The Impact of Jones Tract 2004 Flooding and Pump Out on Urban Drinking Water Supplies: As Simulated by DSM2

California Water and Environmental Modeling Forum

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Michael Mierzwa, P.E.
Delta Modeling Section
California Department of Water Resources

Acknowledgements

Bob Suits, Jim Wilde, Rob DuVall, Ralph Finch, and Jane Schafer-Kramer

References

DWR Flood Management's "After Action Report"

Dec. 2004 – Internal Memo

DSM2 South Delta 2002 & 2003 Studies

http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/dsm2studies.cfm

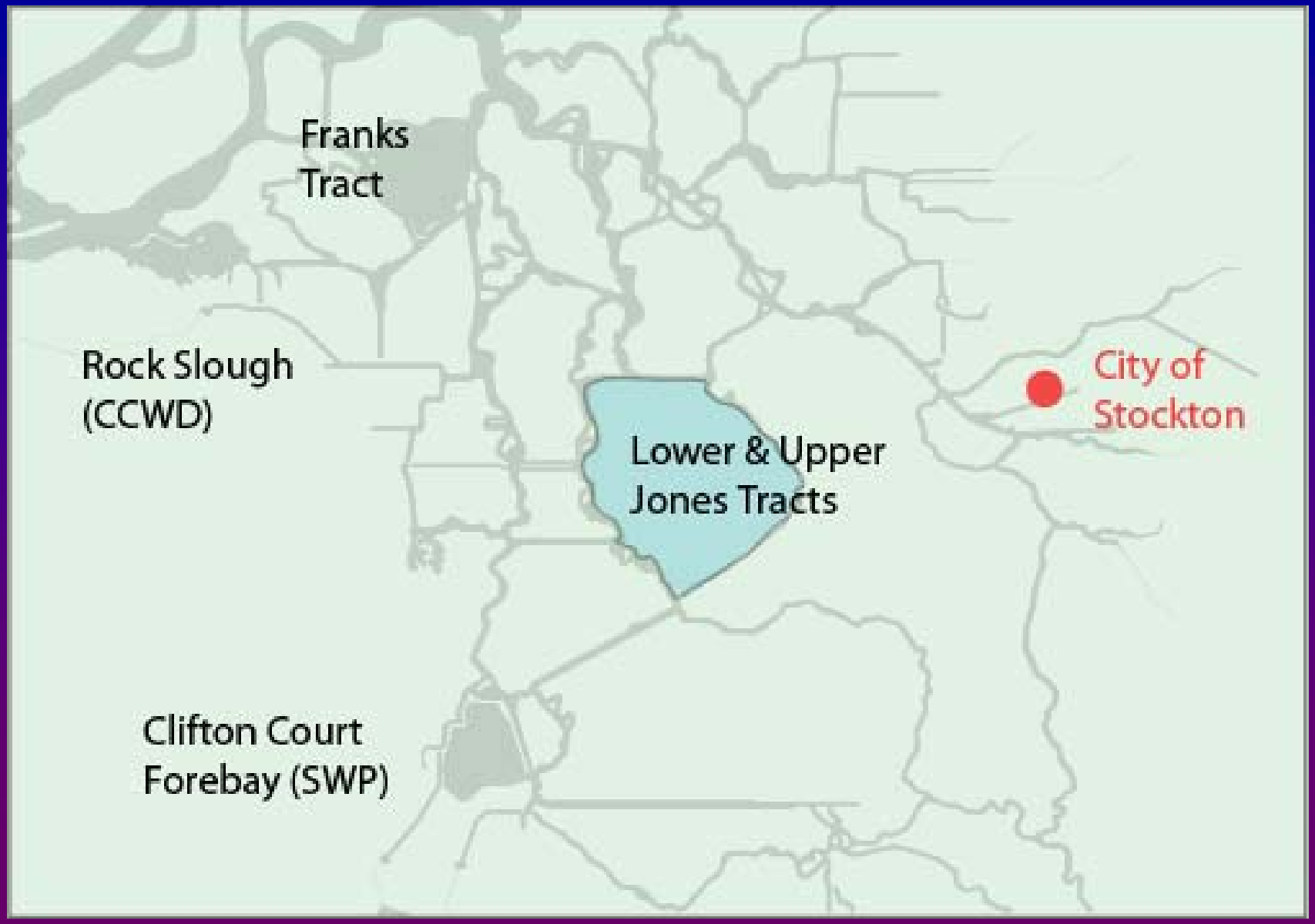
Revision of Representative Delta Island Return Flow Quality for DSM2 and DICU Model Runs

Dec. 2000 – Internal Report

Annual Reports: 2001, Chapter 3 & 2003, Chapter 7

http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/annualreports.cfm

Jones Tract Location



Overview of Prior DSM2 Jones Tract Studies

- Short- and Long-Term DOC Forecasts
  - Jun. 2004 Study – Jul. 8, 2004 Memo
  - http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/news/DOC_July2004_forecast_070804.pdf
- July 2004 Source Water Fingerprint
  - Aug. 2004 Study – Results released to MWQI Stakeholders
- Short- and Long-Term DOC Forecasts
  - Sep. 2004 Study – Sep. 16, 2004 Memo
  - http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/news/2004SepForecast.pdf

Time Line of Jones Tract Events

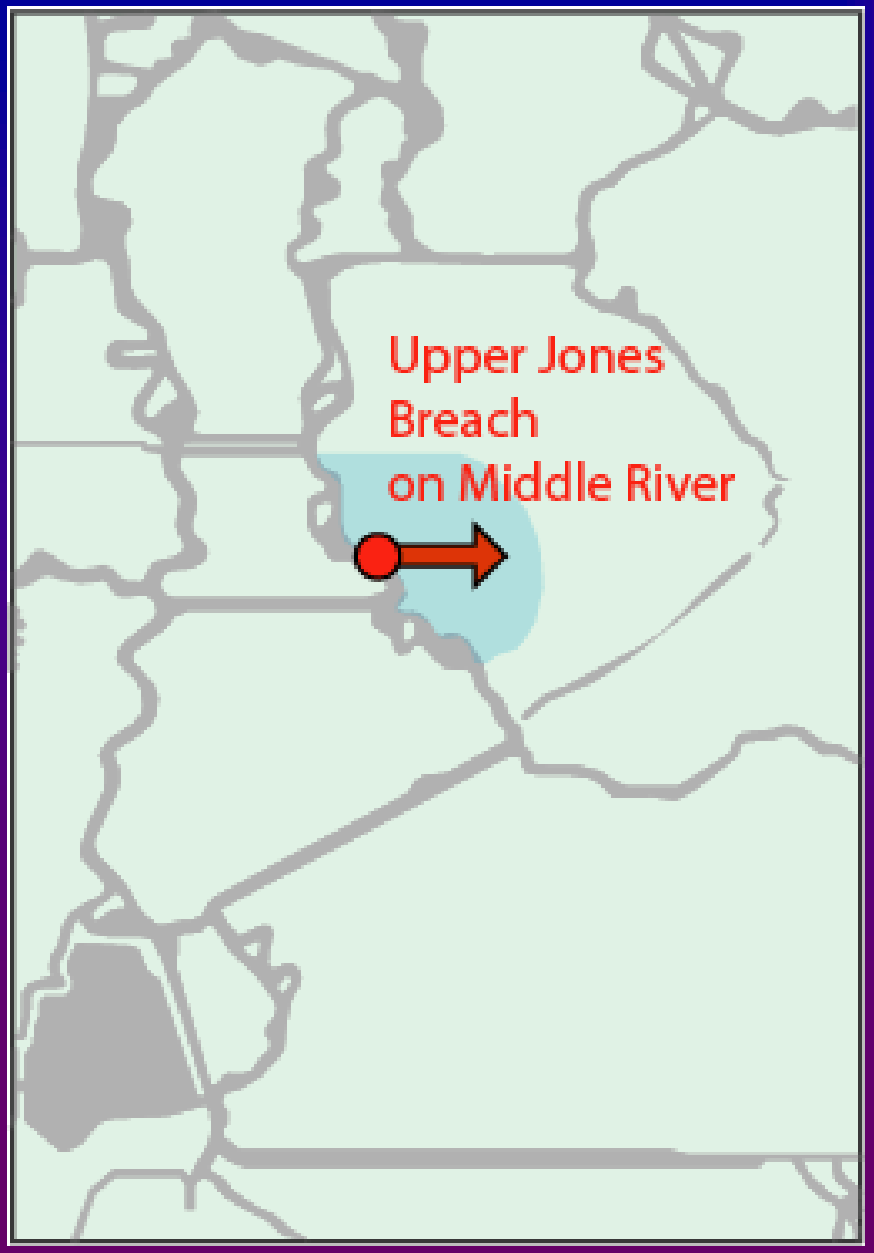
(Hydrodynamic Summary)

