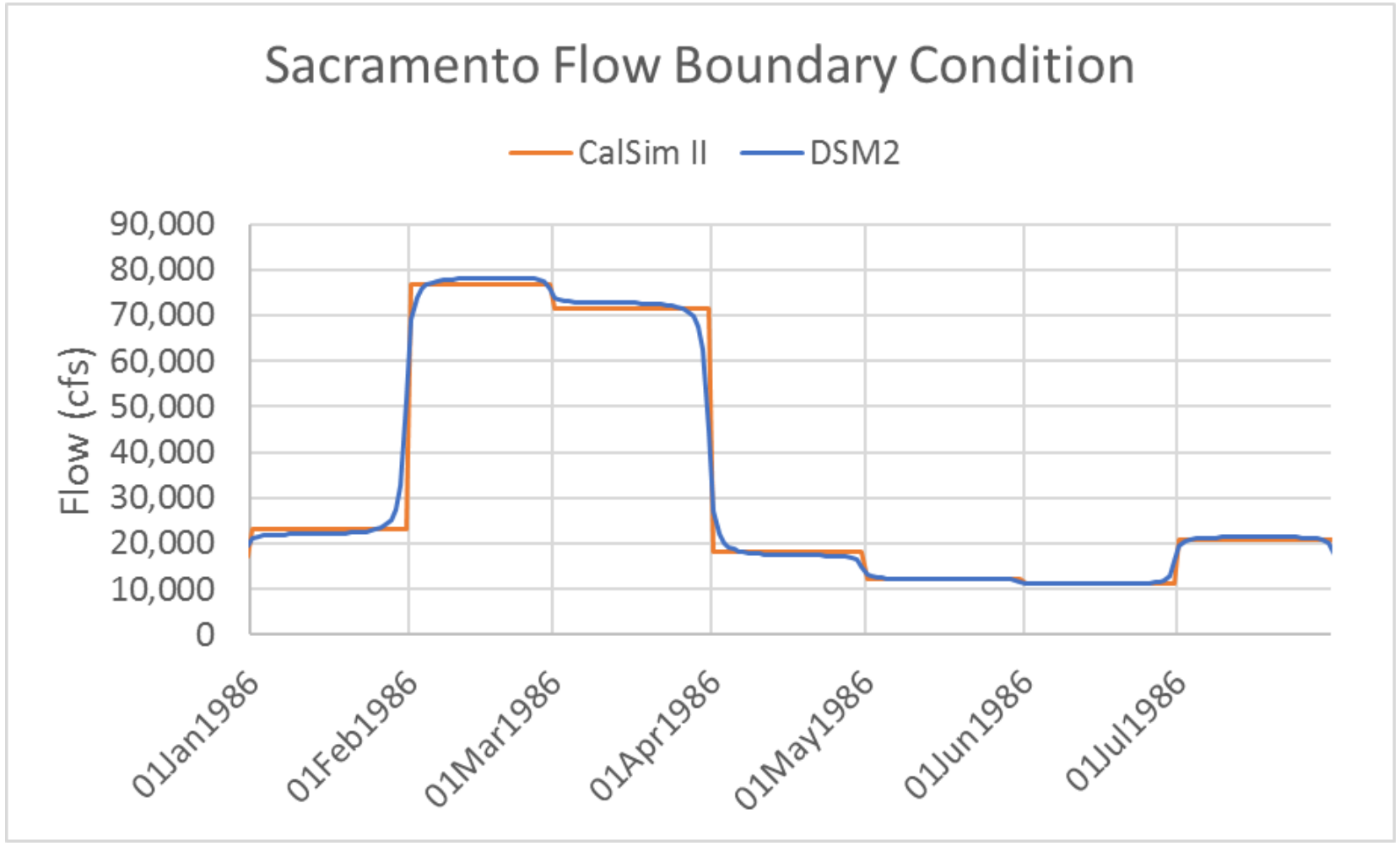
California Department of Fish and Wildlife

July 23, 2019

CalSim II to DSM2

- Monthly CalSim II results are converted to daily DSM2 inputs
  - Daily values equal monthly average
  - Beginning and end of months are splined for continuity
- Main Connections:
  - Sacramento River
  - Yolo Bypass
  - San Joaquin River
  - East Side Streams (Consumnes, Calaveras, and Mokelumne Rivers)
  - Jones and Banks Exports
- Martinez EC is estimated based on Delta Outflow (from CalSim II)

Example of CalSim II to DSM2 Flow



CalSim II to DSM2 – Hydraulic Structures

- Delta Cross Channel Gates
  - Gate operations are consistent with CalSim II operations
- Suisun Marsh Salinity Control Gates
  - May operate from October through March, depending on salinity
- South Delta Temporary Barriers
  - Seasonal operation is a DSM2 input

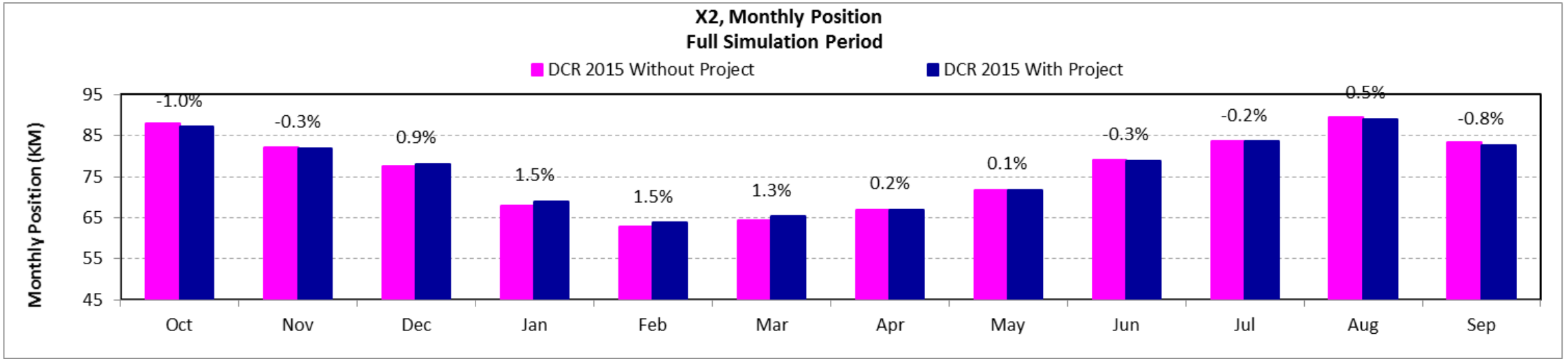
Main Assumptions, per DCR 2015

- D1641
  - All flow requirements
  - Salinity at Emmaton, Jersey Point, Rock Slough, and Collinsville
- Biological Opinions
  - USFWS Delta Smelt BO Actions
  - NMFS BO Salmon Actions
  - Fall X2
  - OMR flows

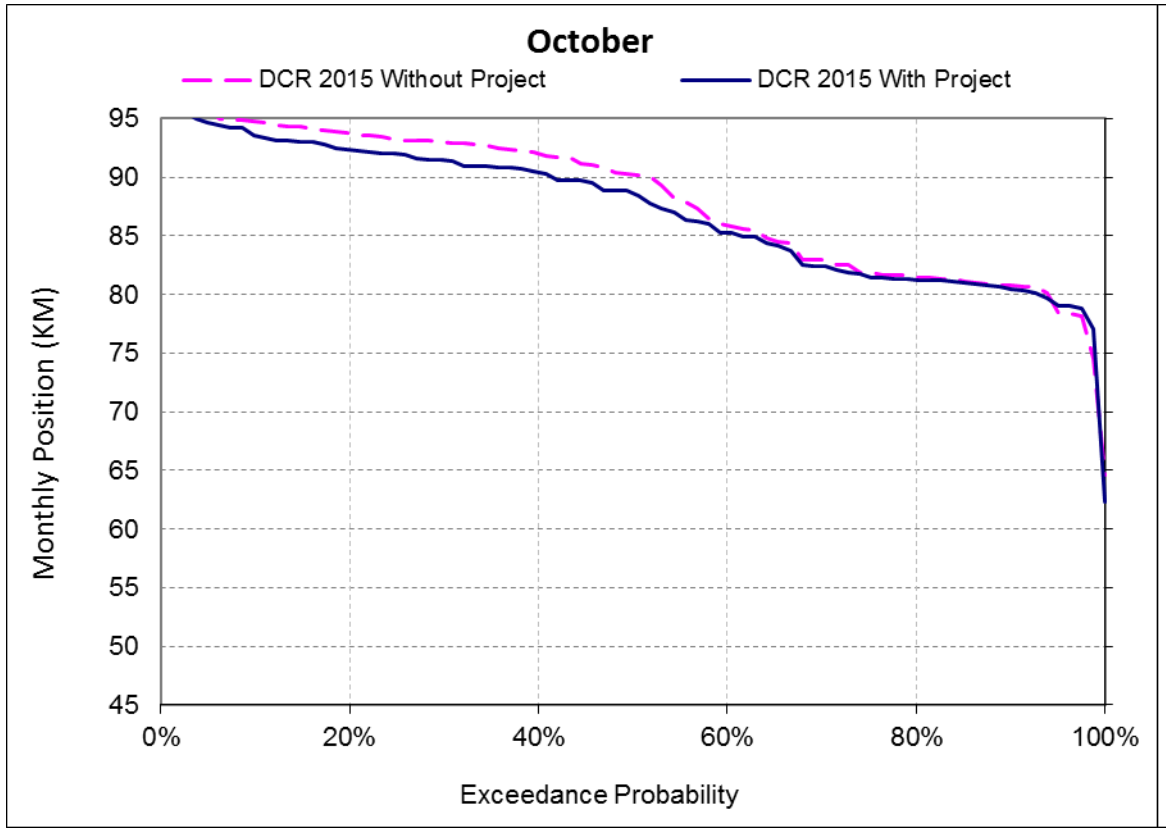
CalSim II Artificial Neural Network

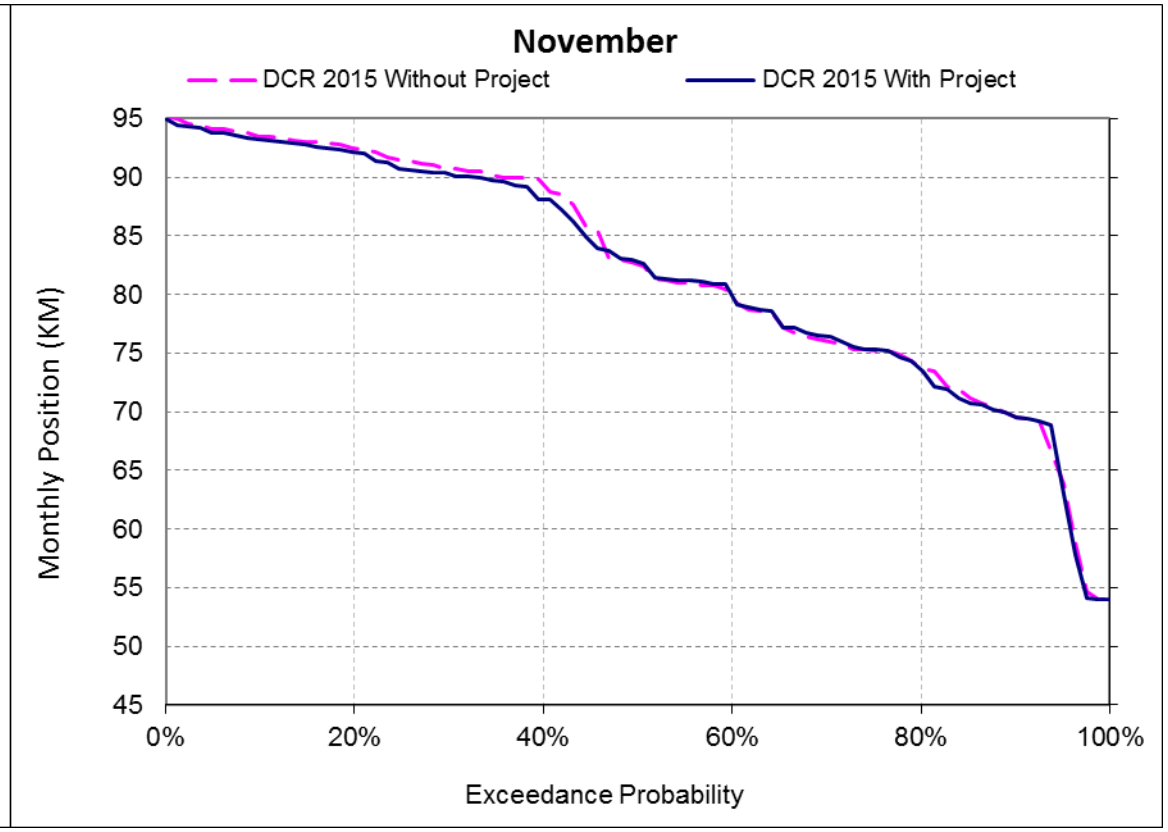
- Salinity requirements are met by CalSim II
- CalSim II estimates EC at control points using an artificial neural network (ANN)
- The ANN must be re-trained when physical conditions cause EC response to flow changes
  - Climate condition, sea level rise, or restoration opportunity areas