Breach: Transition Period

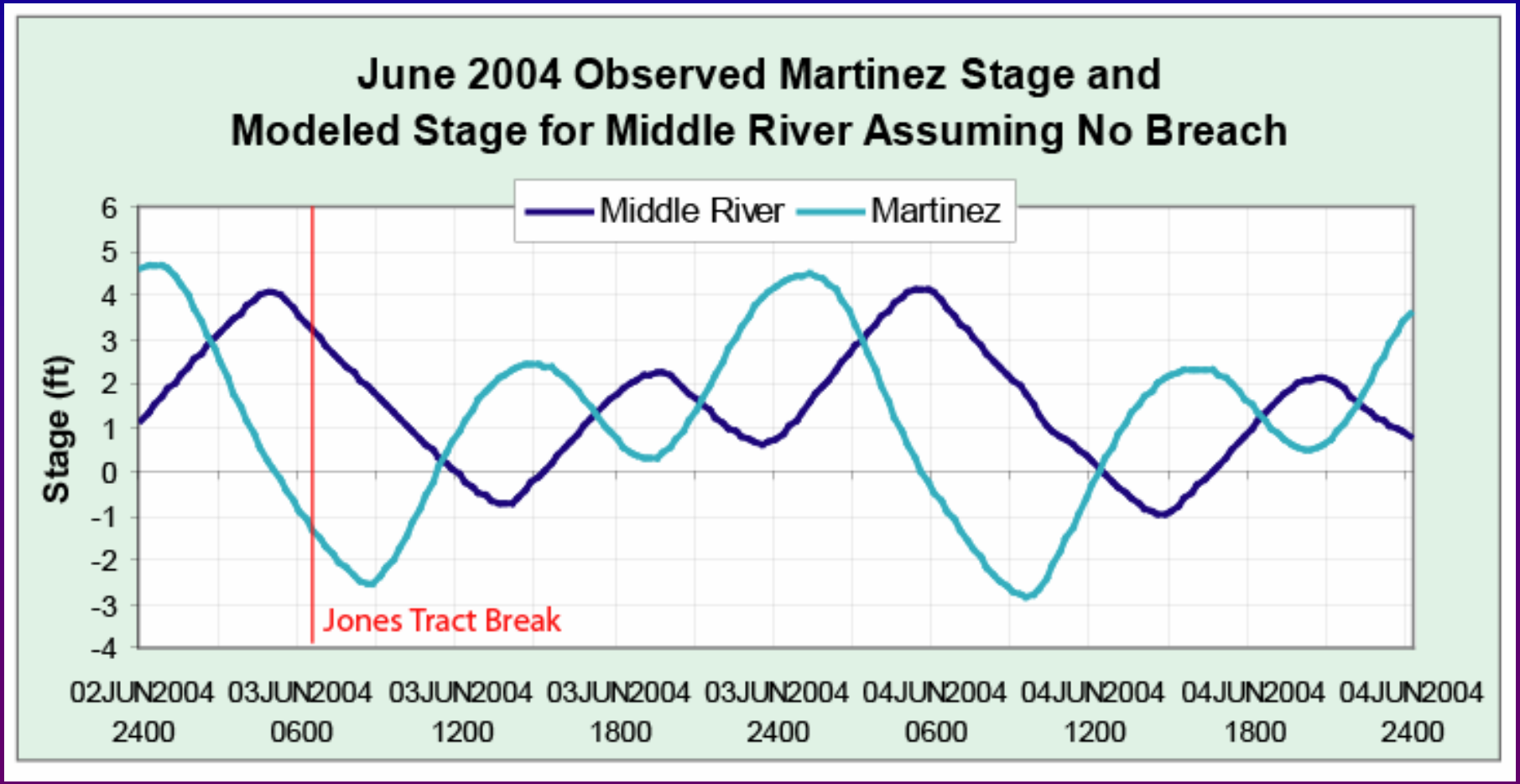
Jun. 3 @
6:51 am (PST)

Upper Jones Tract Levee breaches on Middle River near Woodward and North Victoria Canals during ebb tide (transition from HH to LL water levels) during peak of Spring Tide.

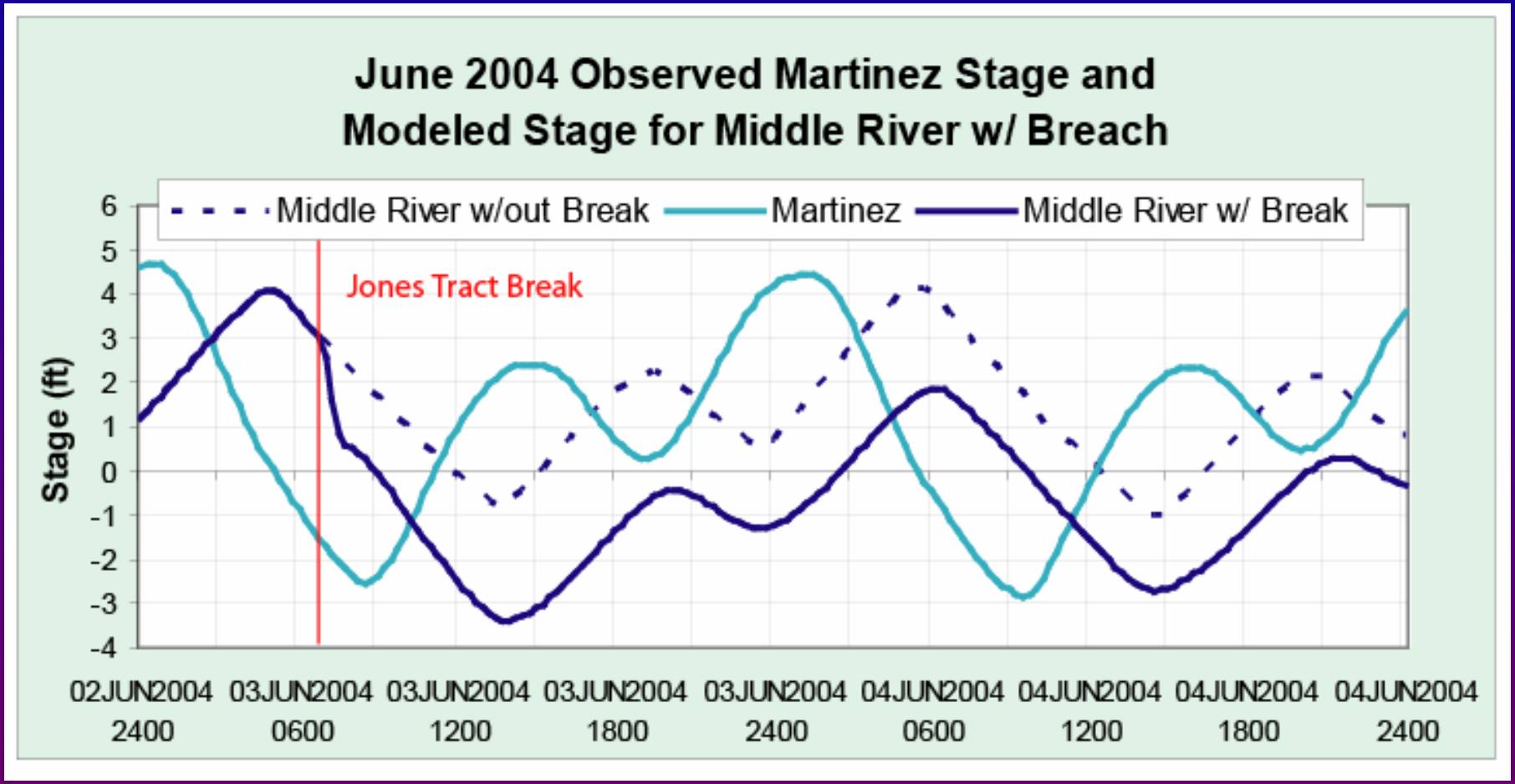
Water rushes onto Jones Tract for several days.



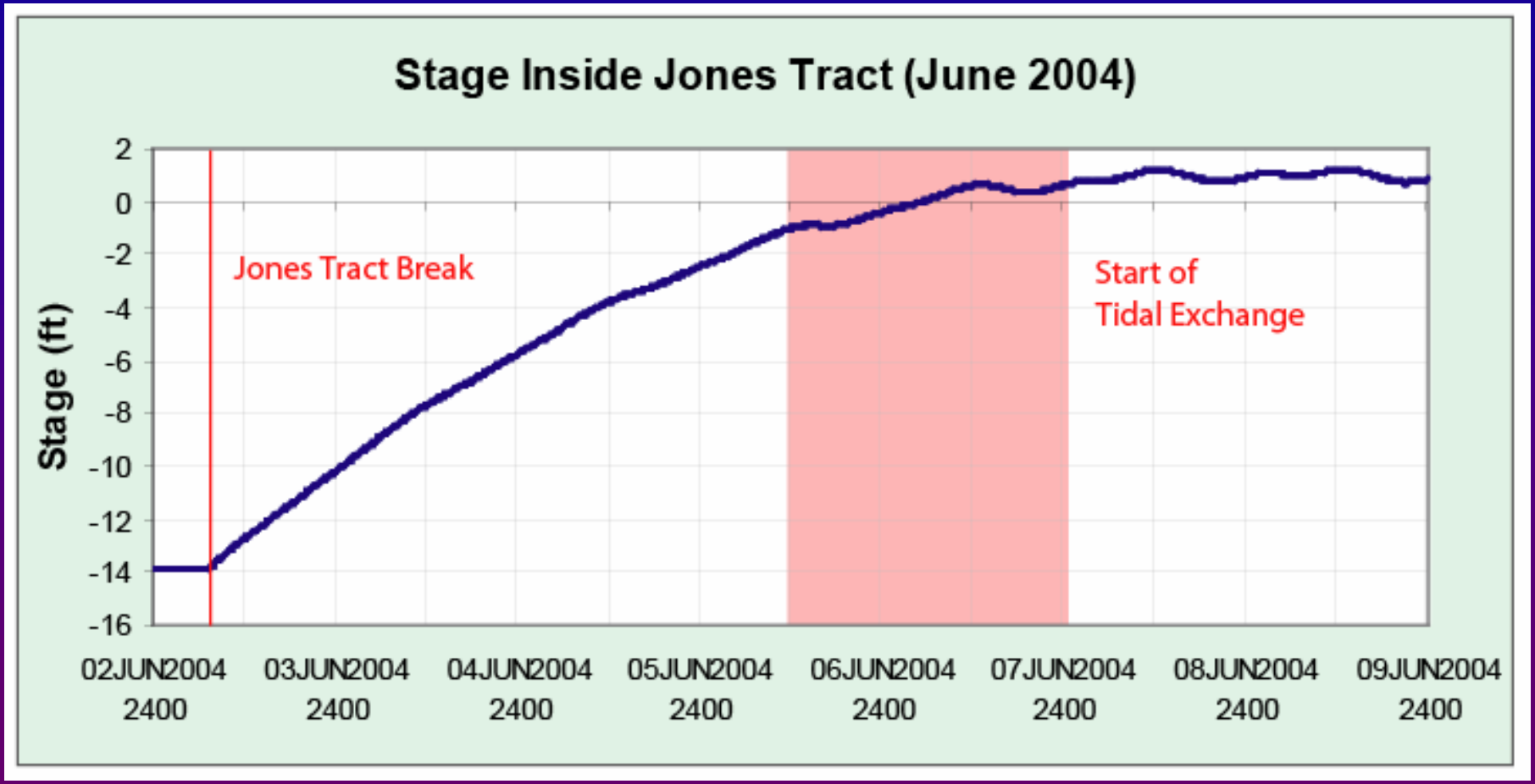
Spring Tide / Ebb Tide: Water Levels with Breach