DSM2 Results – X2

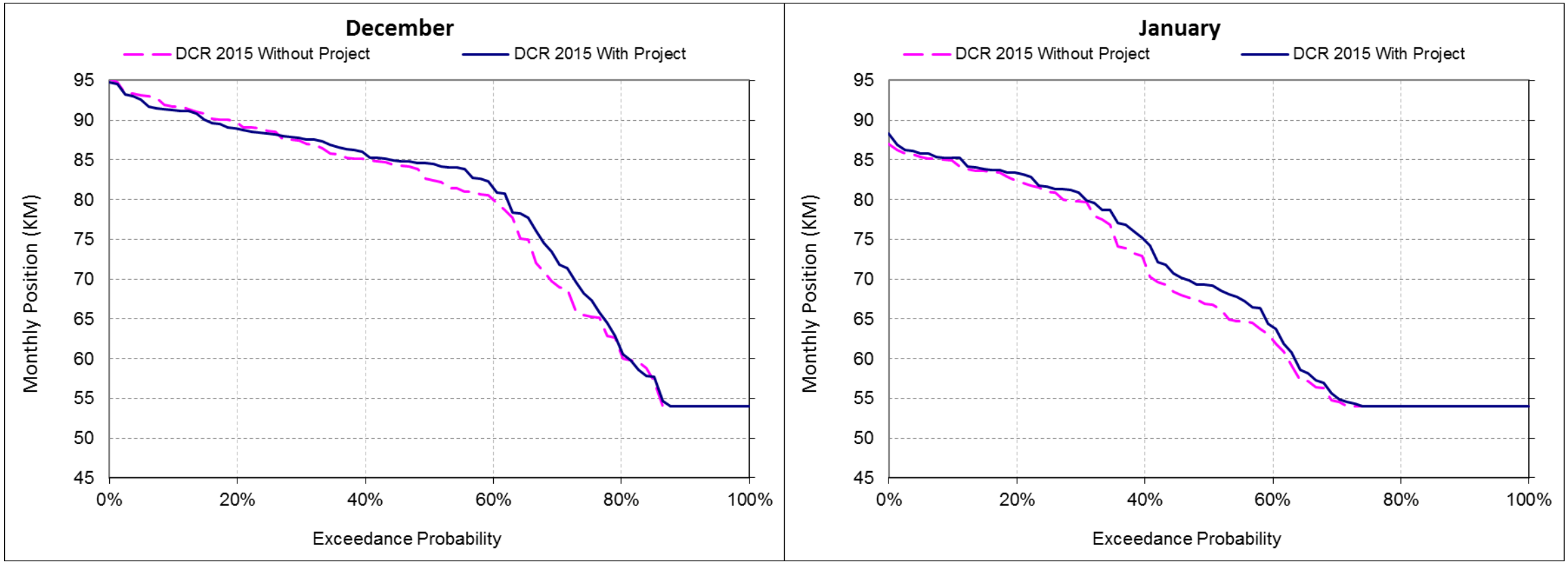


DSM2 Results – X2 – Oct-Nov

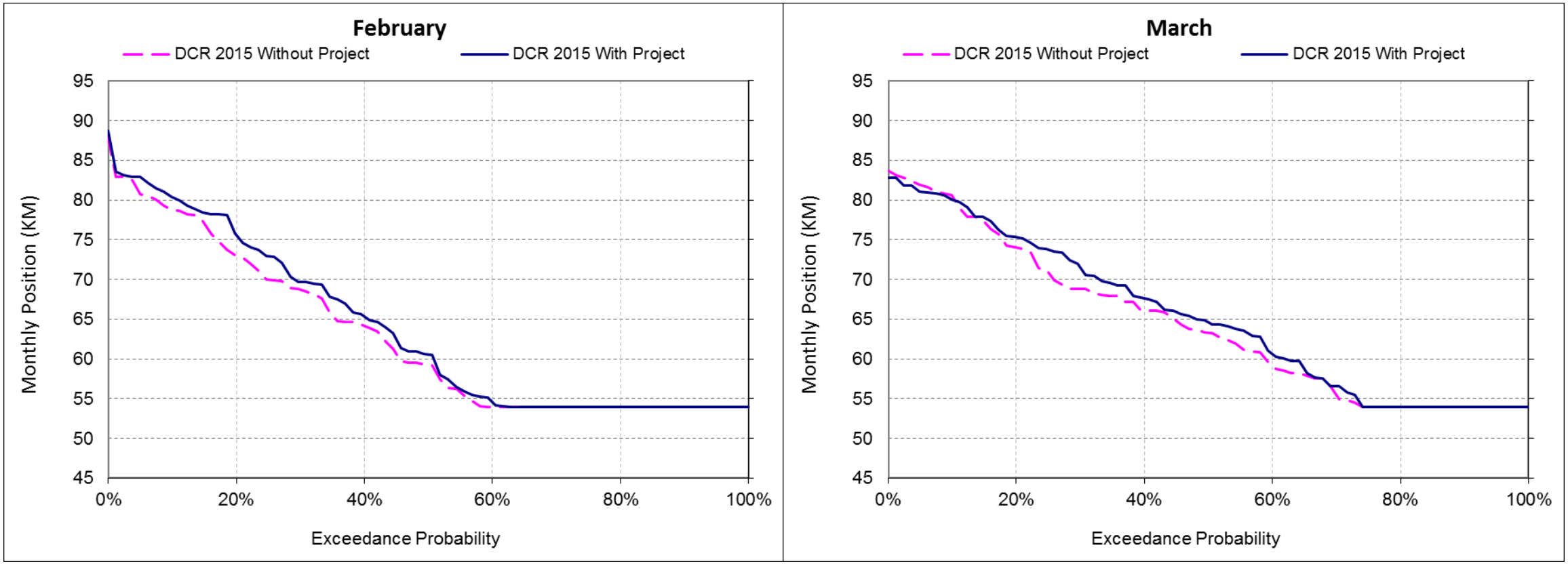




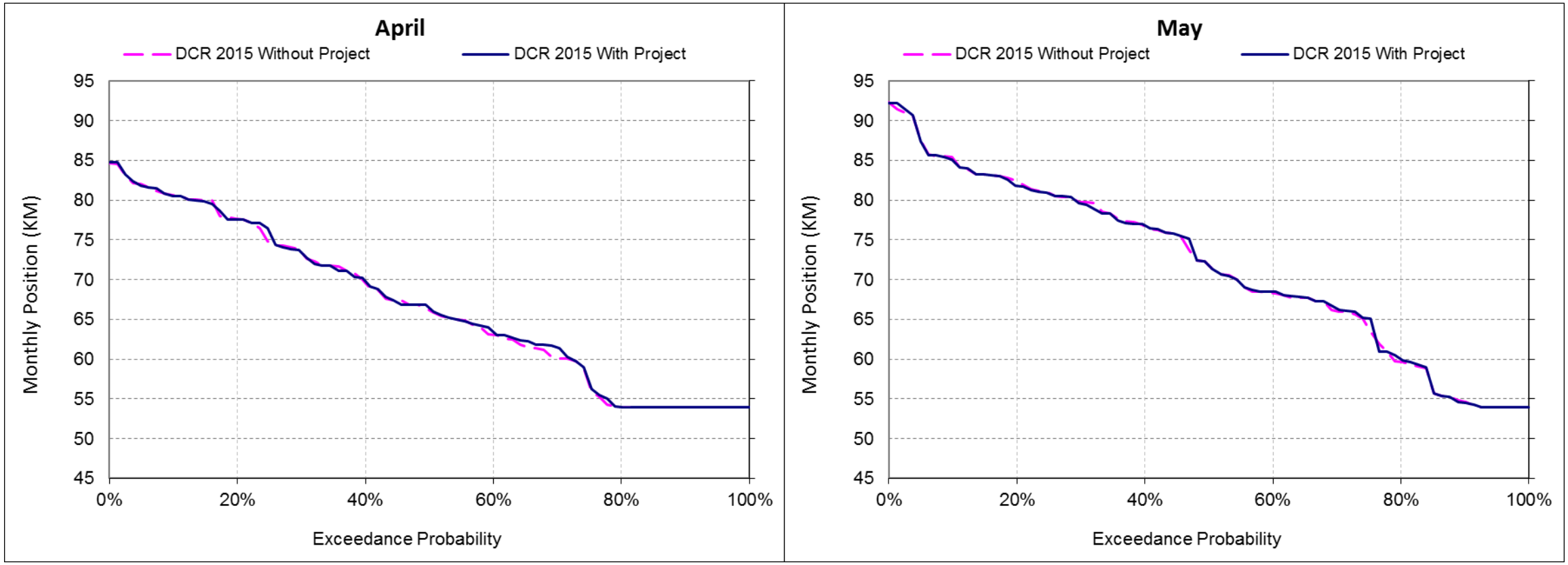
DSM2 Results – X2 – Dec-Jan



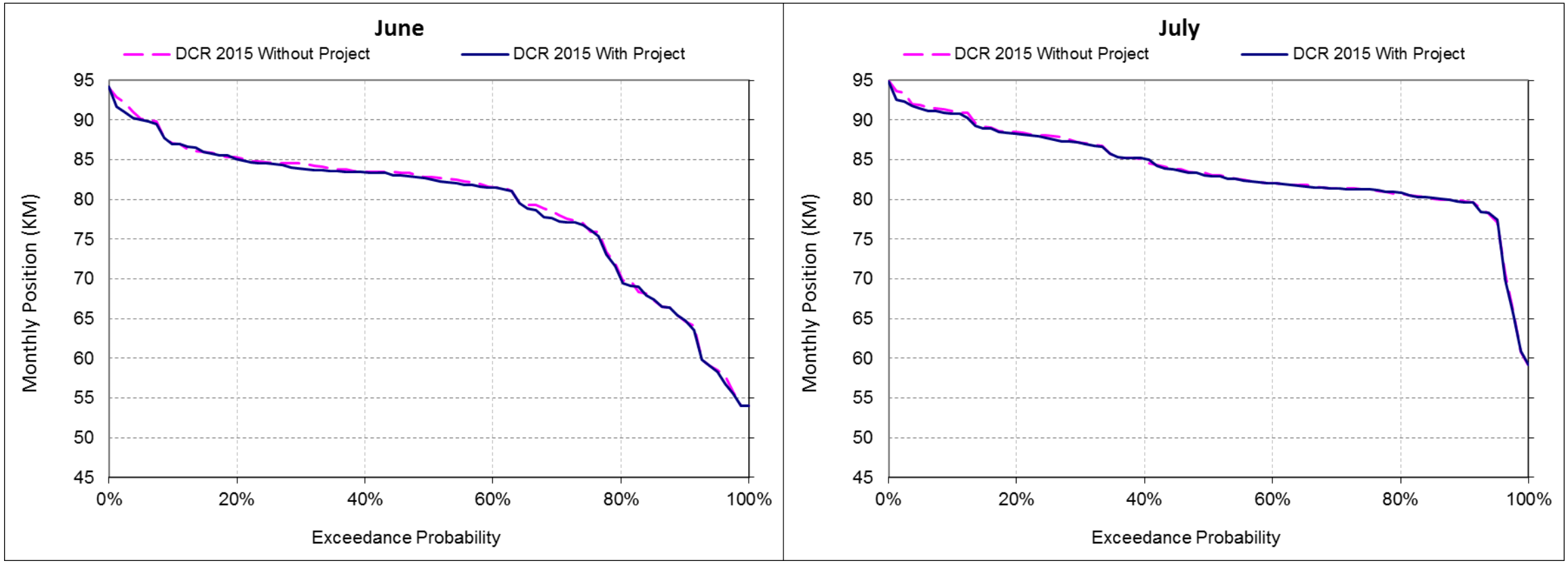
DSM2 Results – X2 – Feb-Mar



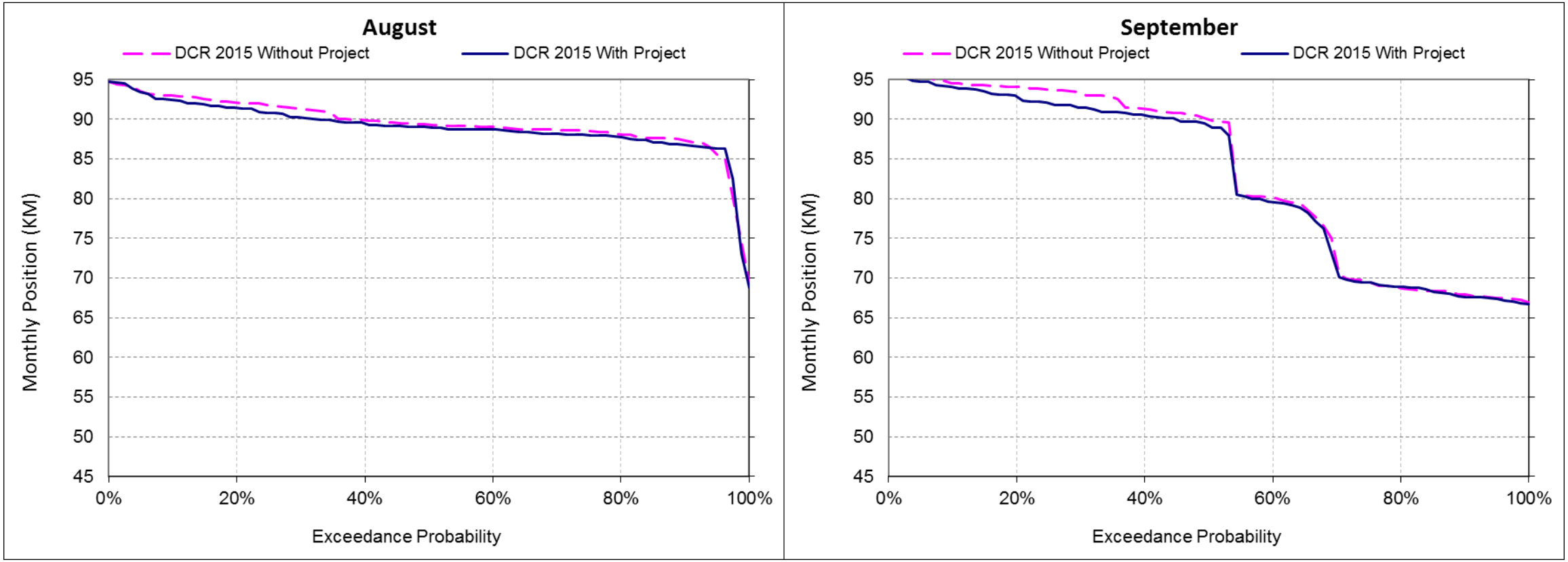
DSM2 Results – X2 – Apr-May



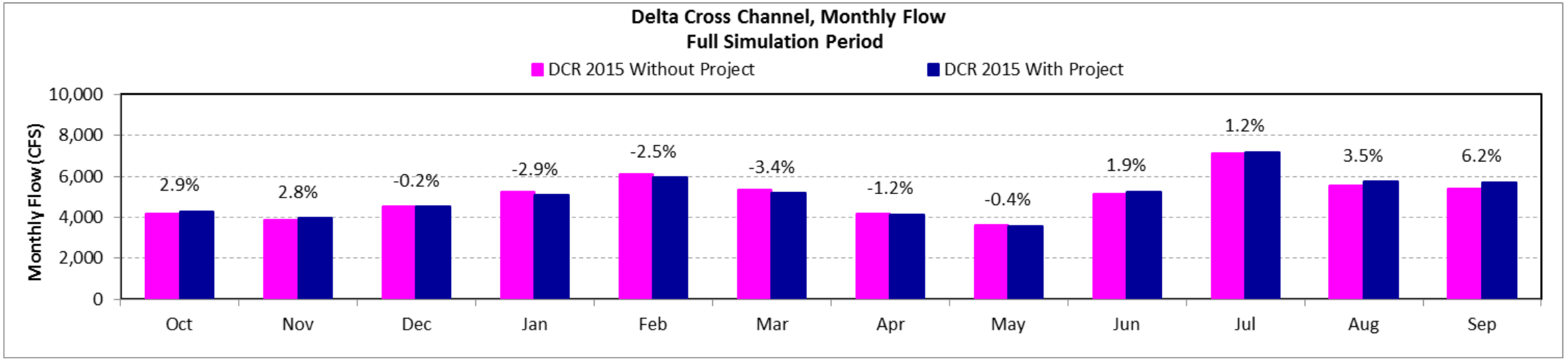
DSM2 Results – X2 – Jun-Jul



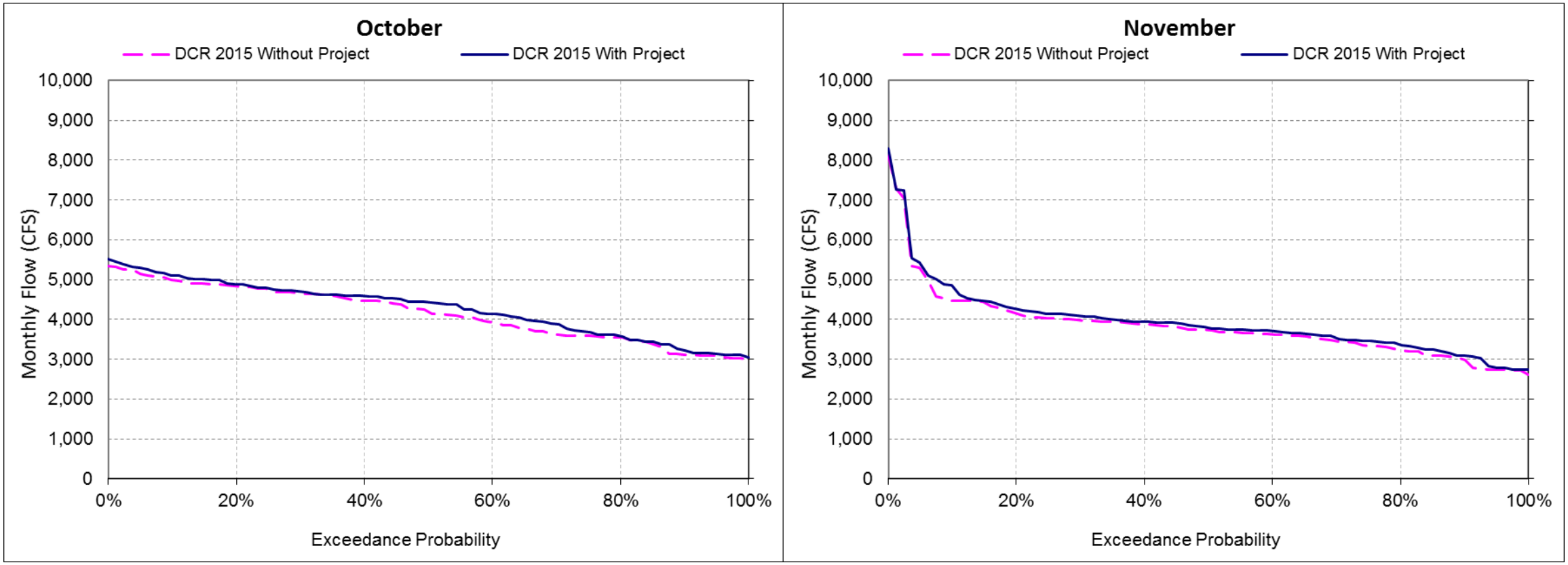
DSM2 Results – X2 – Aug-Sep



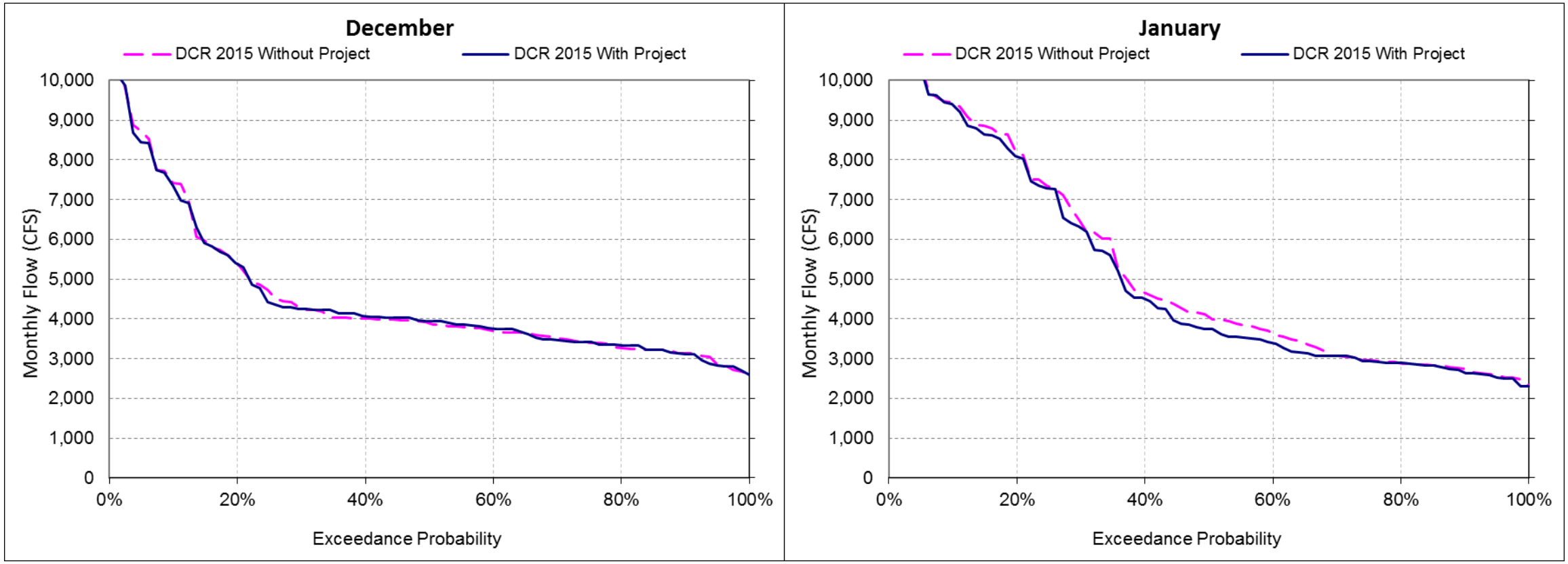
DSM2 Results – DCC Flow



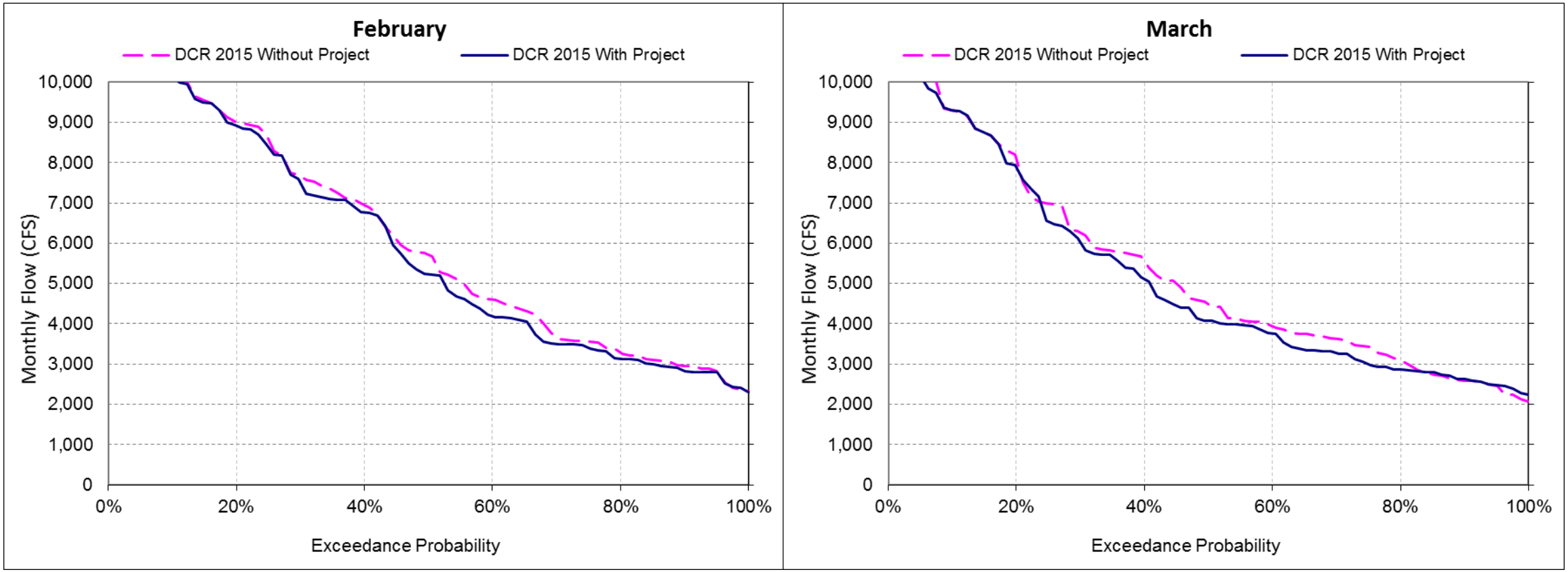
DSM2 Results – DCC Flow – Oct-Nov



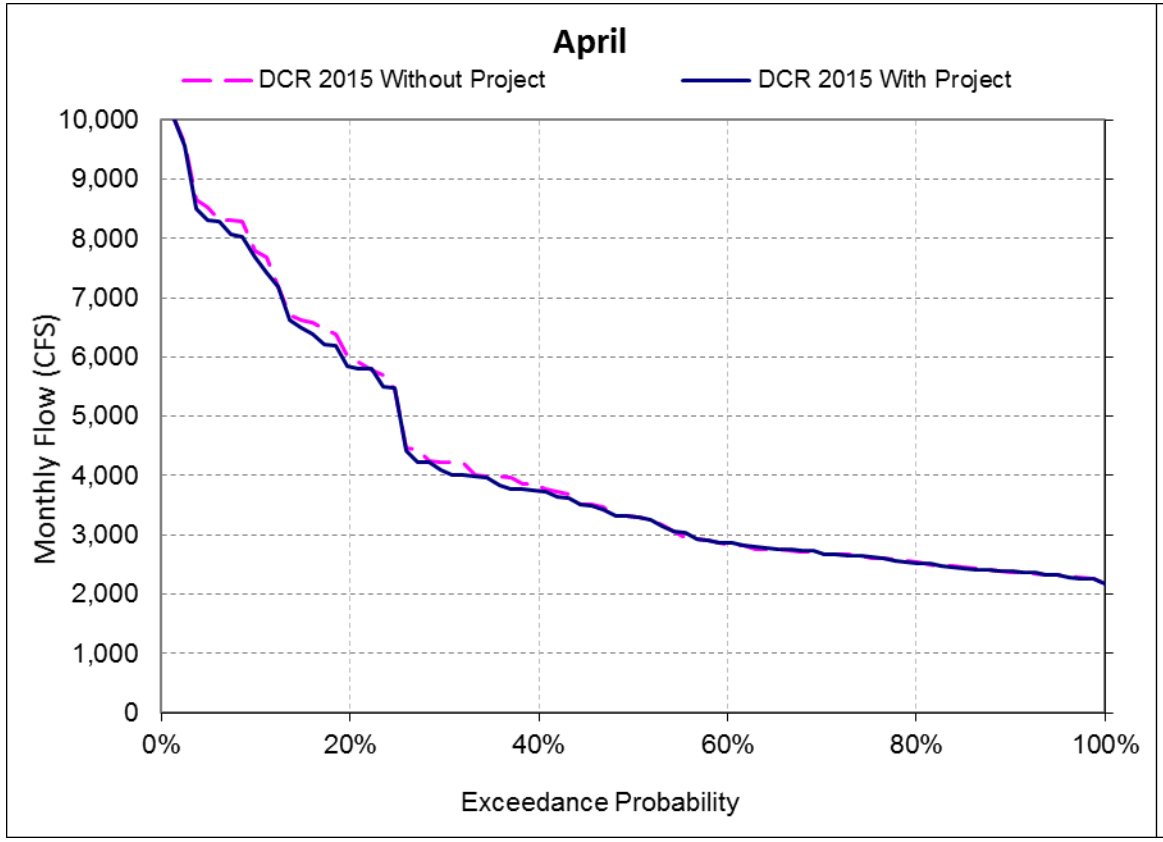
DSM2 Results – DCC Flow – Dec-Jan

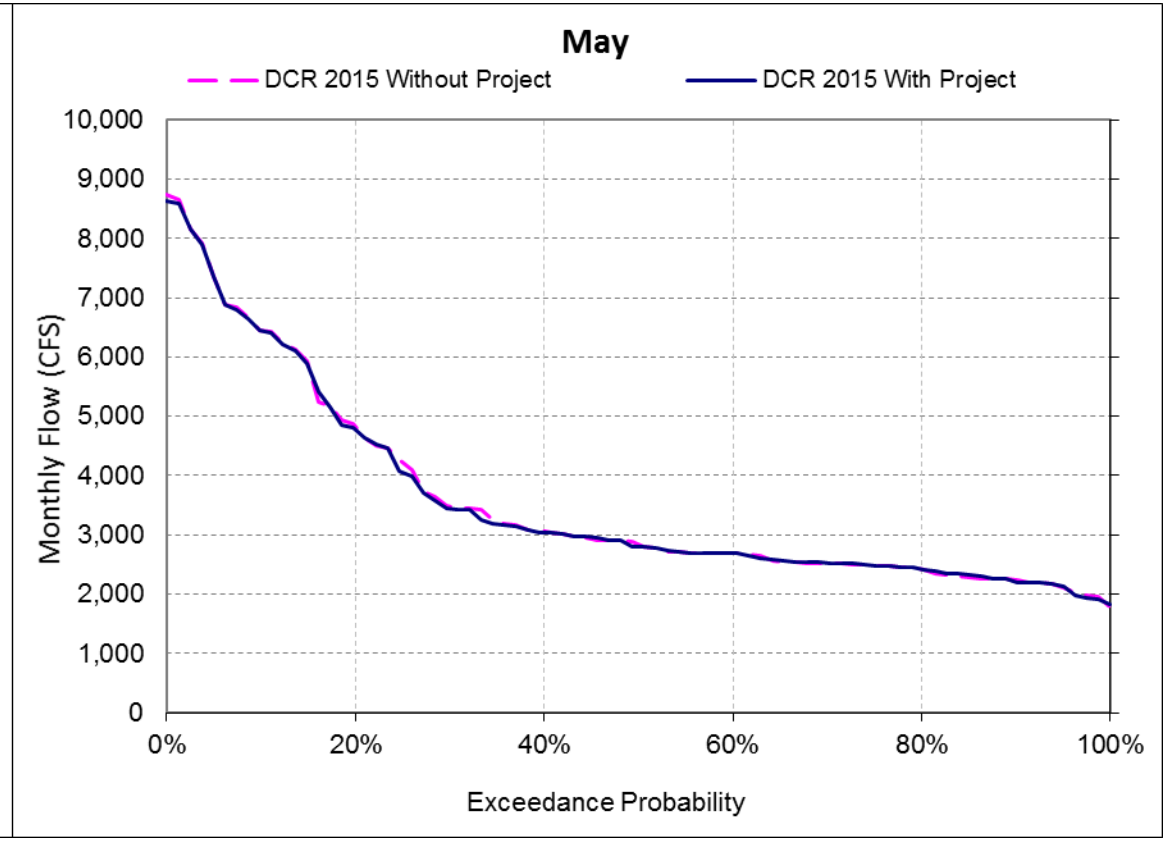


DSM2 Results – DCC Flow – Feb-Mar

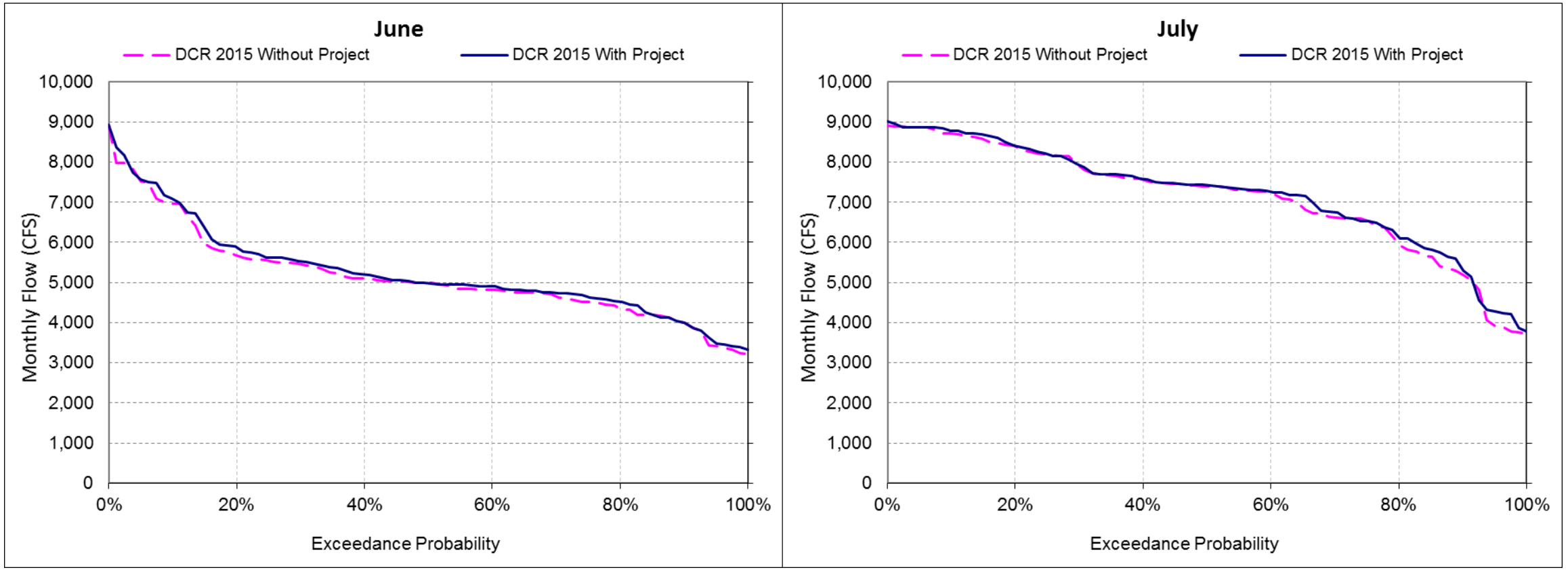