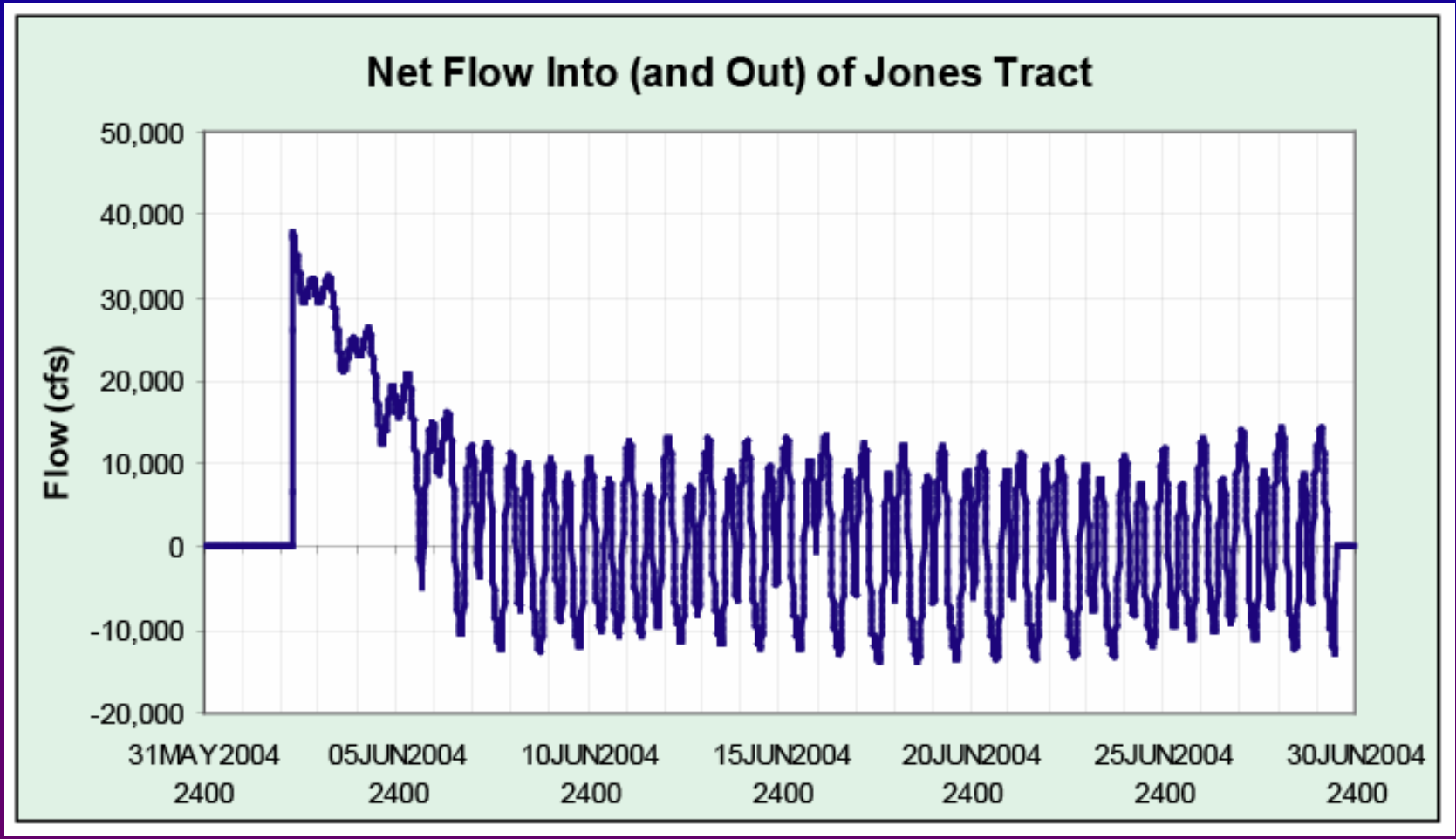
Spring Tide / Ebb Tide: Water Levels without Breach



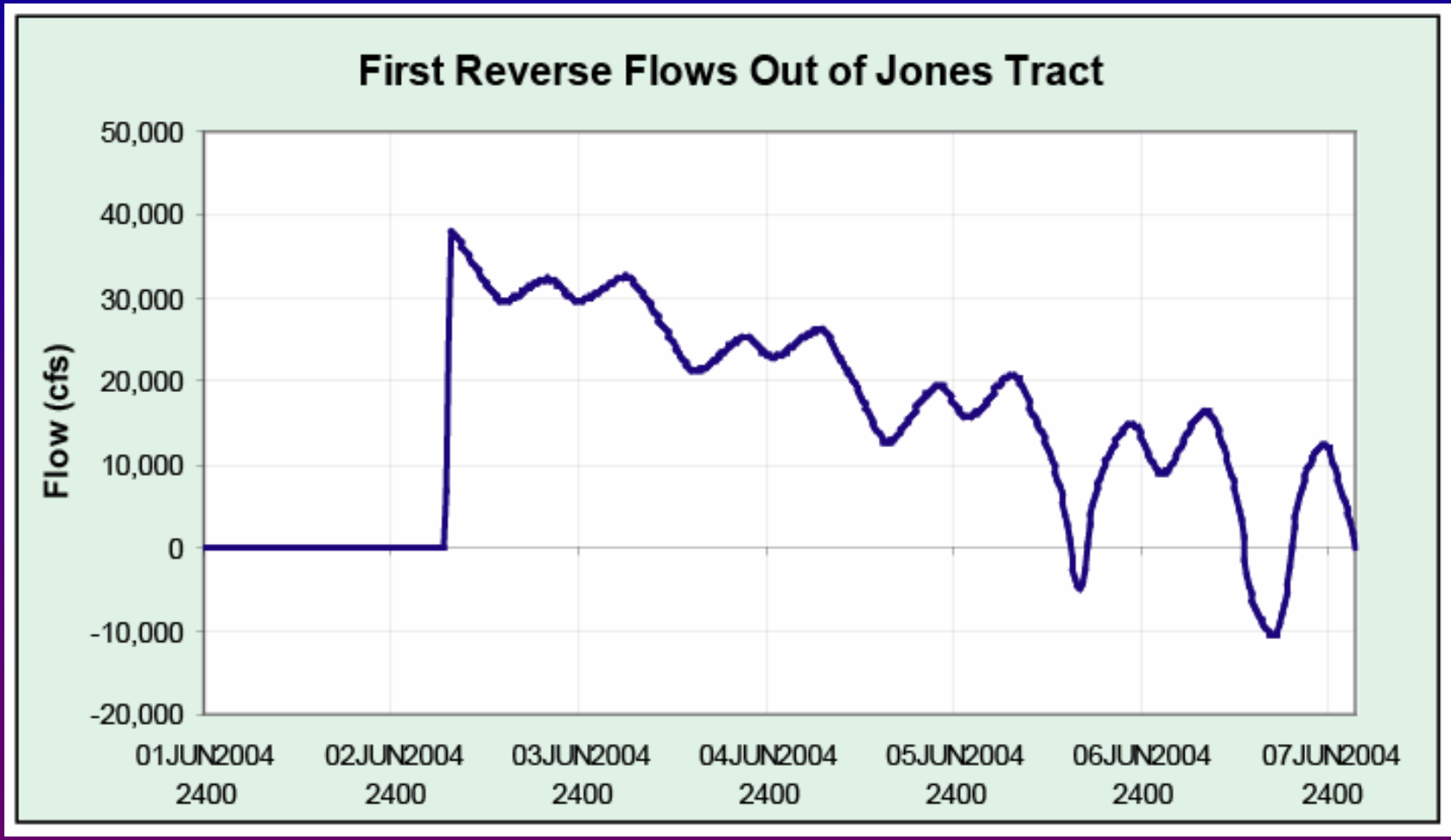
DSM2 Water Levels Inside Jones Tract



DSM2 Net Flow Into Jones Tract

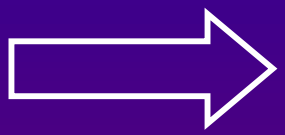


DSM2 Flows During Filling Period



DSM2 Average Inflow During Filling

Day	*Ave. Inflow (cfs)*
Jun. 3rd	31,600
Jun. 4th	26,800
Jun. 5th	20,000
Jun. 6th	12,600
Jun. 7th	6,300
Jun. 8th	2,000
Jun. 9th	-400



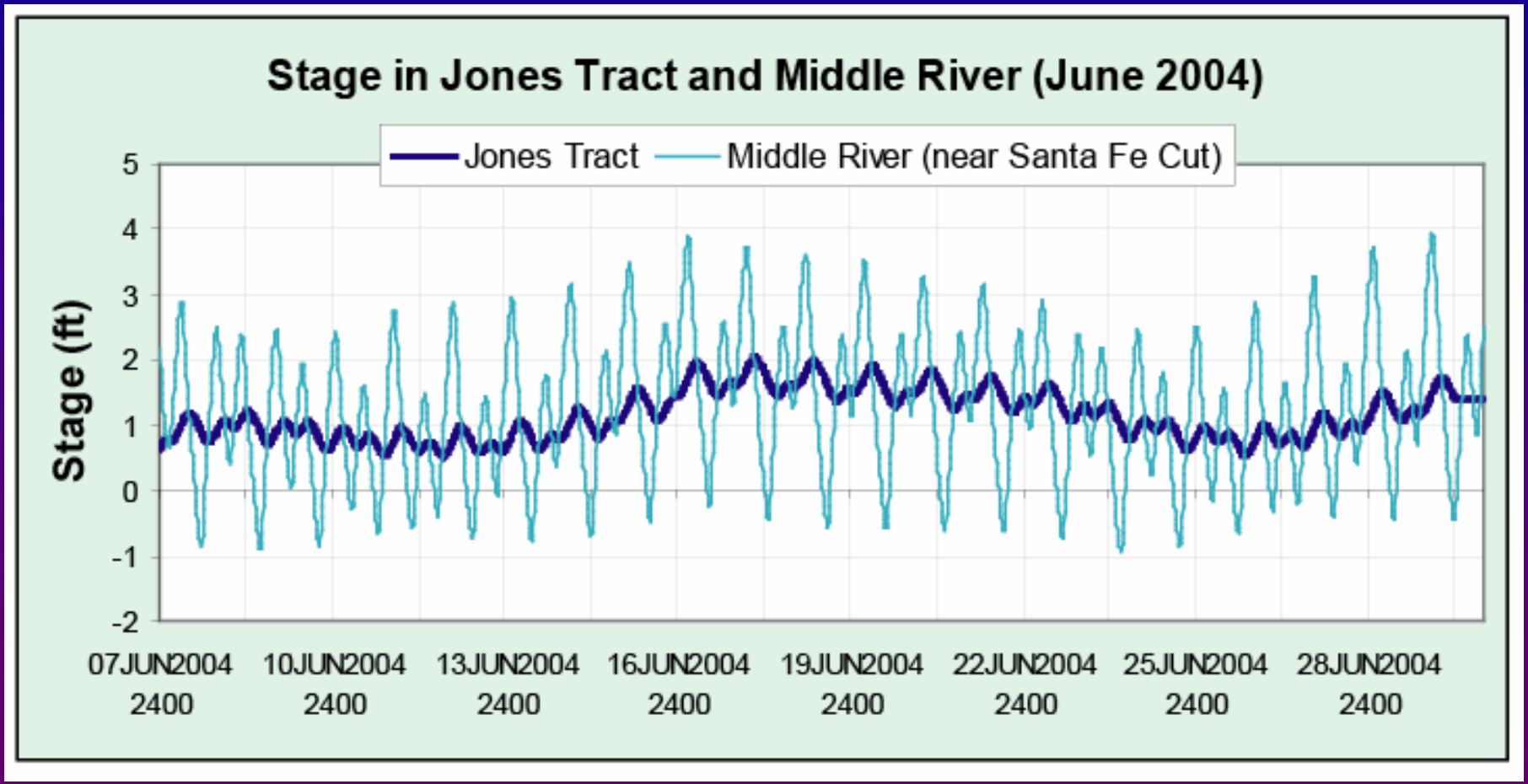
DSM2 Jones Tract Storage = 178 TAF

Islands Filled: Tidal Exchange

Jun. 6 to 7

Water levels on Jones Tract vary now in response to tidal influences, with water actually leaving the islands during ebb tides and returning during flood tides.

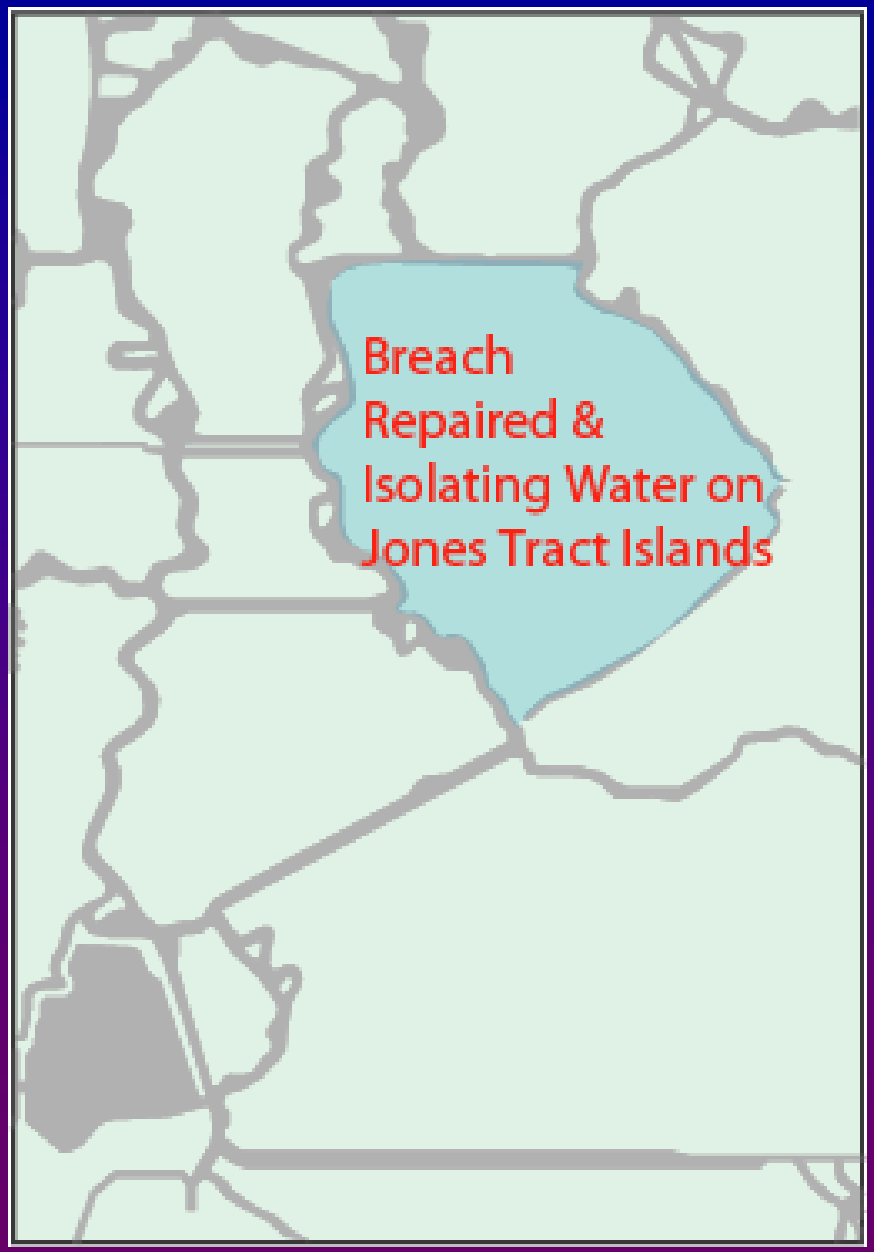
DSM2 Water Levels During Tidal Exchange Period



Breach Repaired: Water Isolated

Jun. 30 @
~12:00 pm (PST)

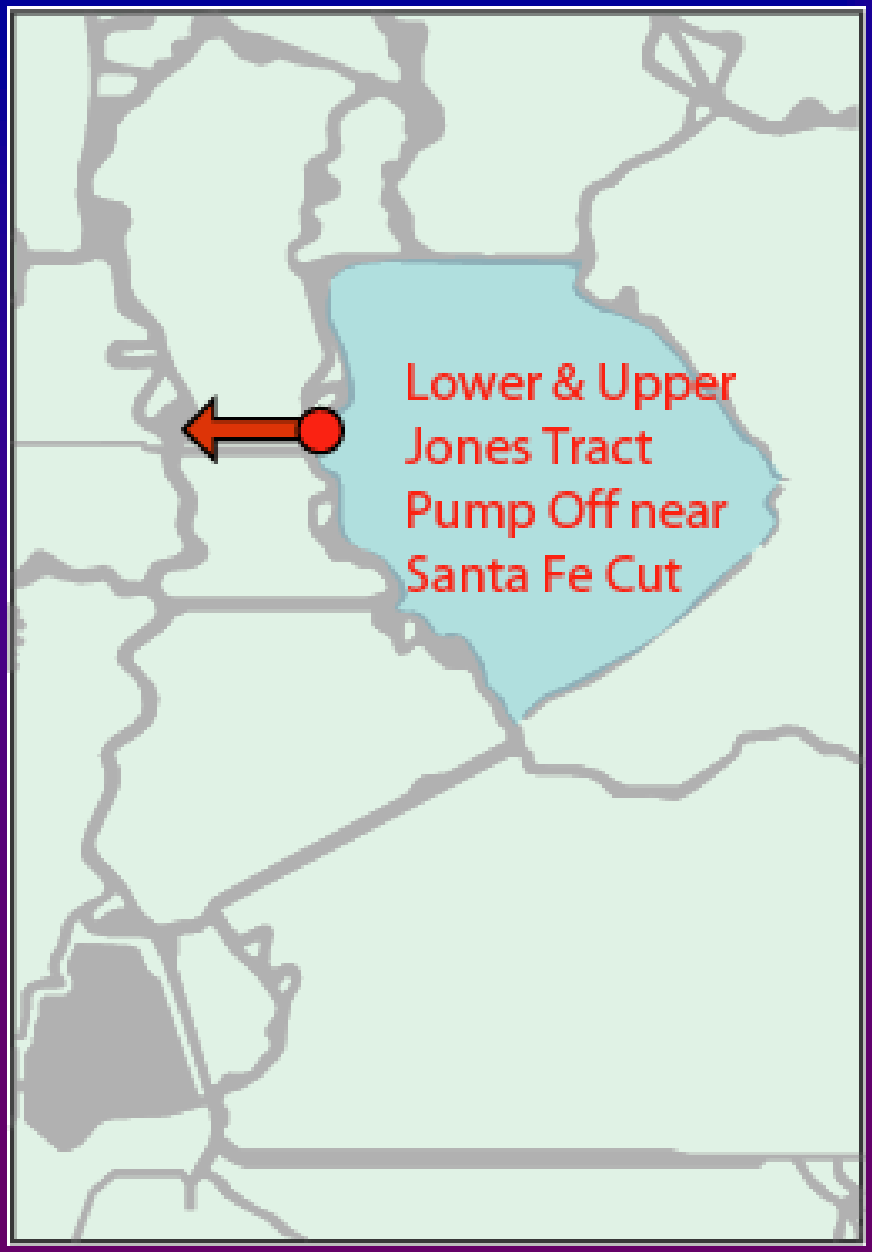
DWR finishes repairs on the levee, isolating Jones Tract from the Middle River. Work now focuses on finishing construction of a series of pumps to remove water from the flooded islands.