DSM2 Results – DCC Flow – Apr-May

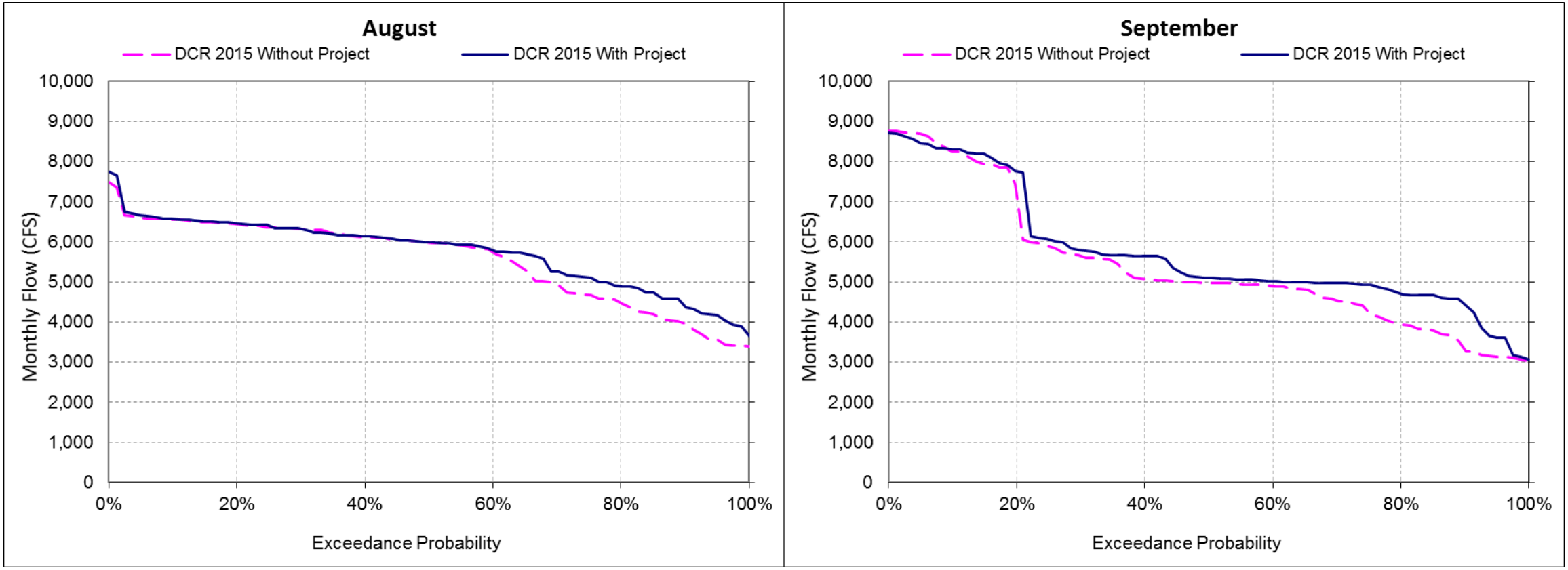




DSM2 Results – DCC Flow – Jun-Jul



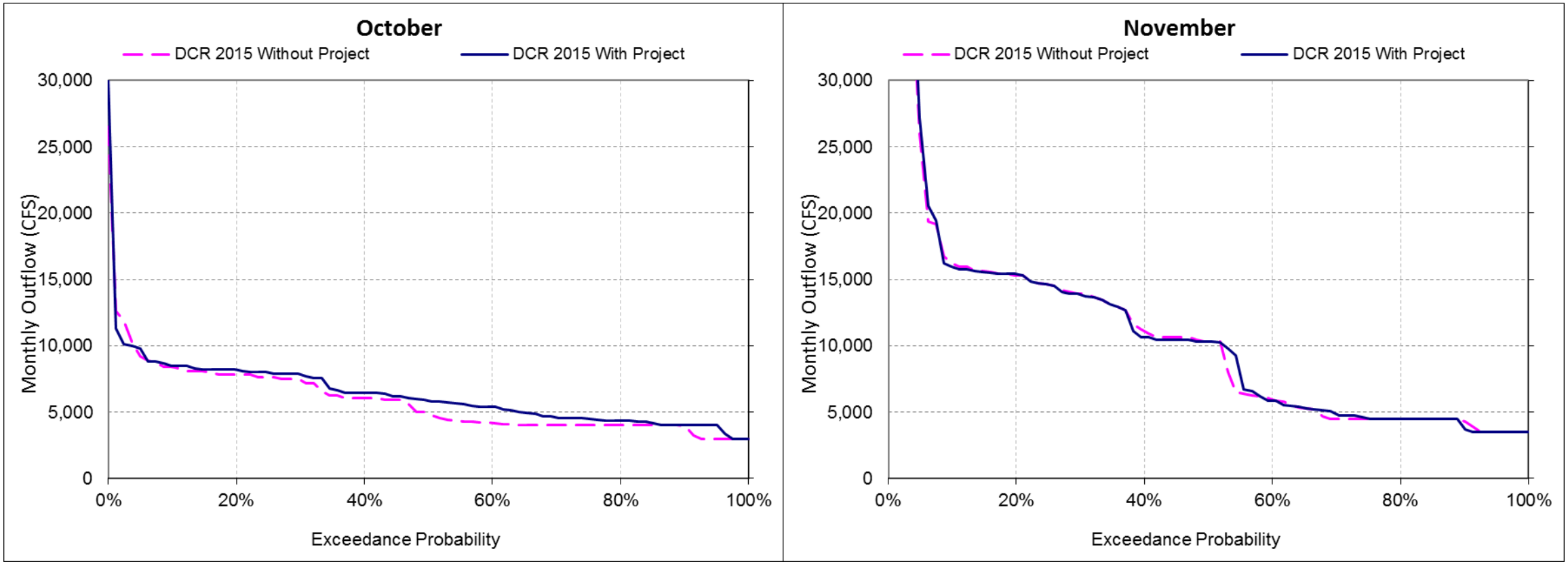
DSM2 Results – DCC Flow – Aug-Sep



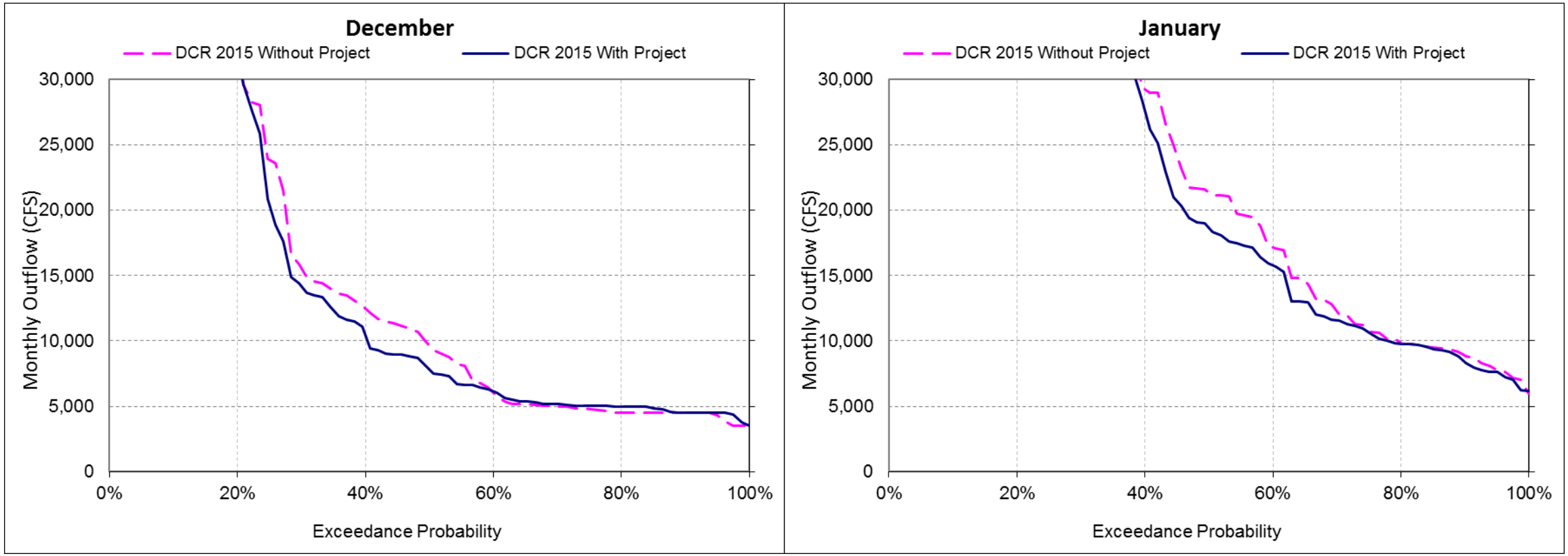
DSM2 Results – Delta Outflow

Long-term Average and Average by Water Year Type												
Analysis Period	Monthly Outflow (CFS)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Long-term												
Full Simulation Period[1]												
DCR 2015 Without Project	5,942	11,480	20,871	41,889	52,430	42,330	30,953	21,902	12,373	7,887	4,343	9,712
DCR 2015 With Project	6,446	11,581	20,055	40,312	51,190	40,594	30,492	21,779	12,611	7,915	4,489	10,064
Difference	503	101	-816	-1,577	-1,240	-1,736	-461	-123	237	29	146	351
Percent Difference[3]	8.5%	0.9%	-3.9%	-3.8%	-2.4%	-4.1%	-1.5%	-0.6%	1.9%	0.4%	3.4%	3.6%