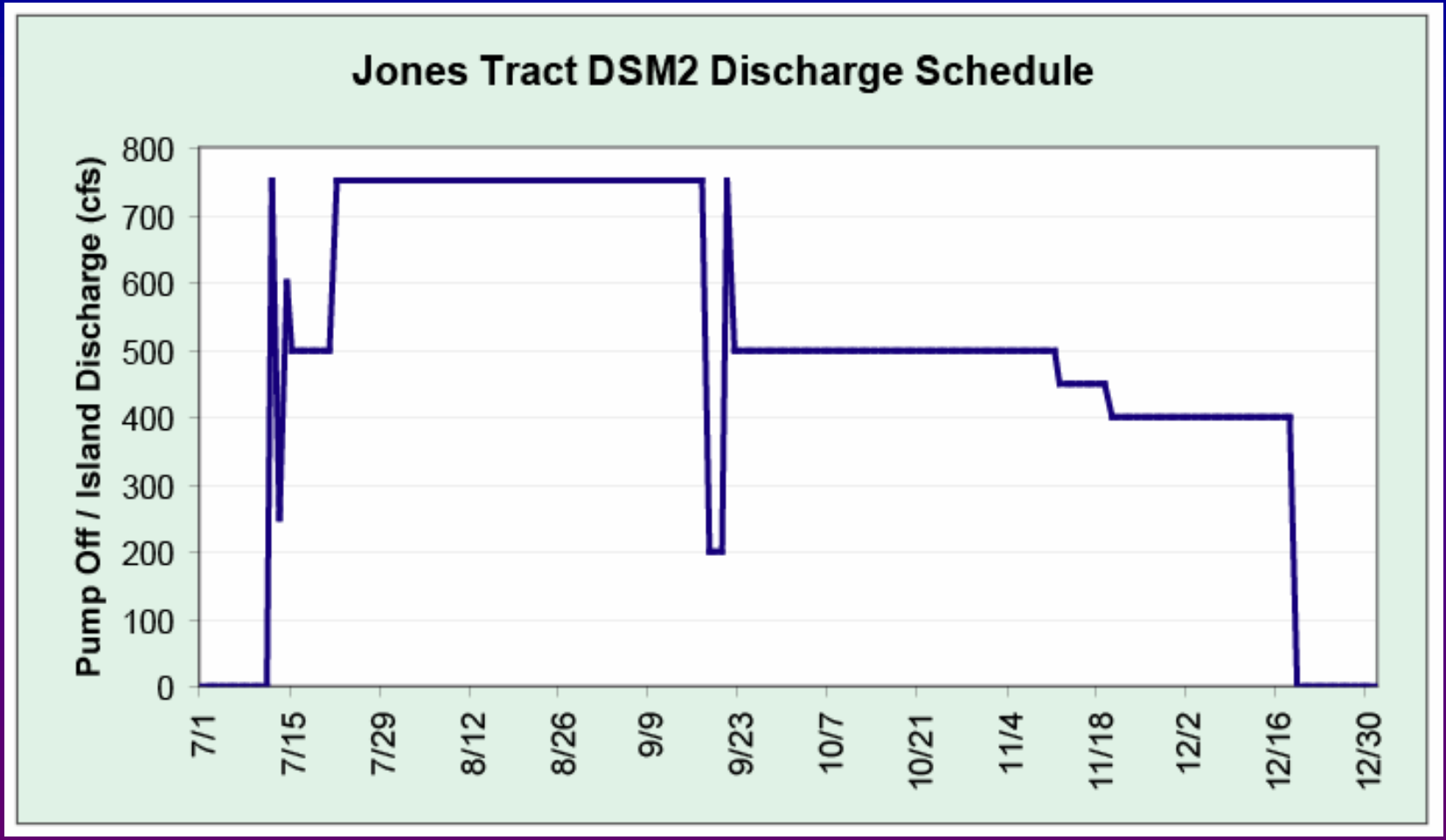
Begin Pump Off

Jul. 12

DWR begins pump off operations for both Upper and Lower Jones Tract, releasing water on Middle River near Santa Fe Rail Road. Pumps have a maximum discharge capacity of 800 cfs.



DSM2 Estimated Jones Tract Pump Off

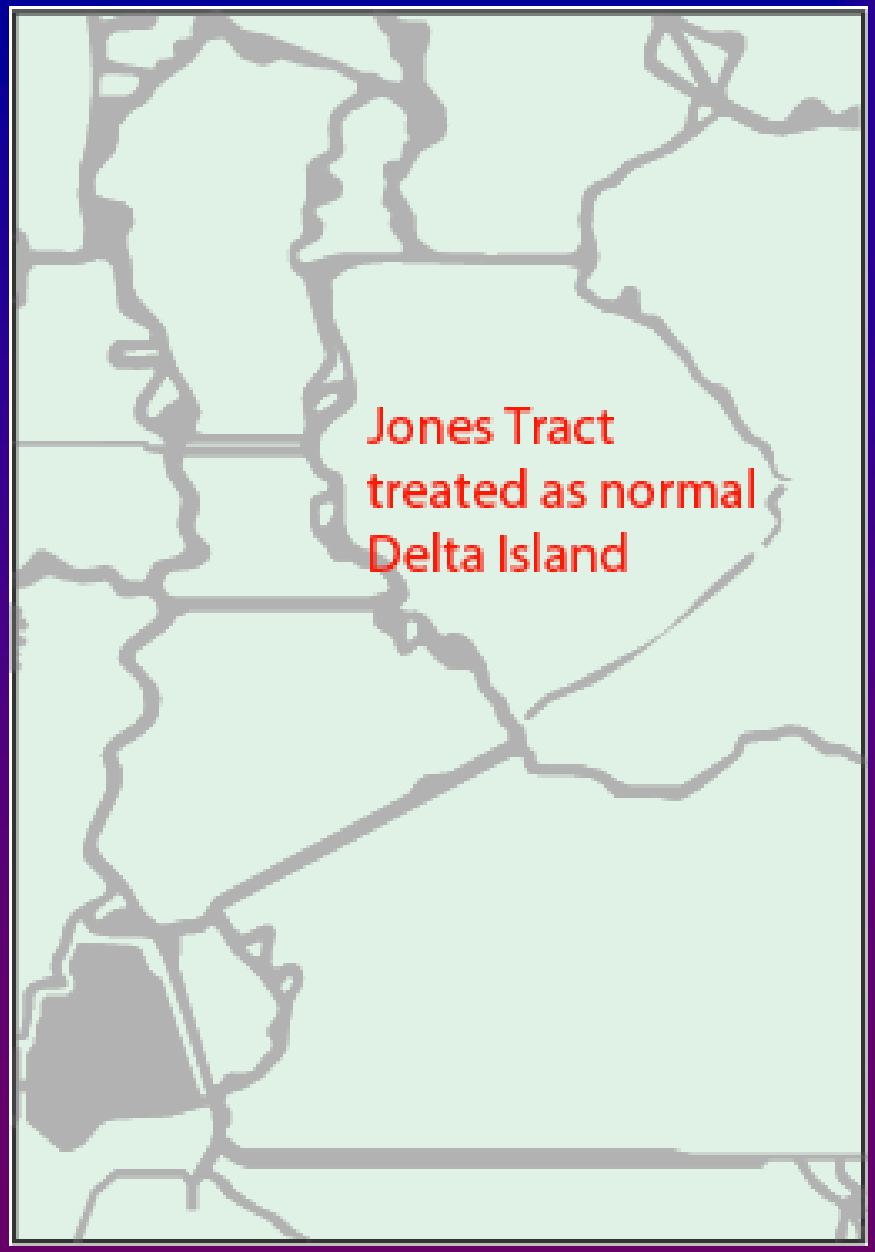


~180 TAF pumped off Jones Tract from Jul. 12 through Dec. 18.

End Pump Off

Dec. 18

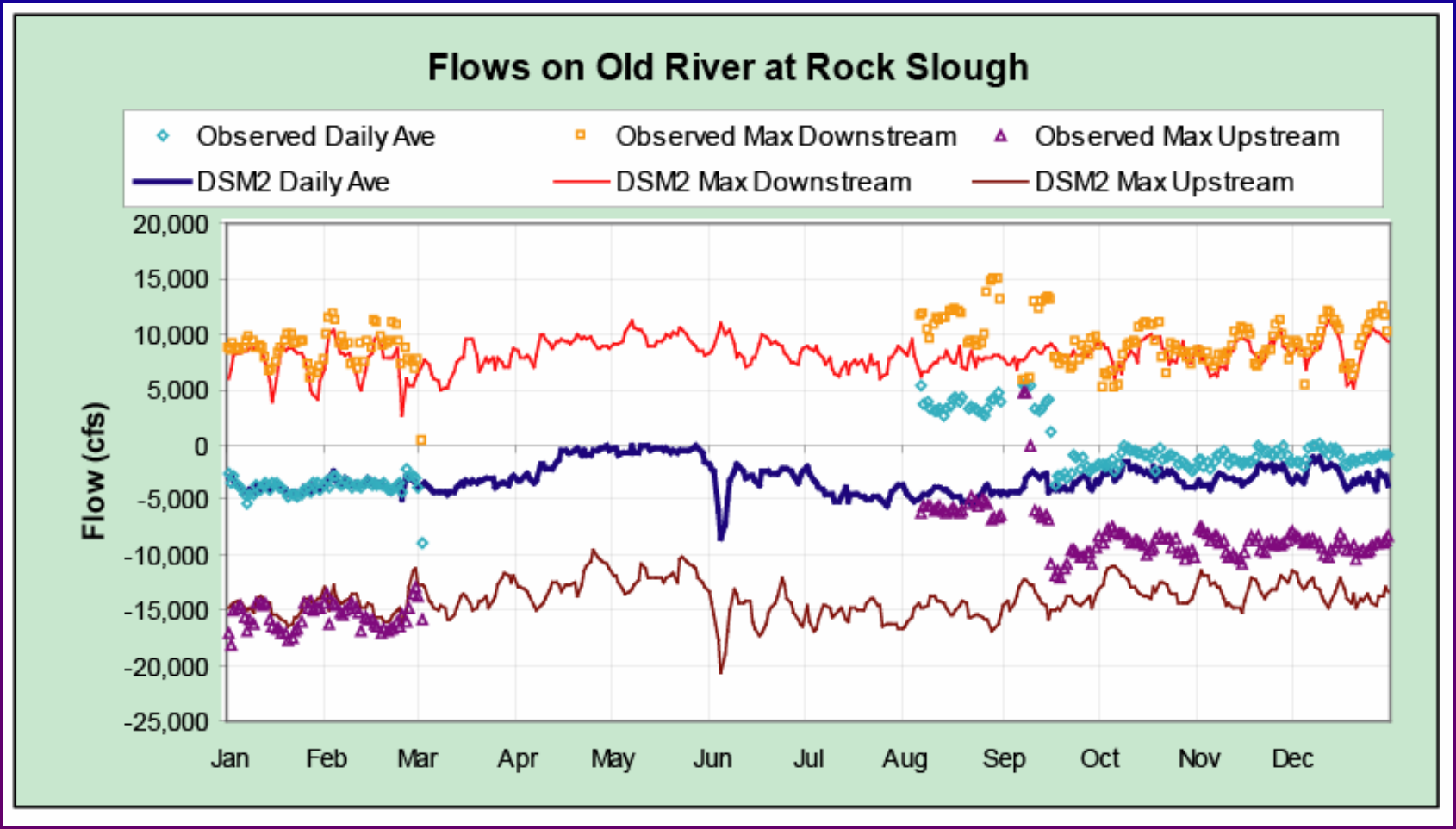
DWR pump off operations finally end, after over 4 months of daily average discharge rates ranging from 750 cfs to 400 cfs.



Summary of Jones Tract Periods

- Jun. 3 – Jun. 7
  Jones Tract Fills
- Jun. 7 – Jun. 30
  Limited Tidal Mixing in Jones Tract through Levee Breach
- Jun. 30 – Jul. 12
  Jones Tract Isolated from Delta
- Jul. 12 – Dec. 18
  Water Released from Jones Tract

DSM2 Flows Elsewhere



DSM2 Jones Tract Summary

Surface Area (Fixed)	12,000 acres
Bottom Elevation	14 ft NGVD
June Tidal Variation	0.5 ft to 2.0 ft
Design Depth	15 ft
Design Storage	180 TAF
Min. June Storage	174 TAF
Max. June Storage	193 TAF
June 30th Storage	185 TAF

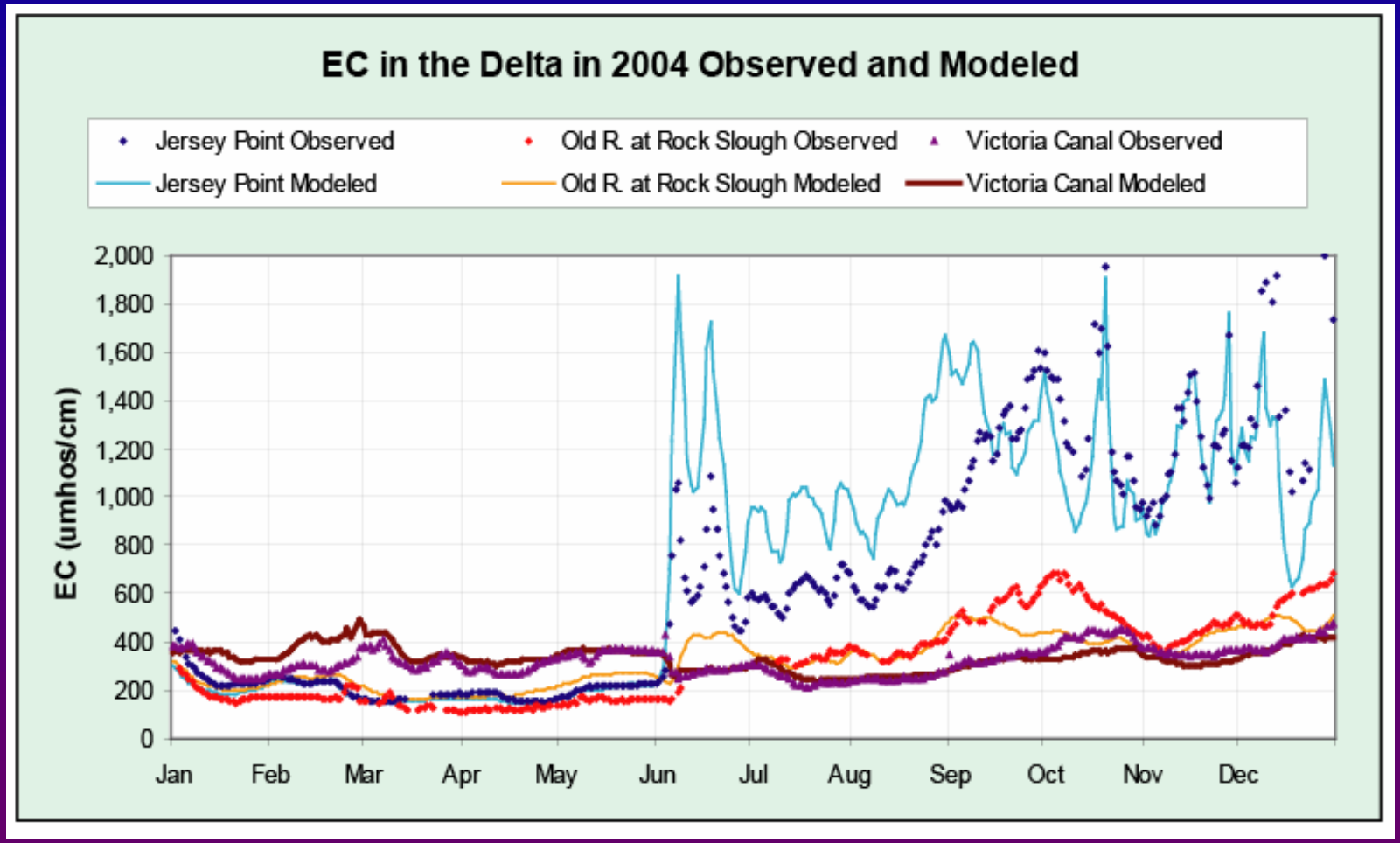
DSM2 Scenarios

Scenario	Date of Levee Break	Date of Pump Off	OC Growth Rate
Historical	Jun. 3	Jul. 12	0.5 $gC/m^2/day$
Historical-Low	Jun. 3	Jul. 12	0.05 $gC/m^2/day$
No Pump Off	Jun. 3	-	0.5 $gC/m^2/day$
No Break	-	-	0.5 $gC/m^2/day$

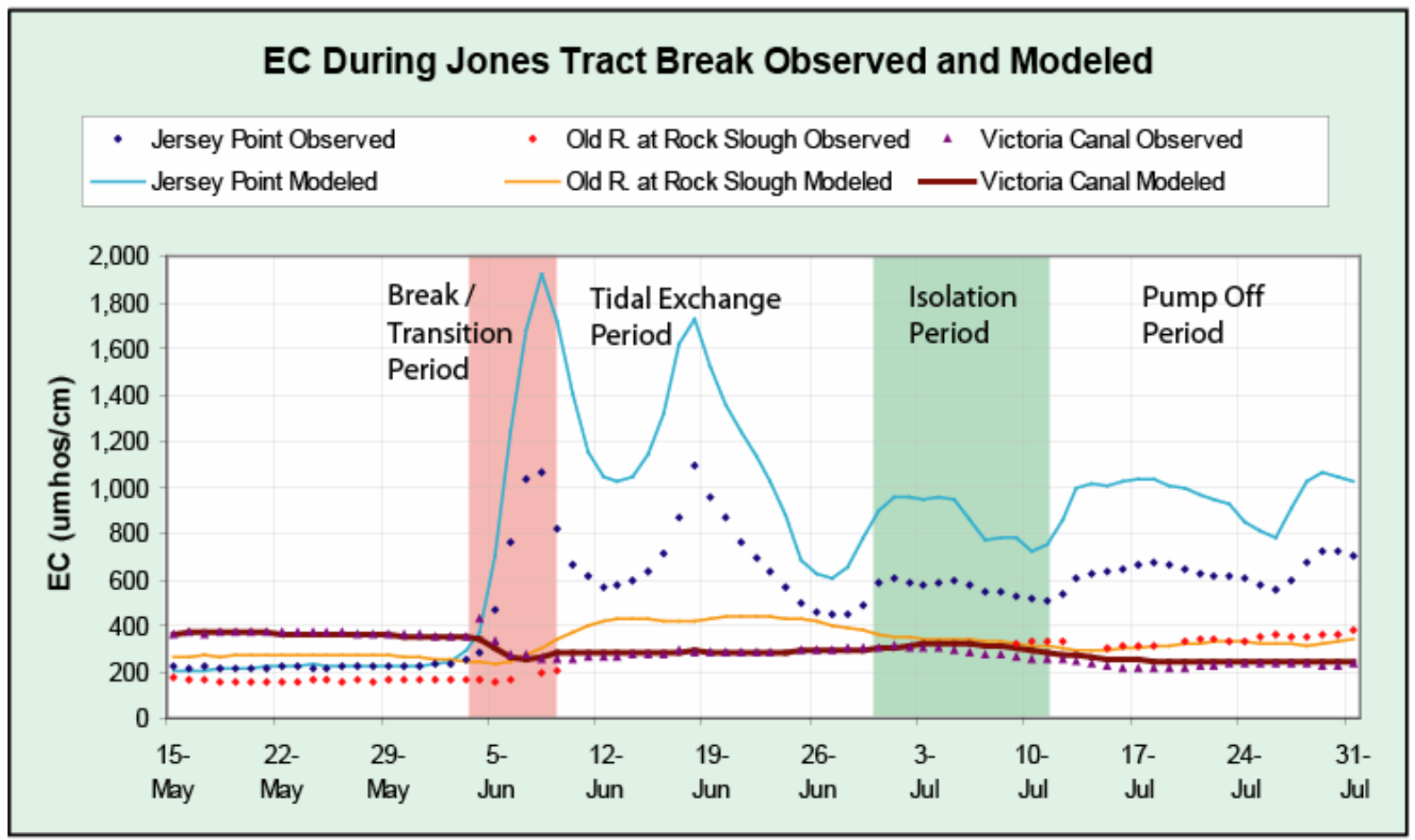
Water Quality Response

(EC / Salinity)