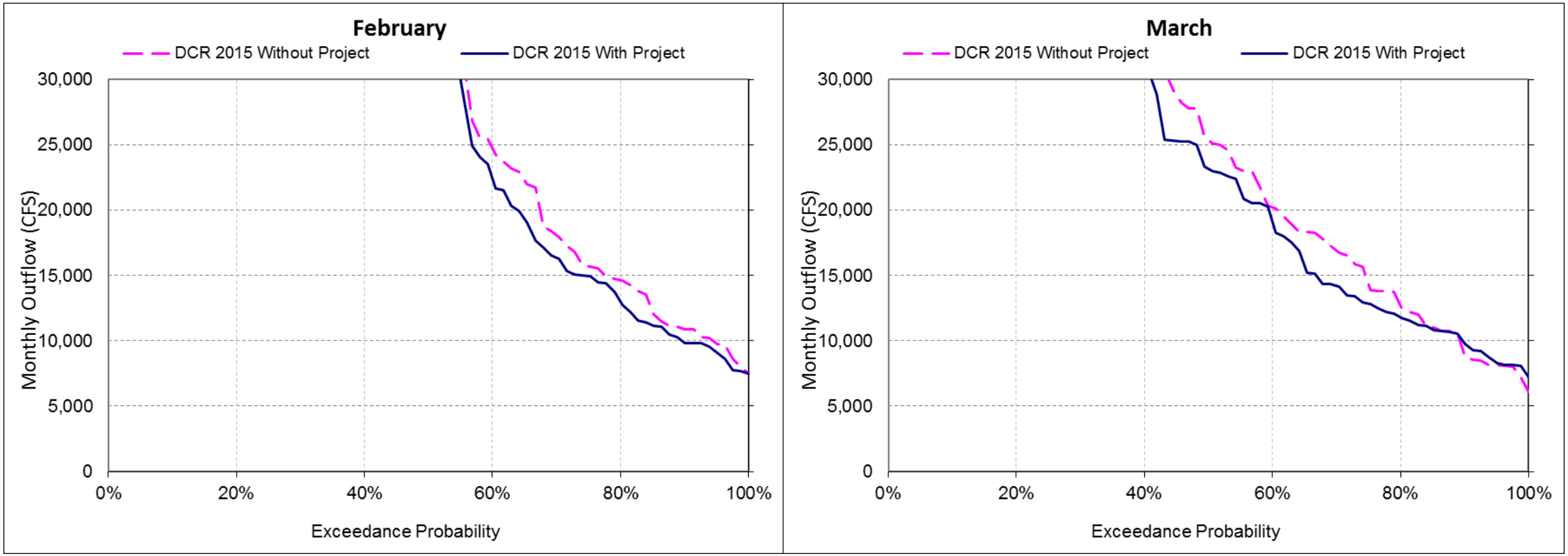
DSM2 Results – Delta Outflow – Oct-Nov



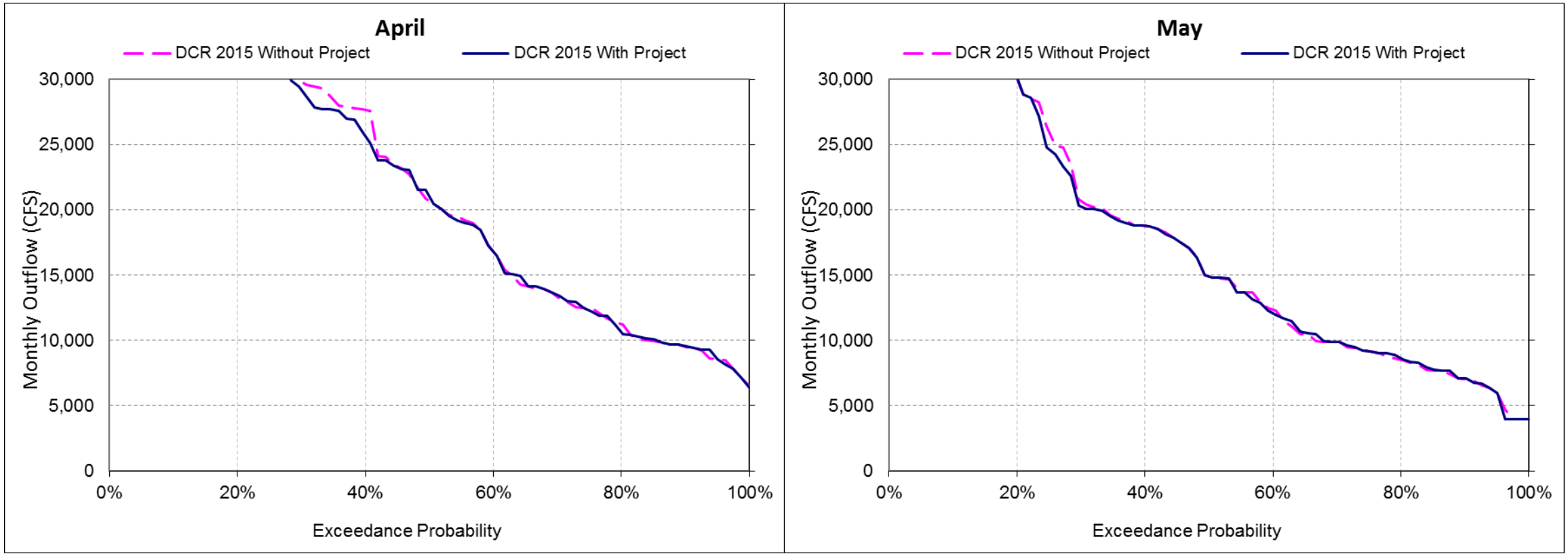
DSM2 Results – Delta Outflow – Dec-Jan



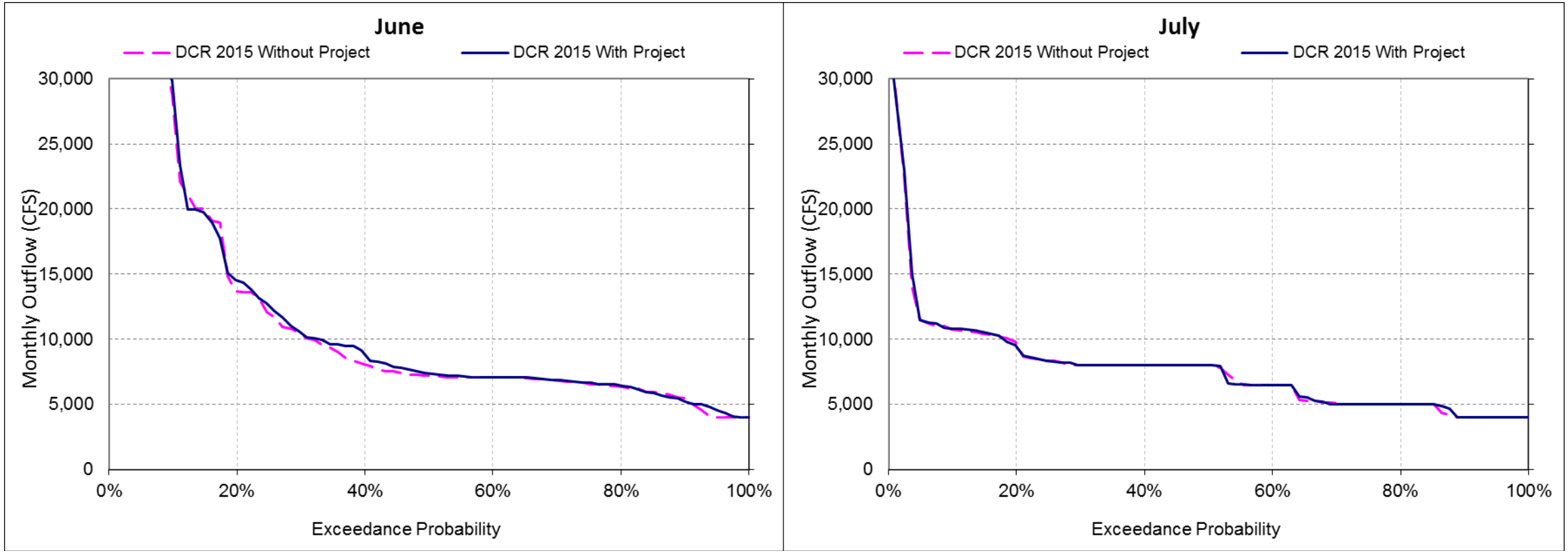
DSM2 Results – Delta Outflow – Feb-Mar



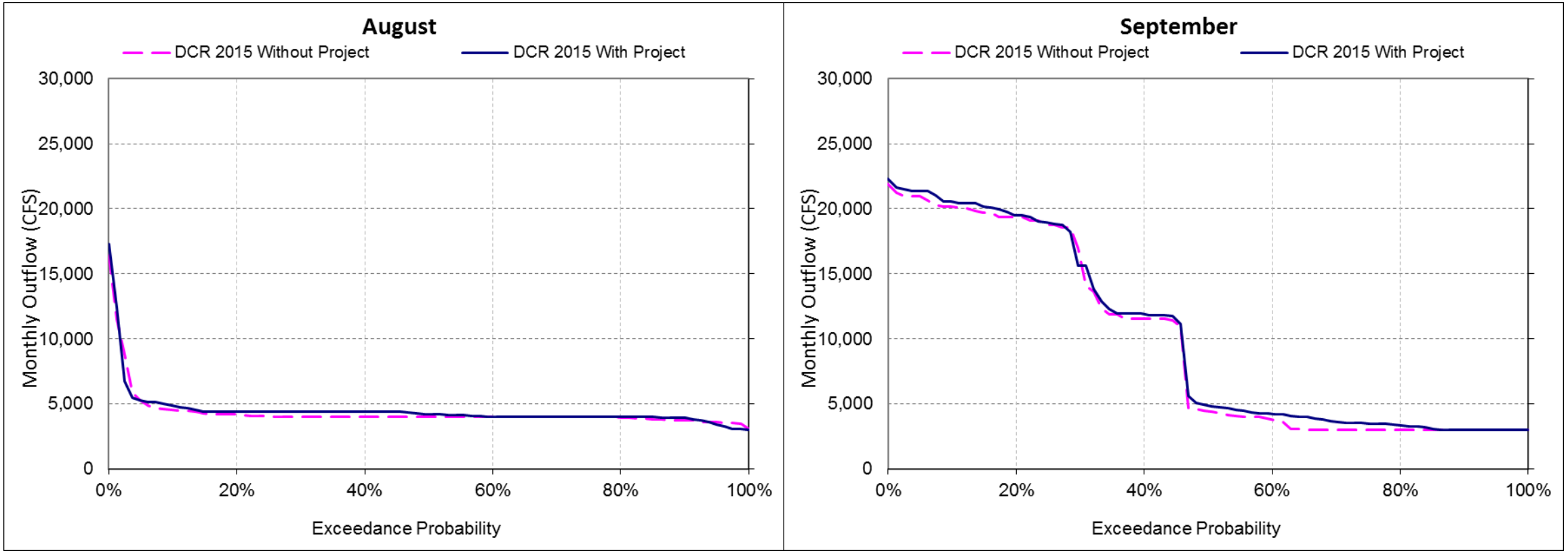
DSM2 Results – Delta Outflow – Apr-May



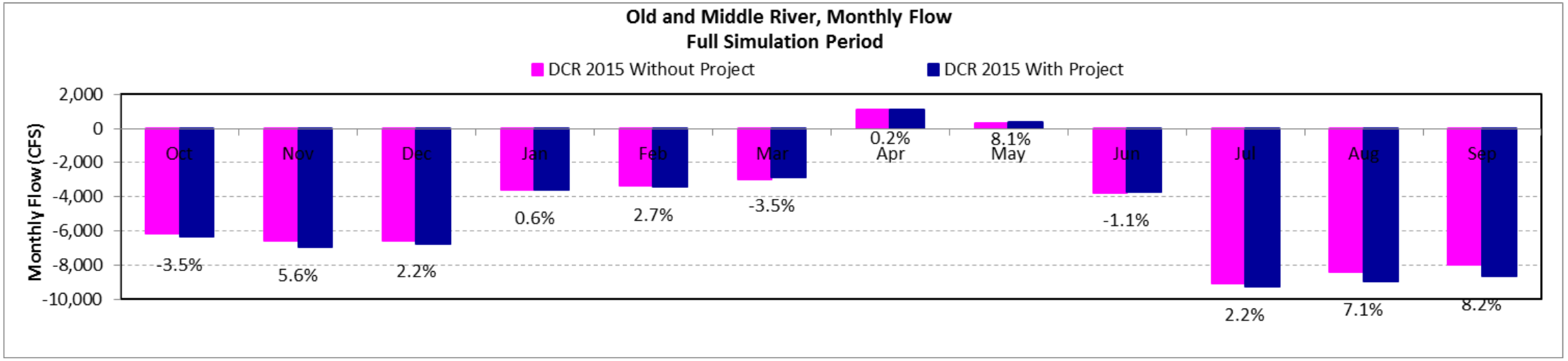
DSM2 Results – Delta Outflow – Jun-Jul



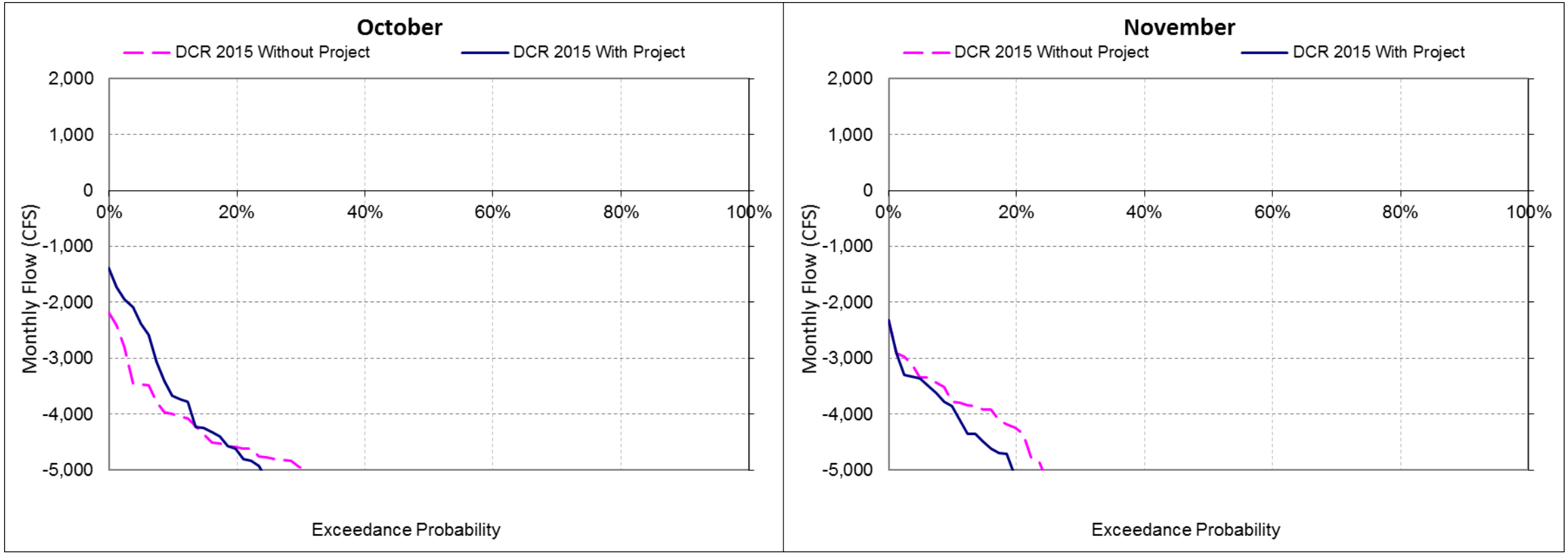
DSM2 Results – Delta Outflow – Aug-Sep



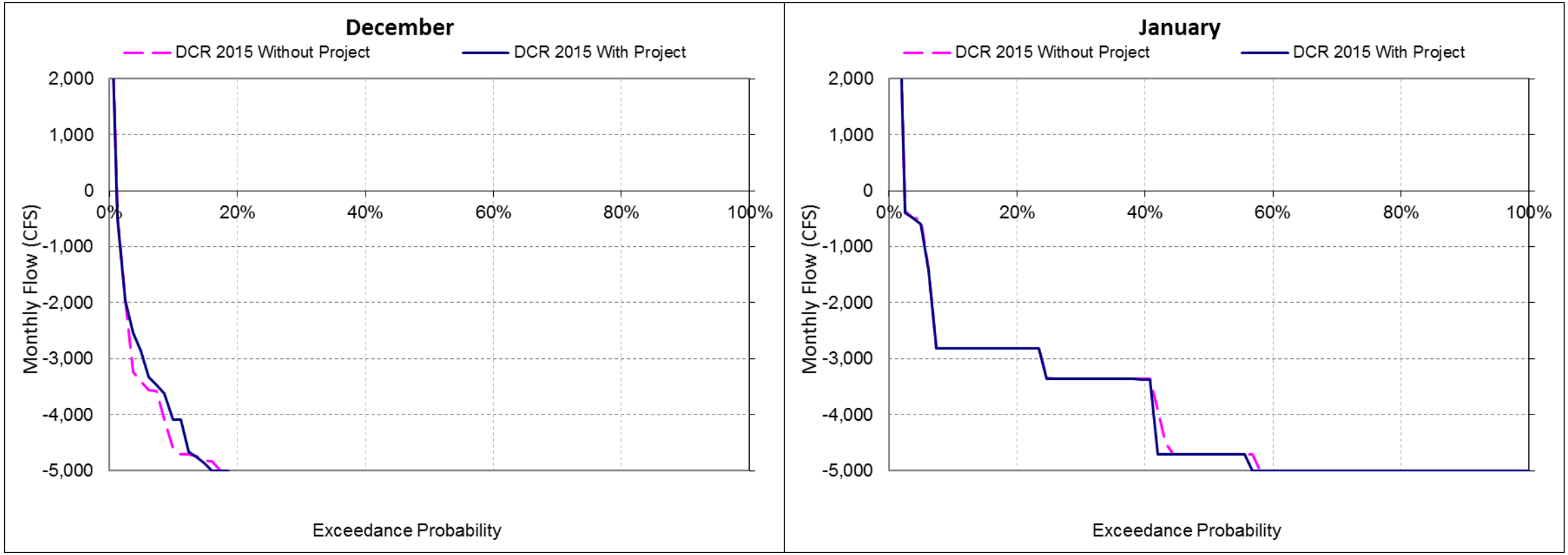
DSM2 Results – OMR



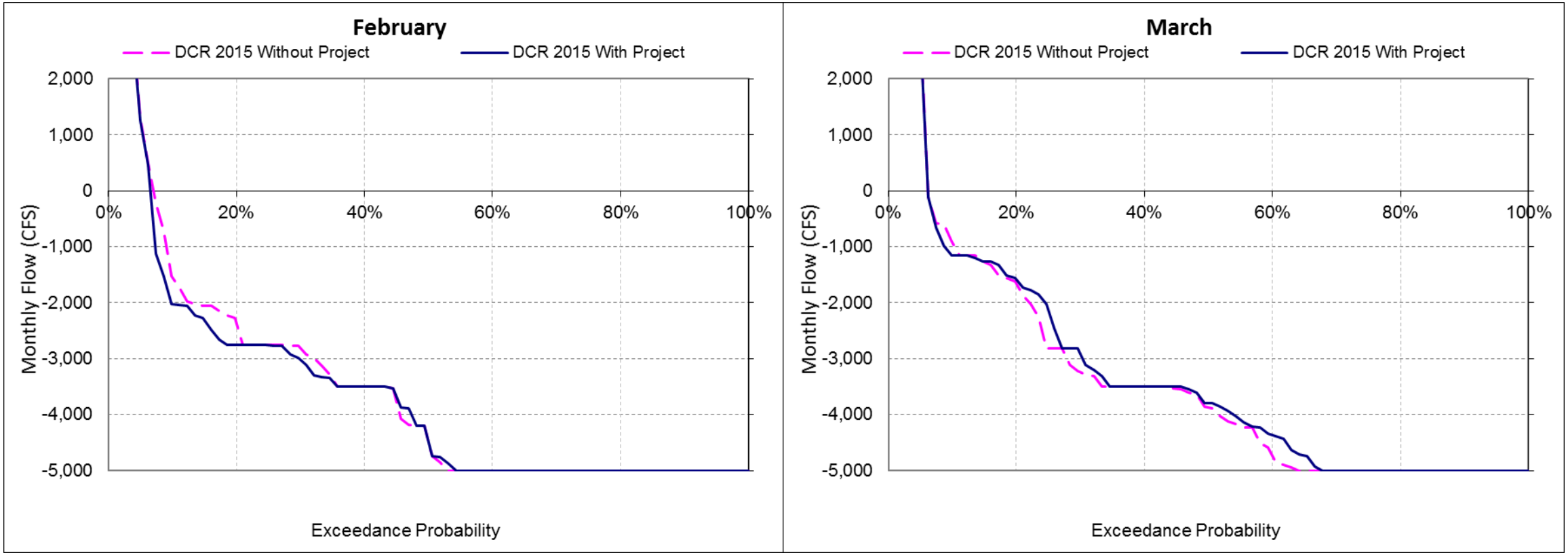
DSM2 Results – OMR – Oct-Nov



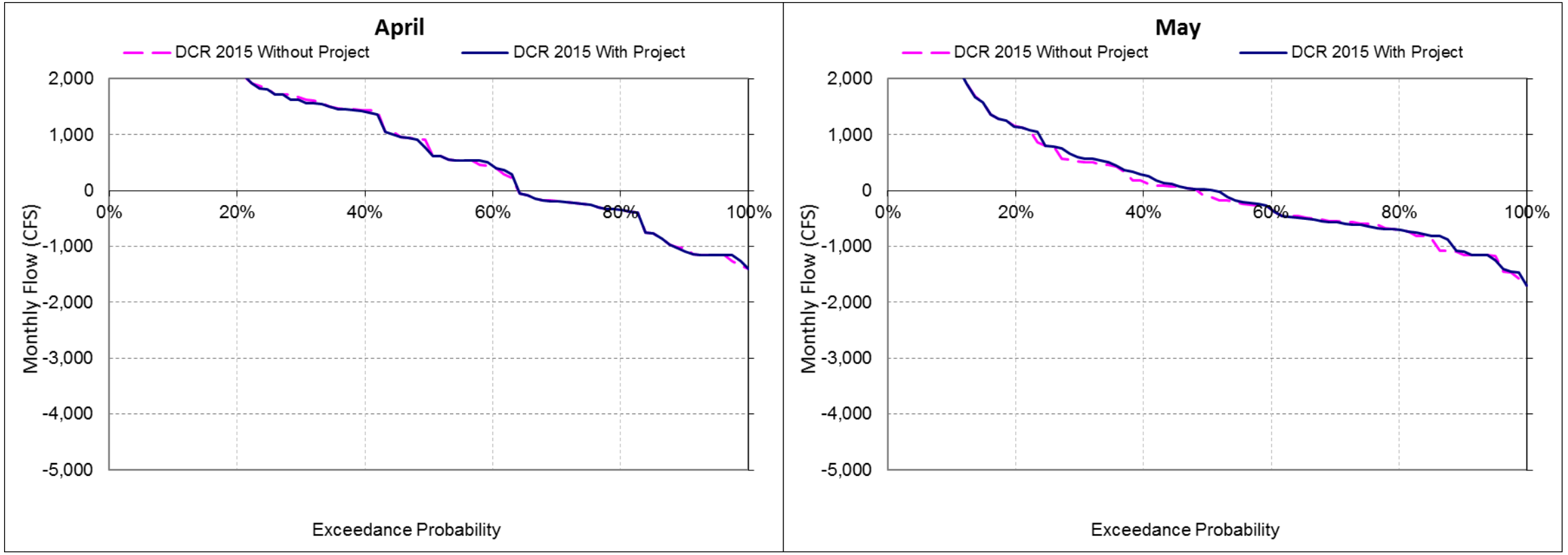
DSM2 Results – OMR – Dec-Jan



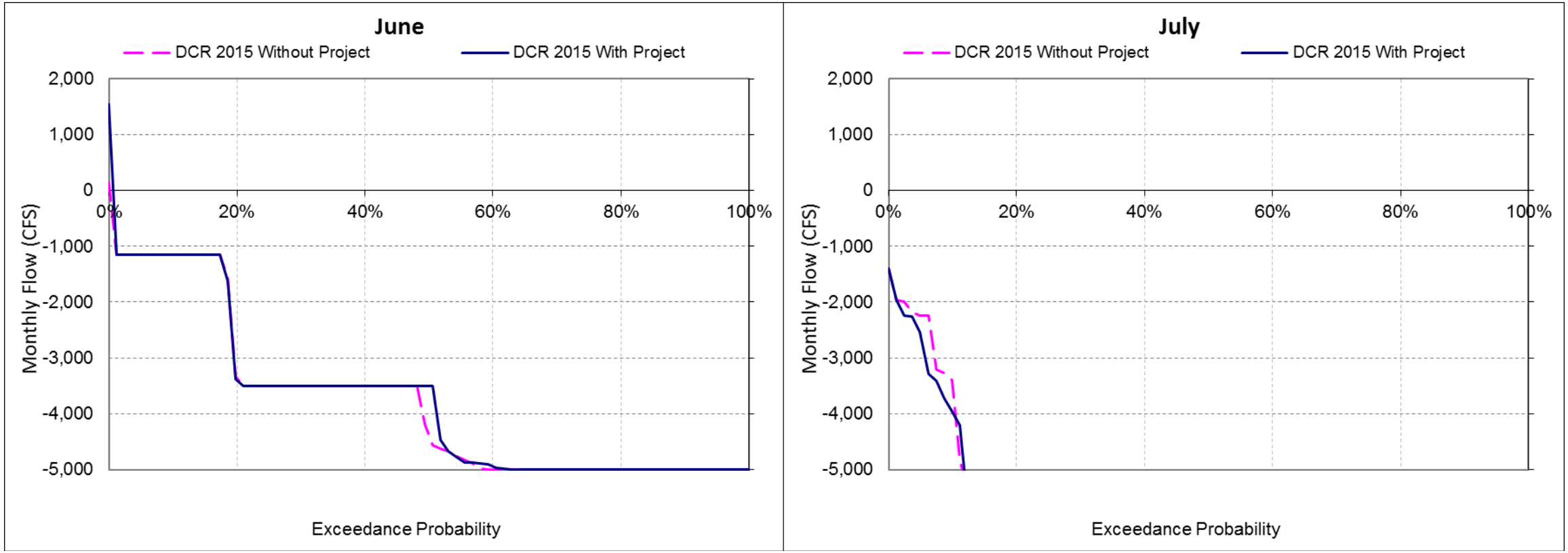
DSM2 Results – OMR – Feb-Mar



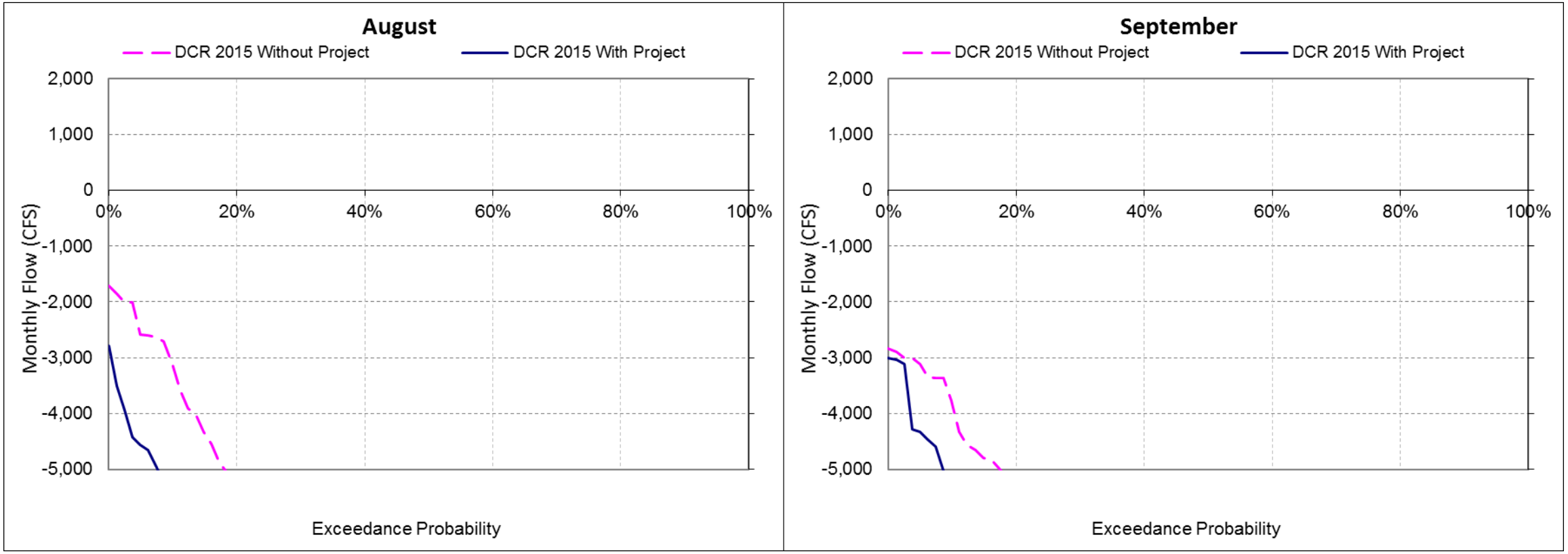
DSM2 Results – OMR – Apr-May



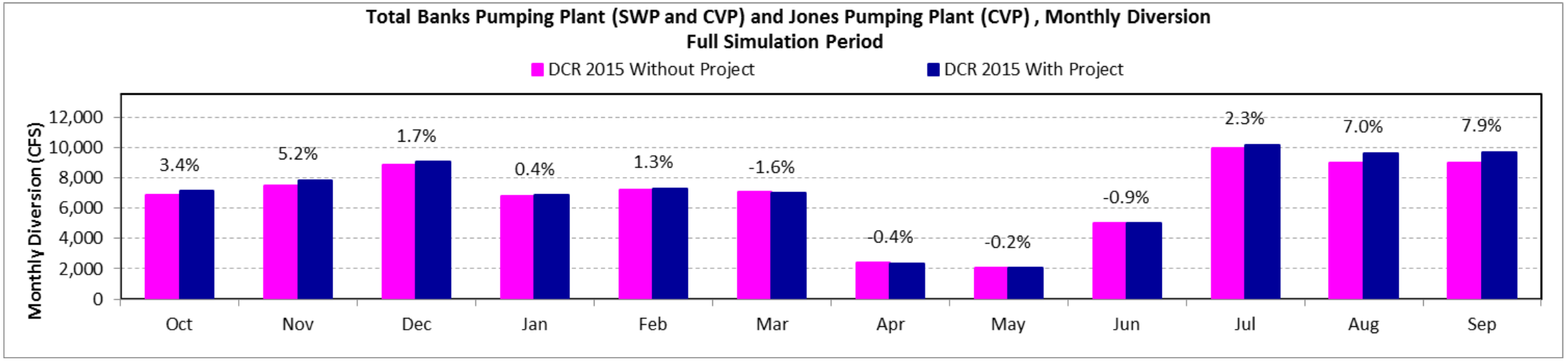
DSM2 Results – OMR – Jun-Jul



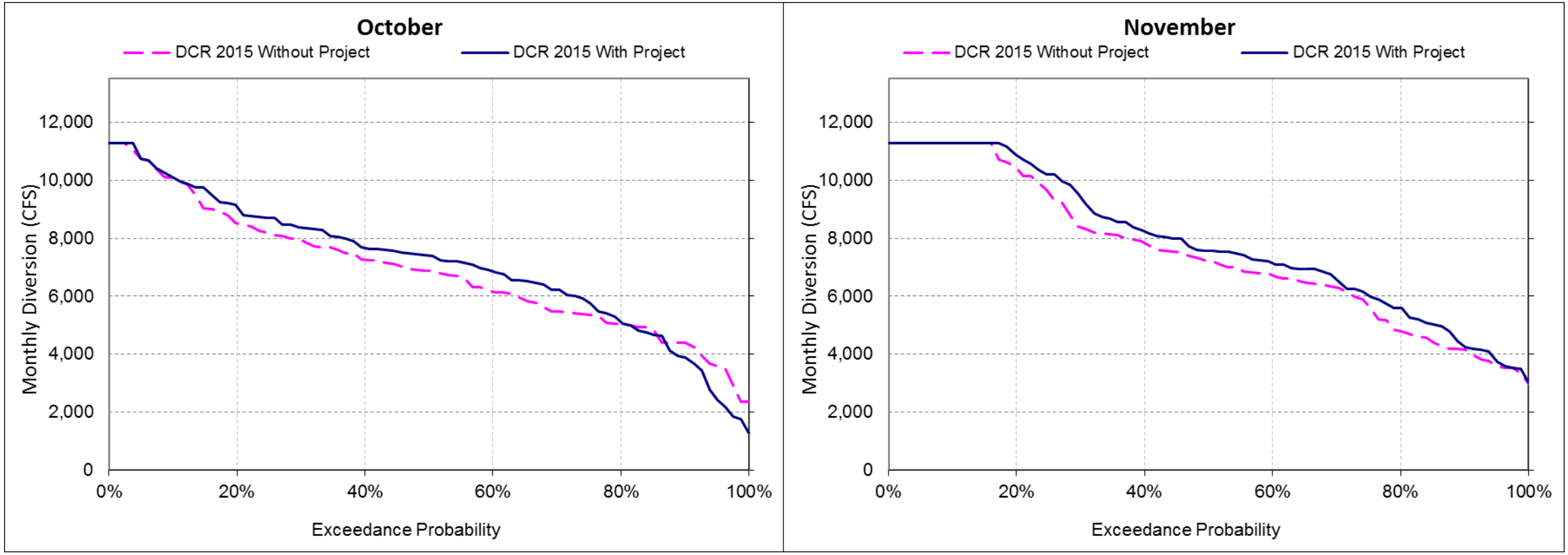
DSM2 Results – OMR – Aug-Sep



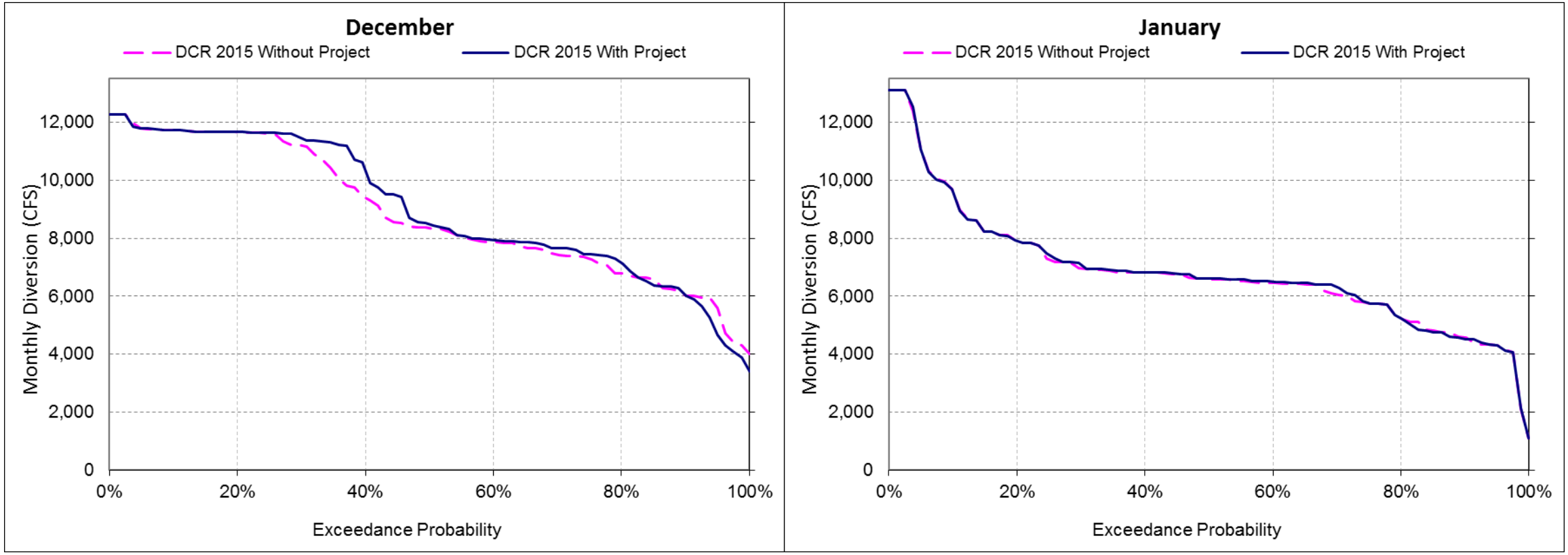
DSM2 Results – Total Exports



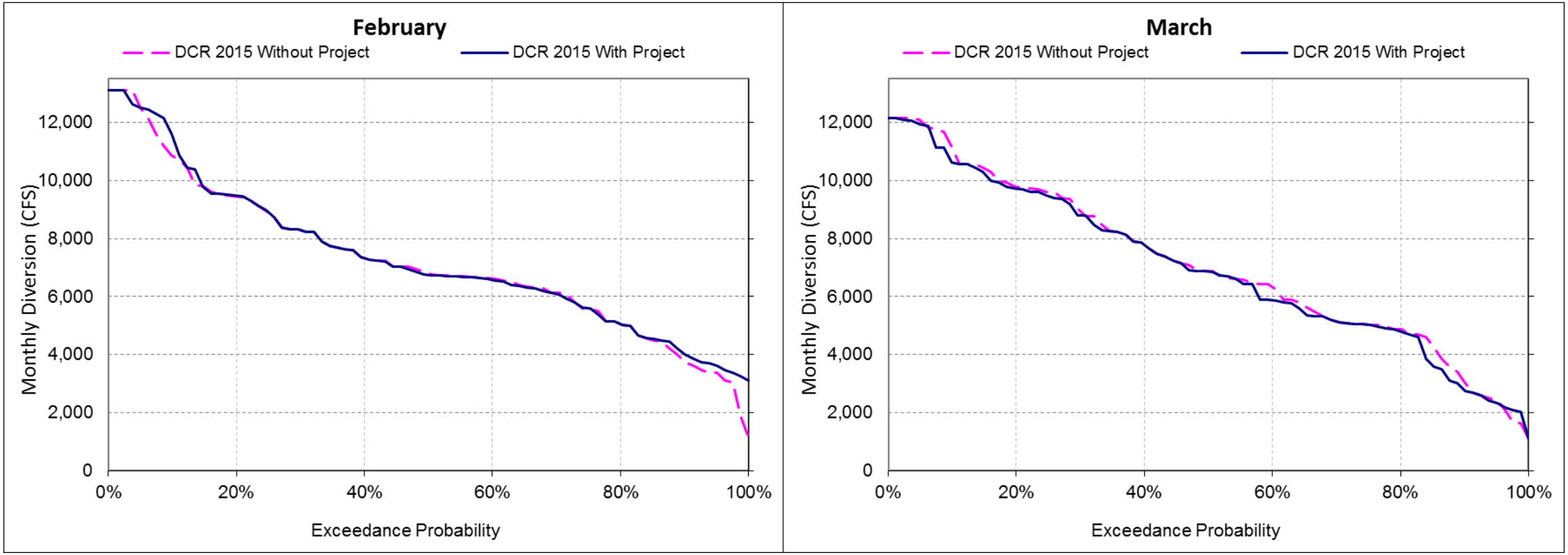
DSM2 Results – Total Exports – Oct-Nov



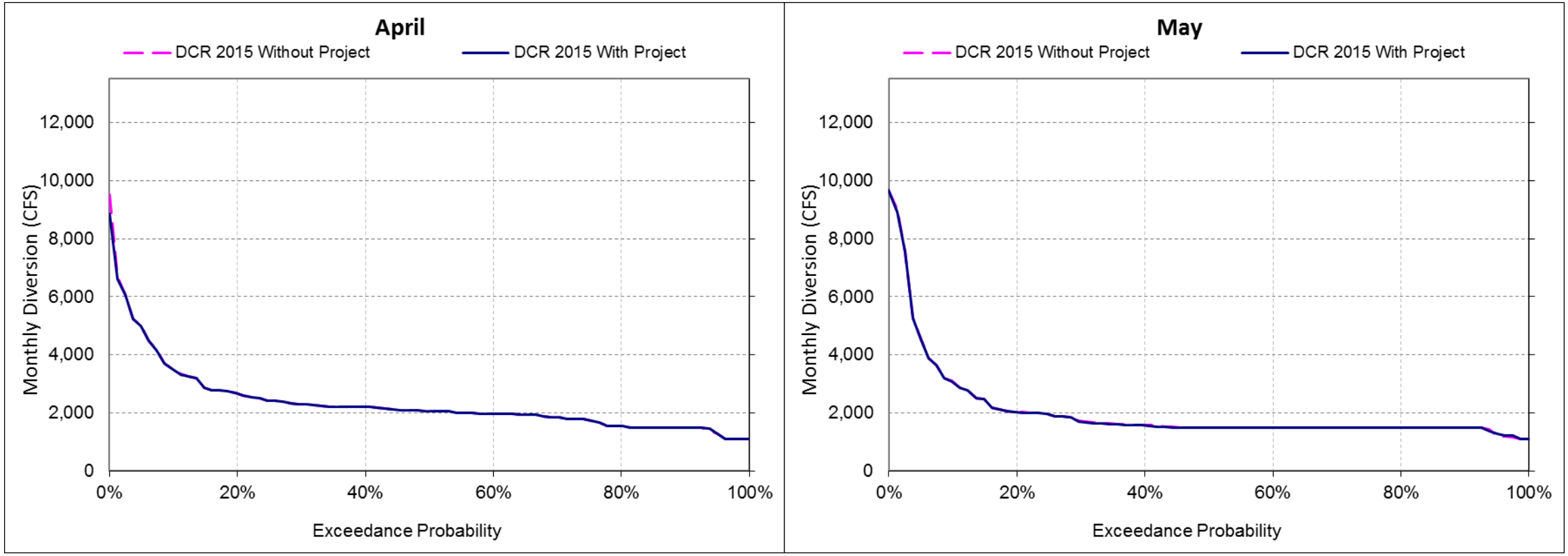
DSM2 Results – Total Exports – Dec-Jan



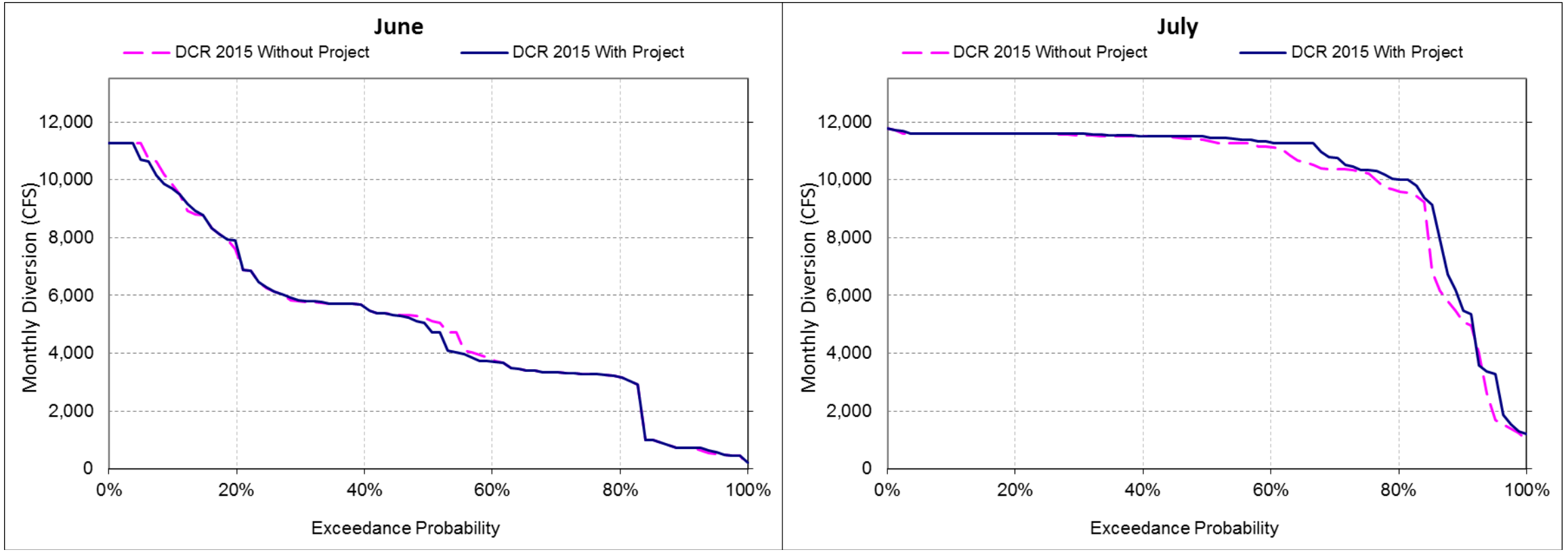