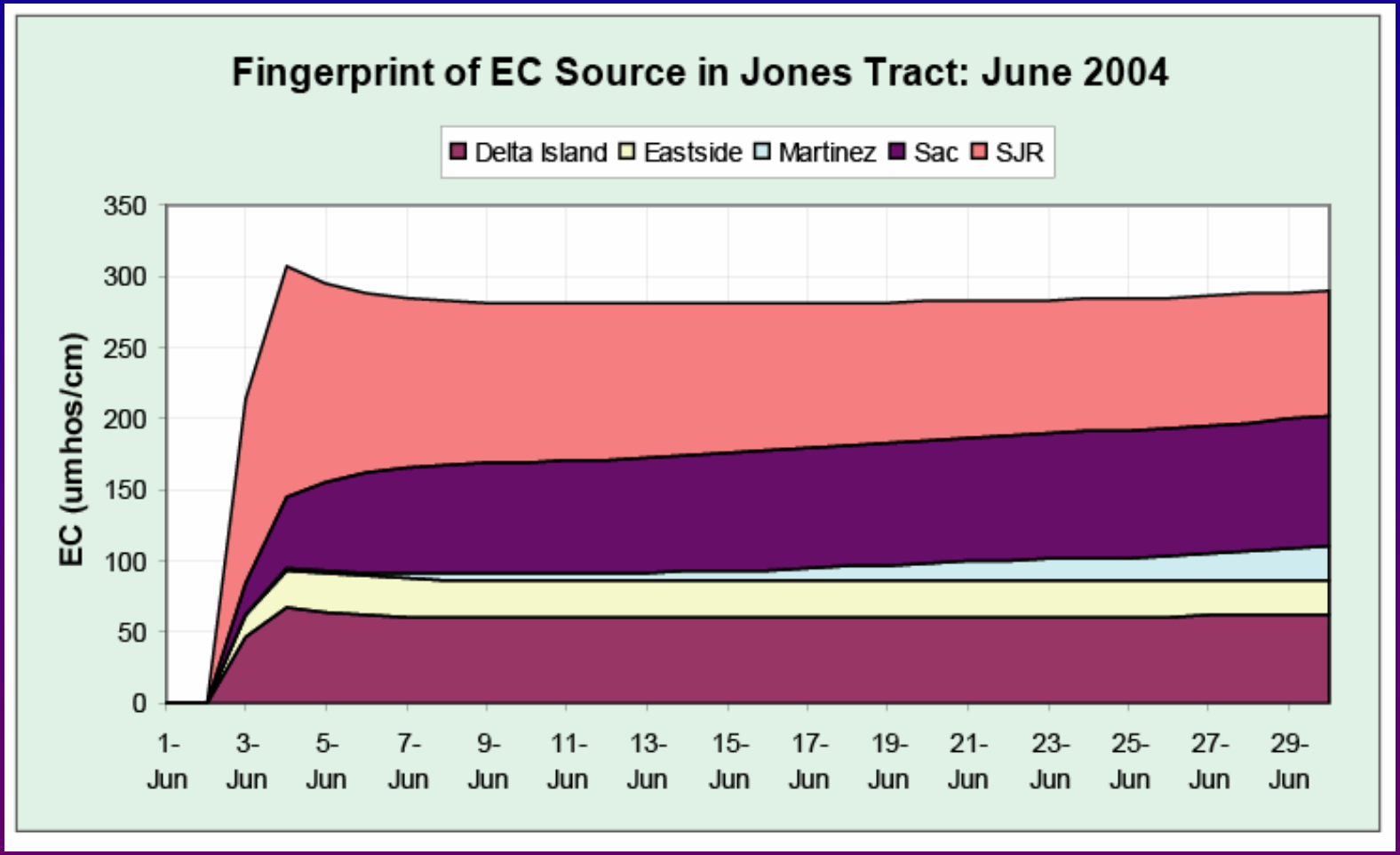
Delta EC in 2004



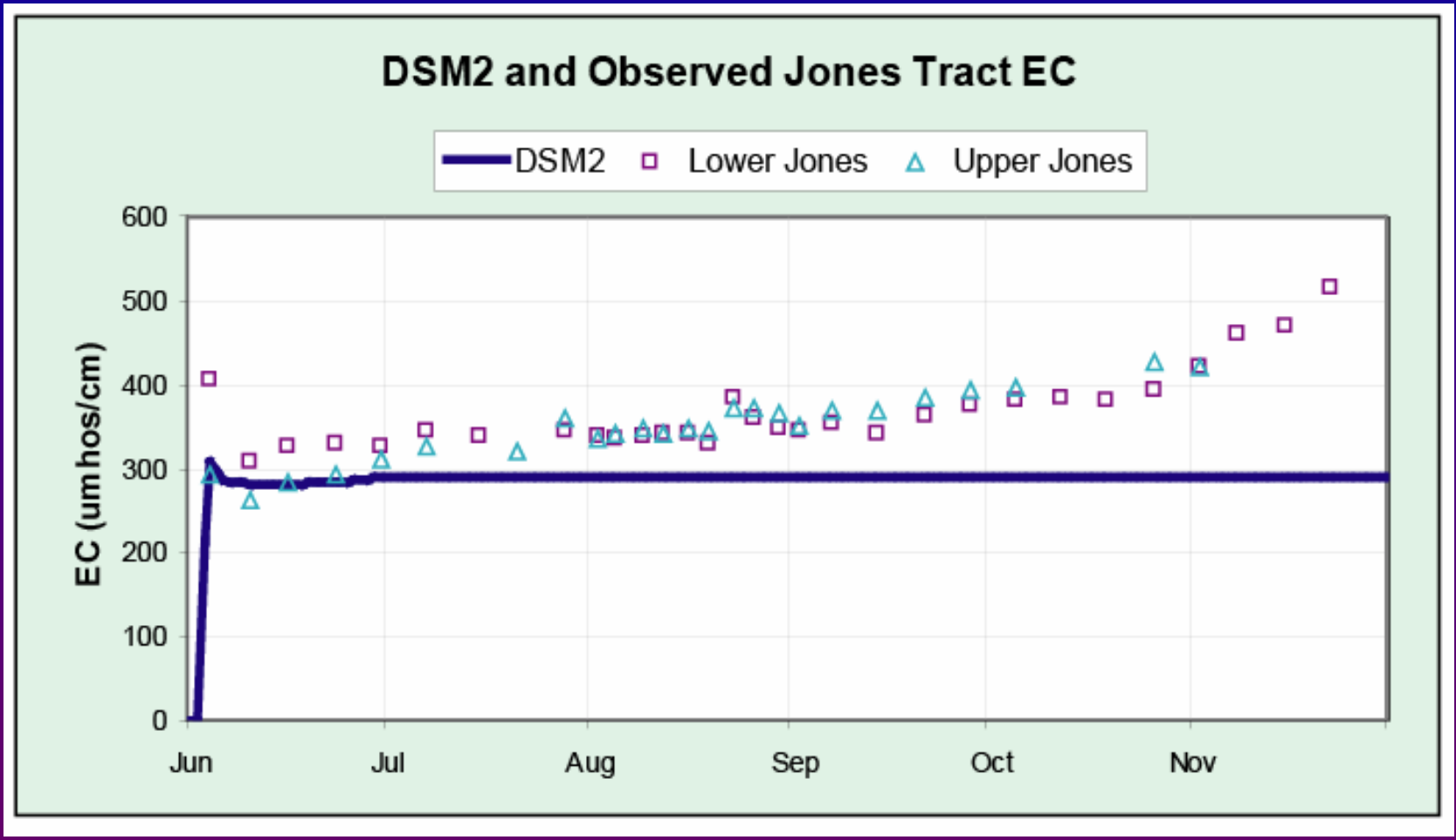
Intrusion of EC During Break



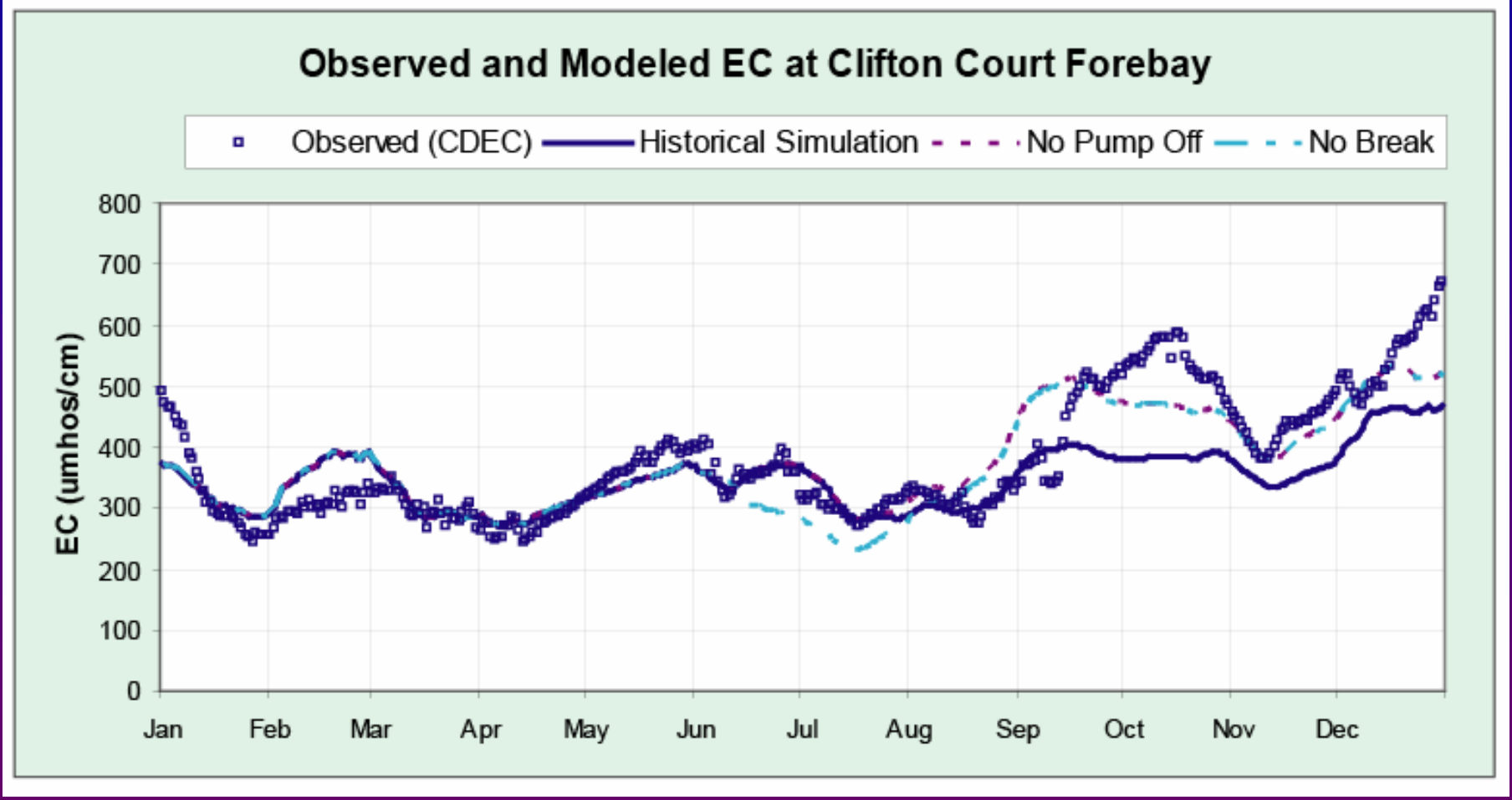
Sources of EC on Jones Tract