DSM2 Results – Total Exports – Feb-Mar



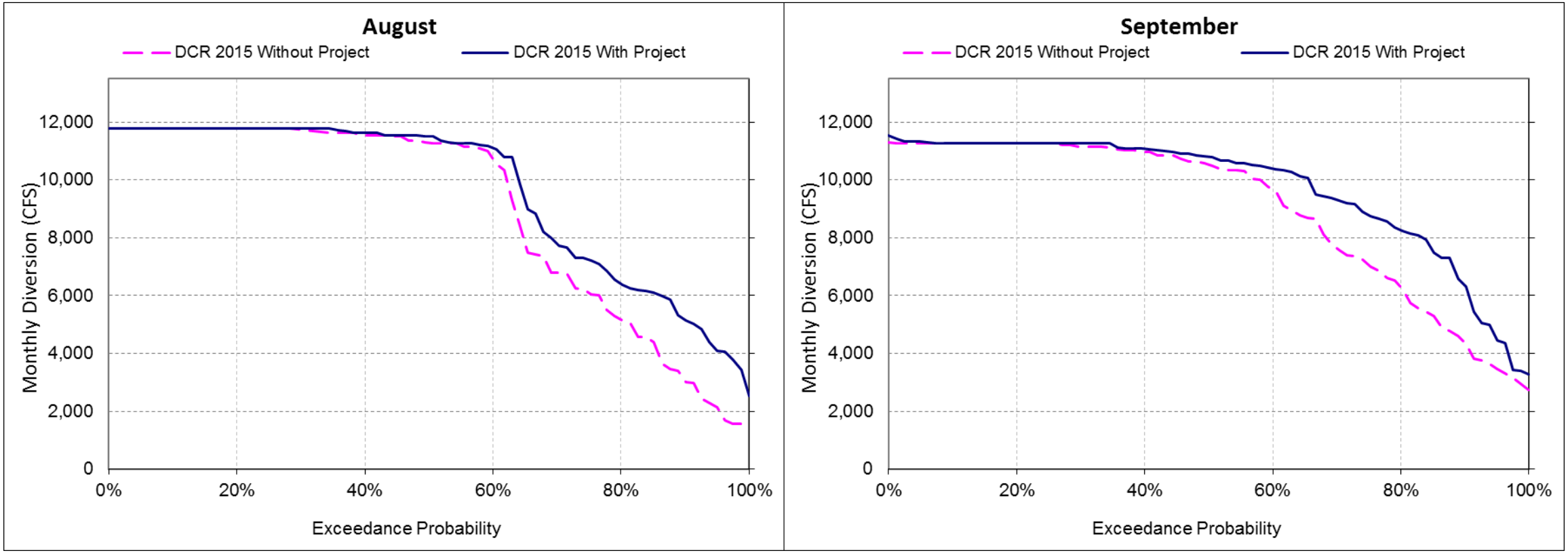
DSM2 Results – Total Exports – Apr-May



DSM2 Results – Total Exports – Jun-Jul



DSM2 Results – Total Exports – Aug-Sep



Tools for Delta Smelt Analysis

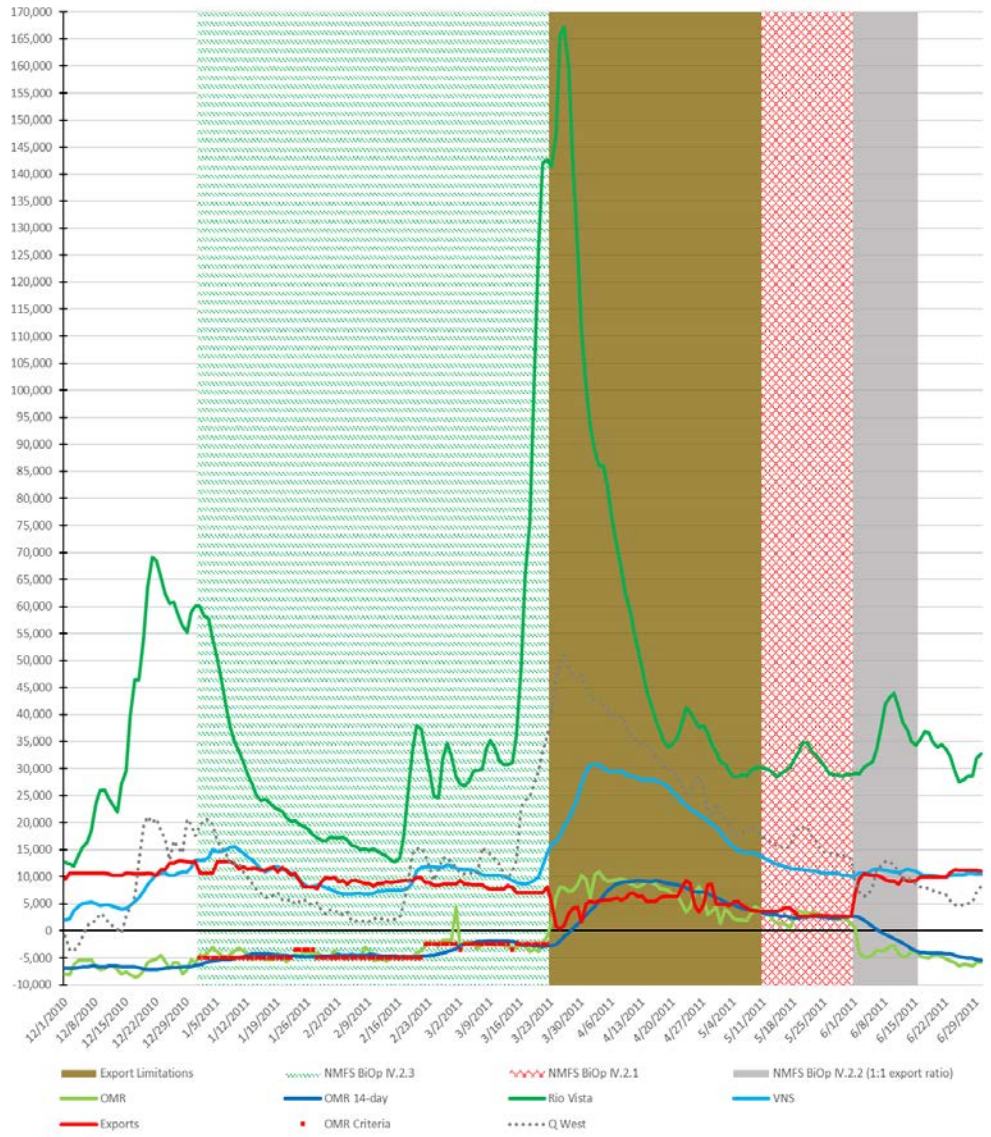
- Low Salinity Zone
- Delta Smelt Habitat Index
- Estimate change in entrainment with DSM2 PTM simulations
  - Implemented in WaterFix EIR/EIS

Review of Delta Operations Report

- Daily availability tool is based on DOSS, SWG, and WOMT
- For the most part, consistent with Daily Availability Tool
  - Slight difference on control factor in some days of some years

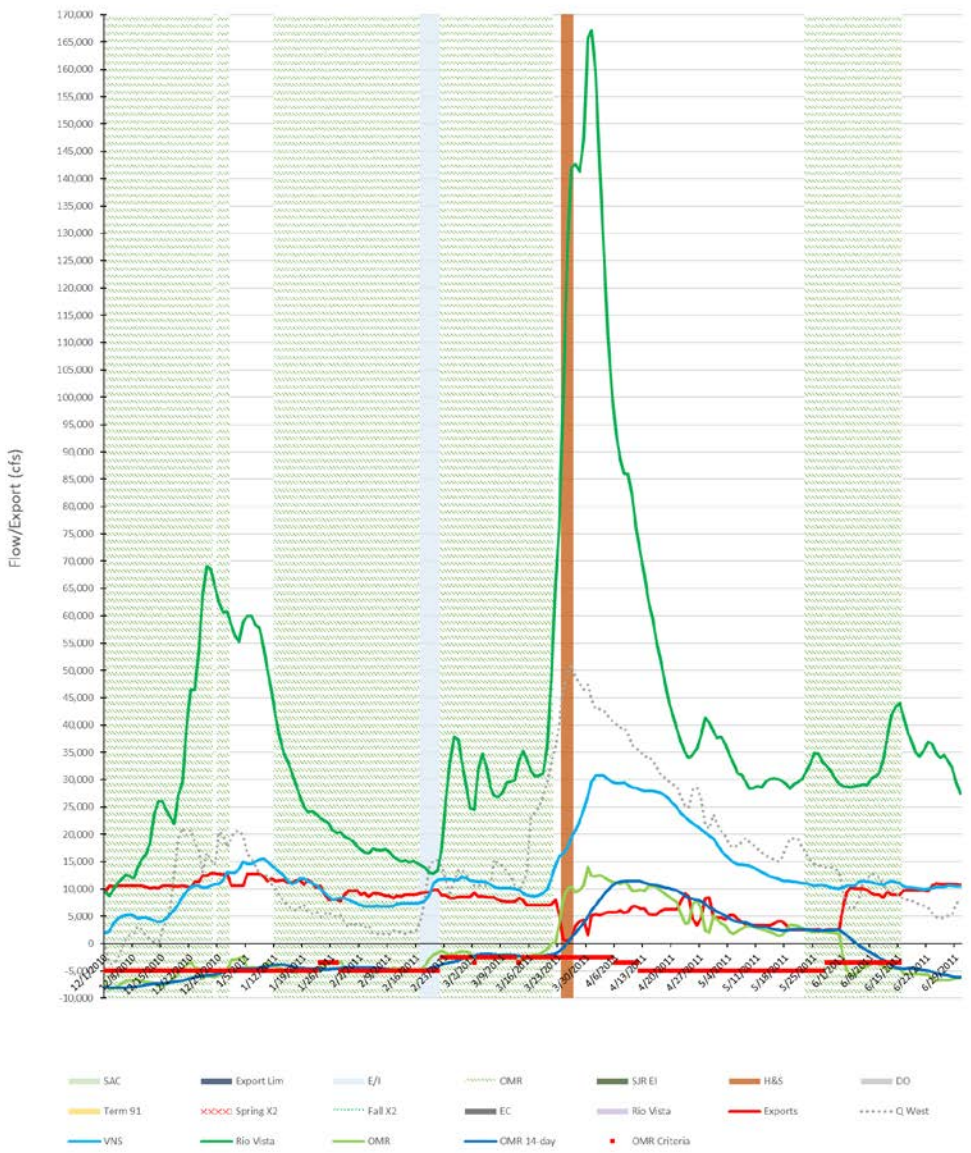
Excess Delta Conditions

2011 SVI:W/SJVI:W

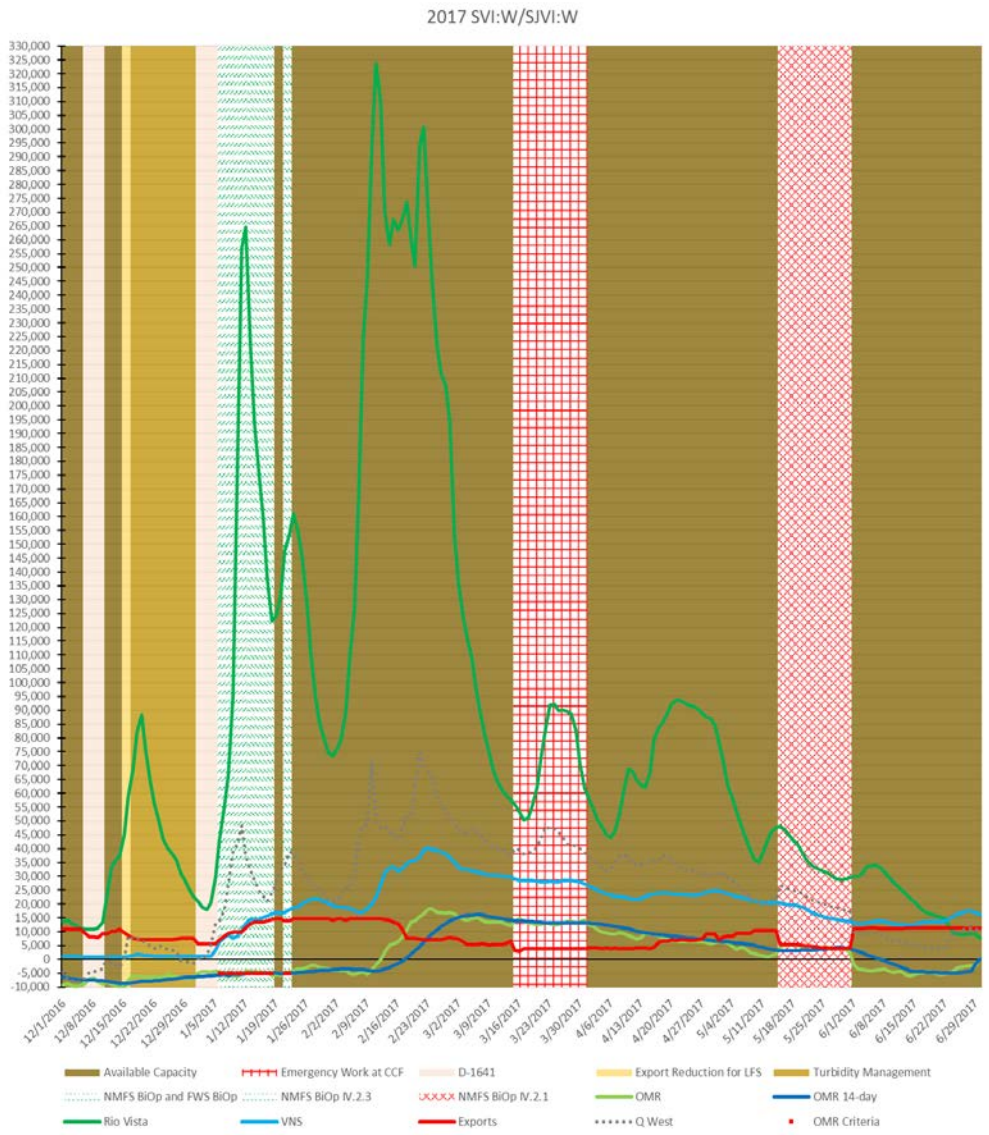


Excess Delta Conditions

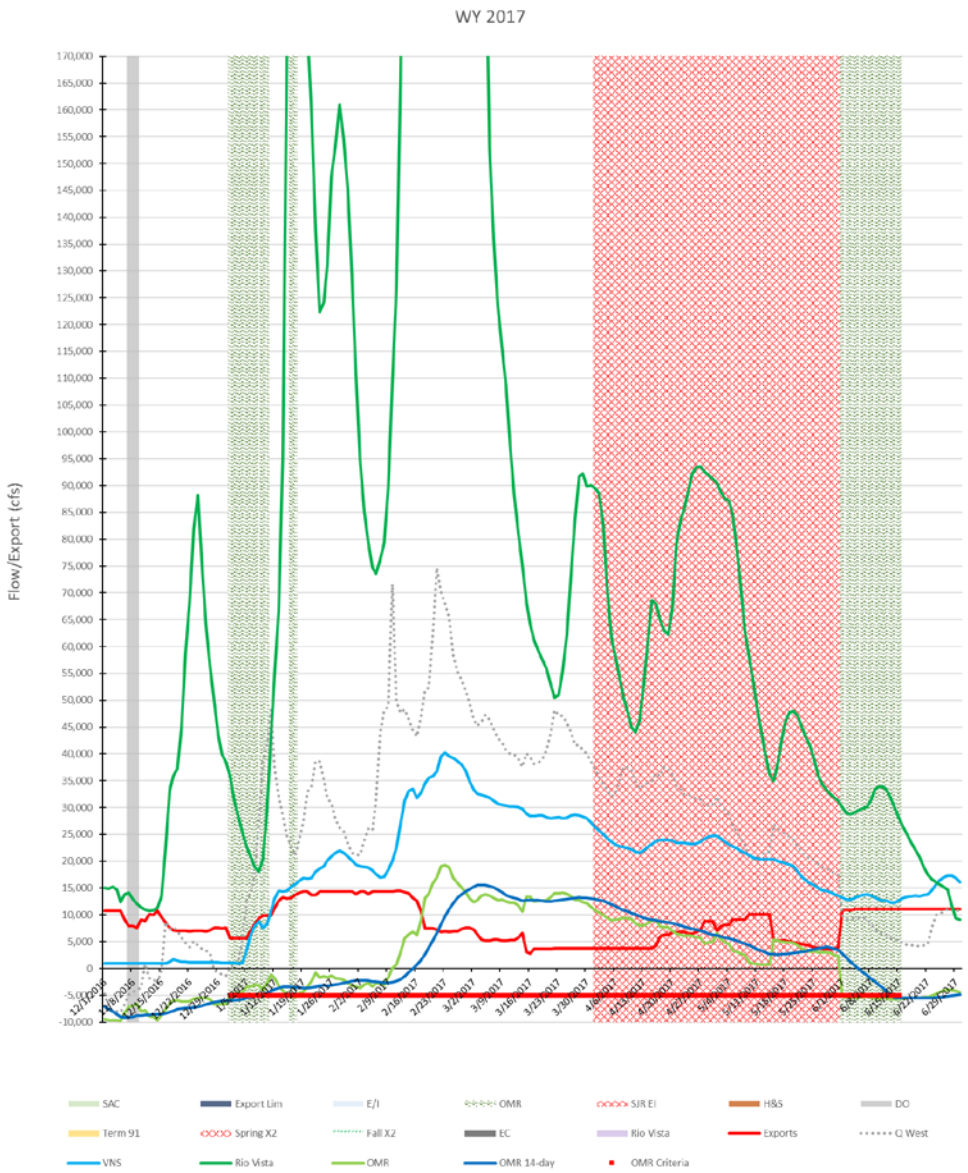
WY 2011



Excess Delta Conditions



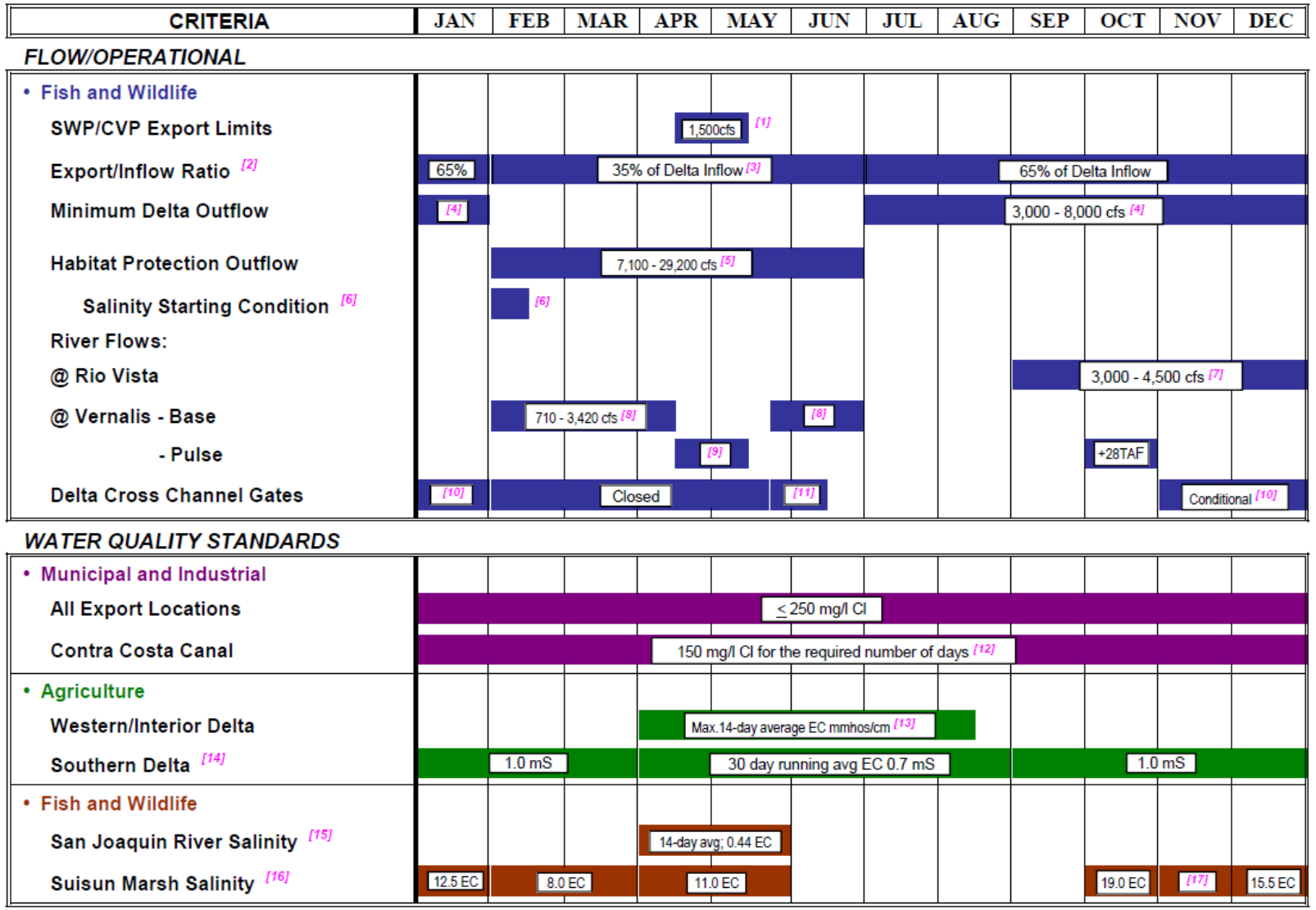
Excess Delta Conditions



Bay-Delta Standards

Contained in D-1641

DRAFT



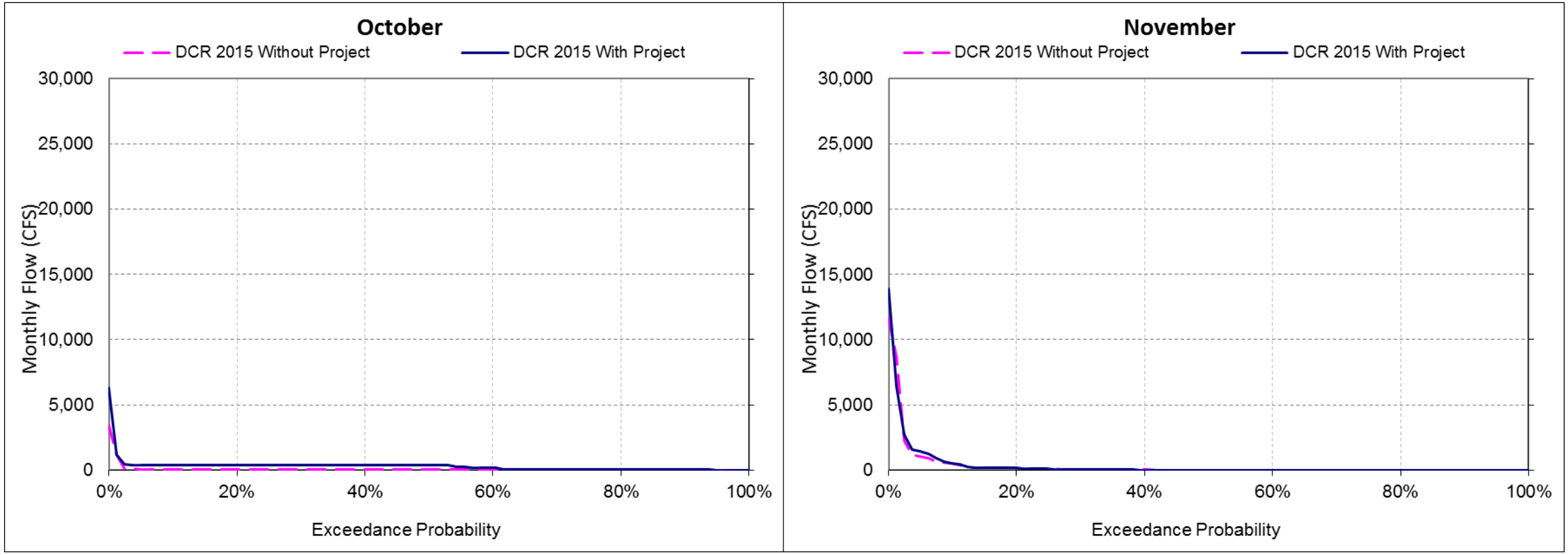
[#] See Footnotes

Operations Compliance and Studies Section

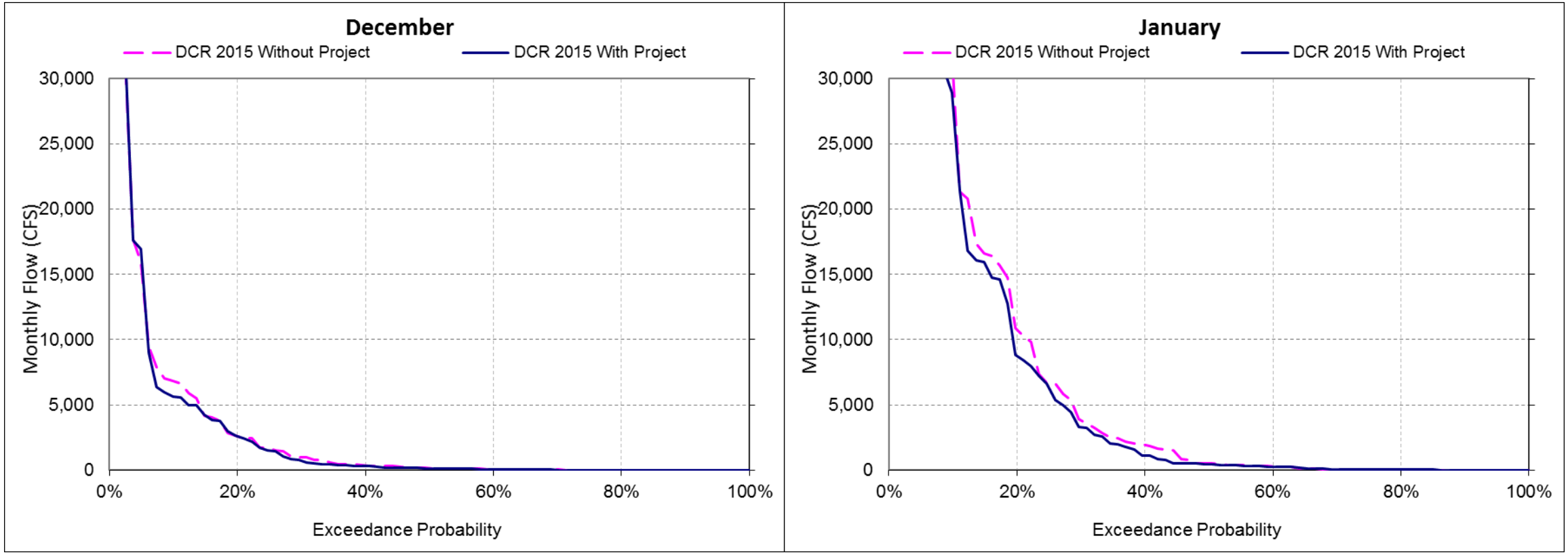
Revised 9/29/00

Preliminary: Subject to Revision

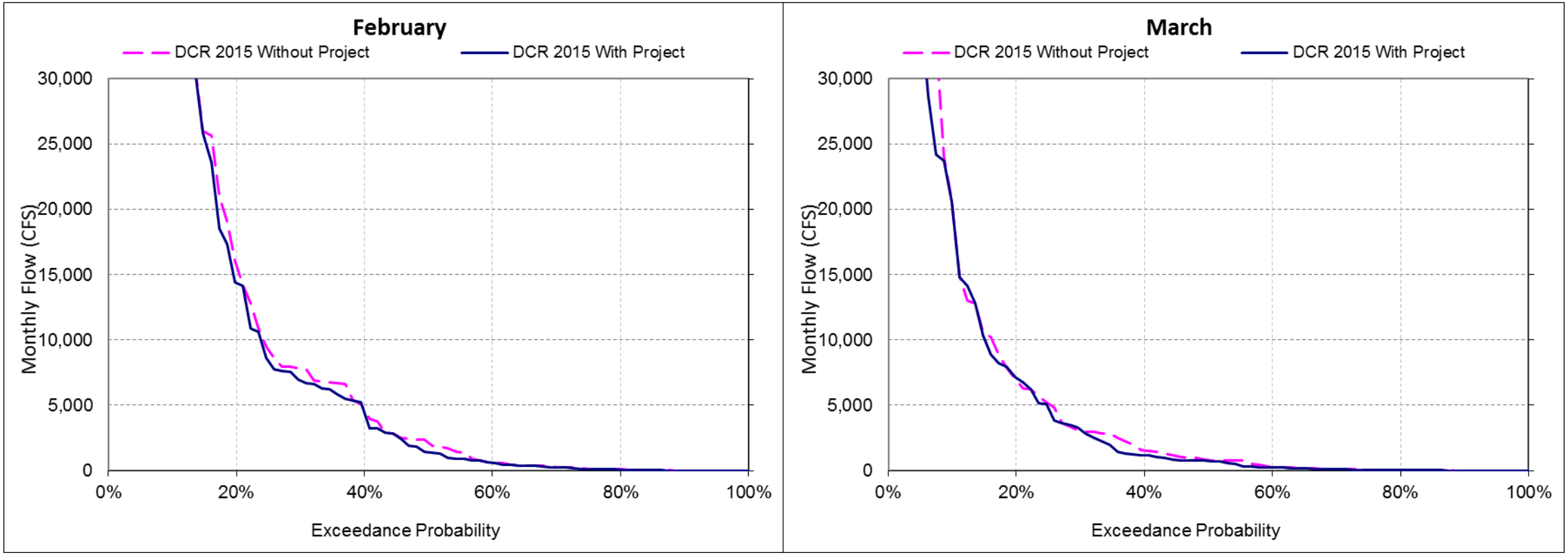
DSM2 Results – Yolo Bypass Flow – Oct-Nov



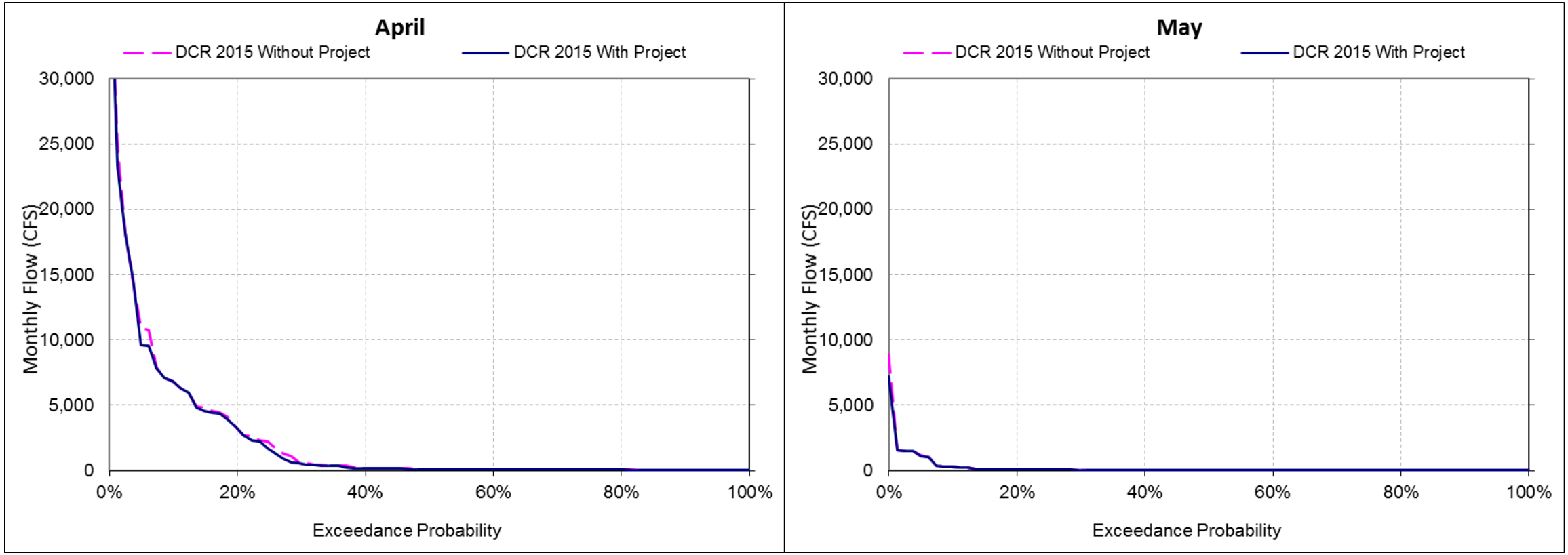
DSM2 Results – Yolo Bypass Flow – Dec-Jan



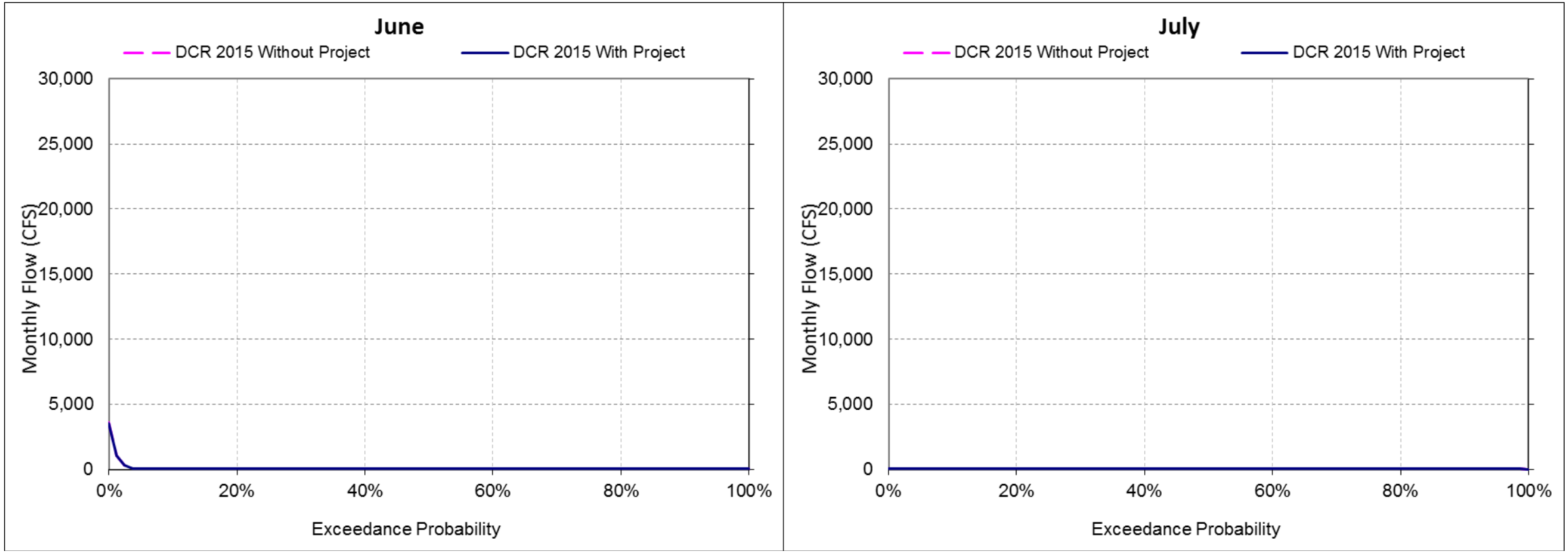
DSM2 Results – Yolo Bypass Flow – Feb-Mar



DSM2 Results – Yolo Bypass Flow – Apr-May



DSM2 Results – Yolo Bypass Flow – Jun-Jul



DSM2 Results – Yolo Bypass Flow – Aug-Sep