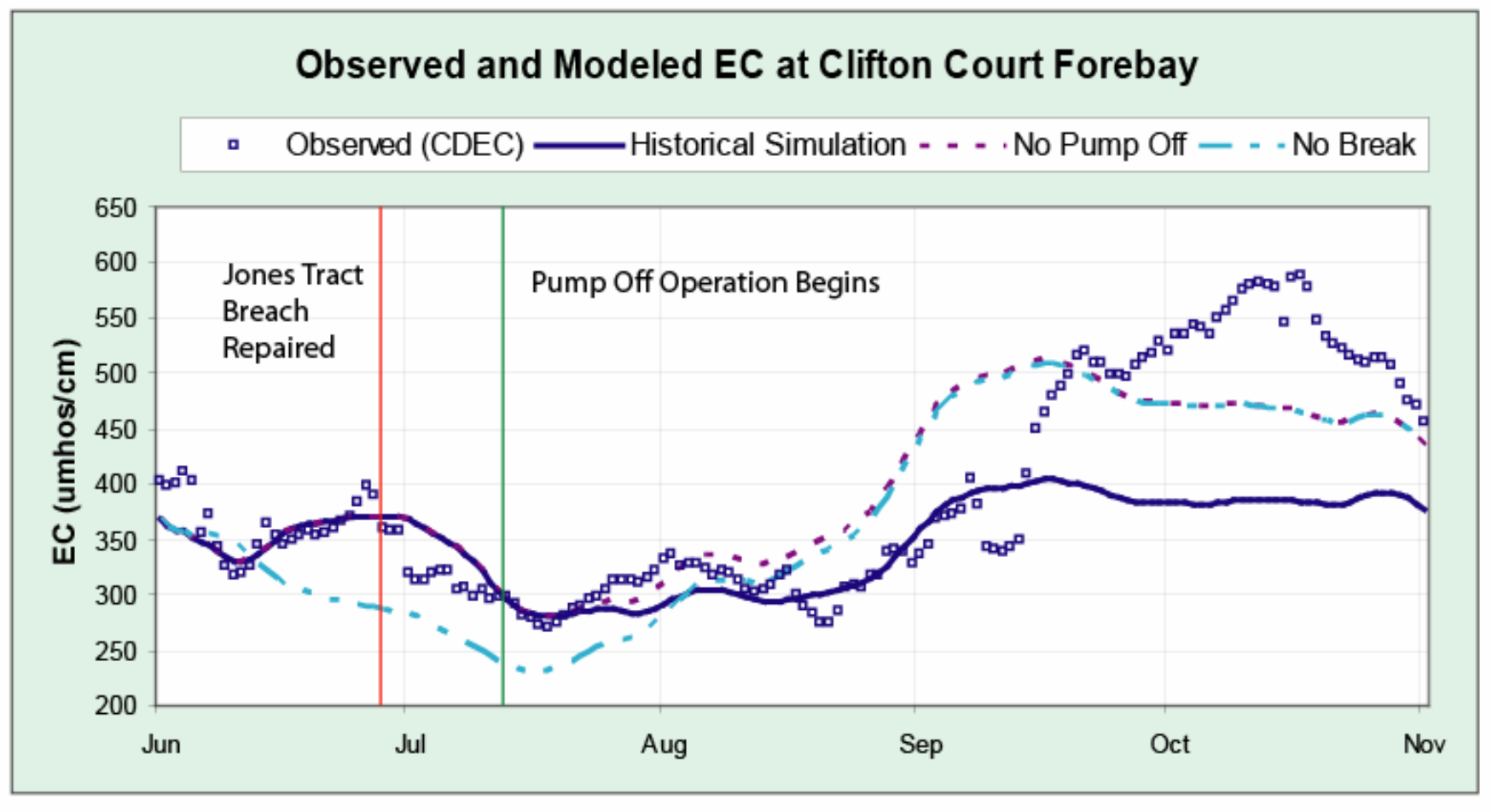
DSM2 and Observed Jones Tract EC



EC at Clifton Court Forebay



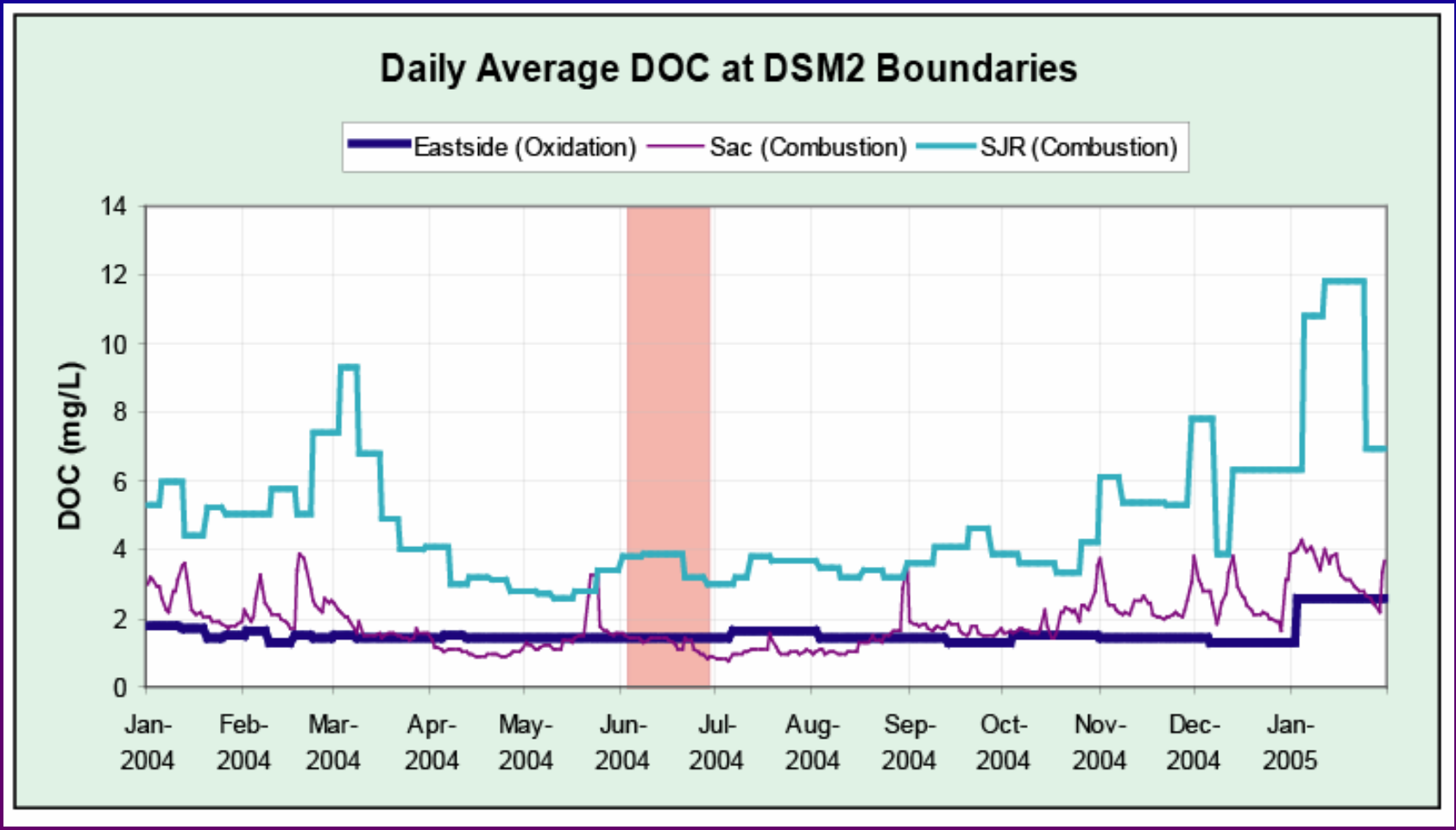
Clifton Court: Jun. – Nov.



Water Quality Response

(Organic Carbon)

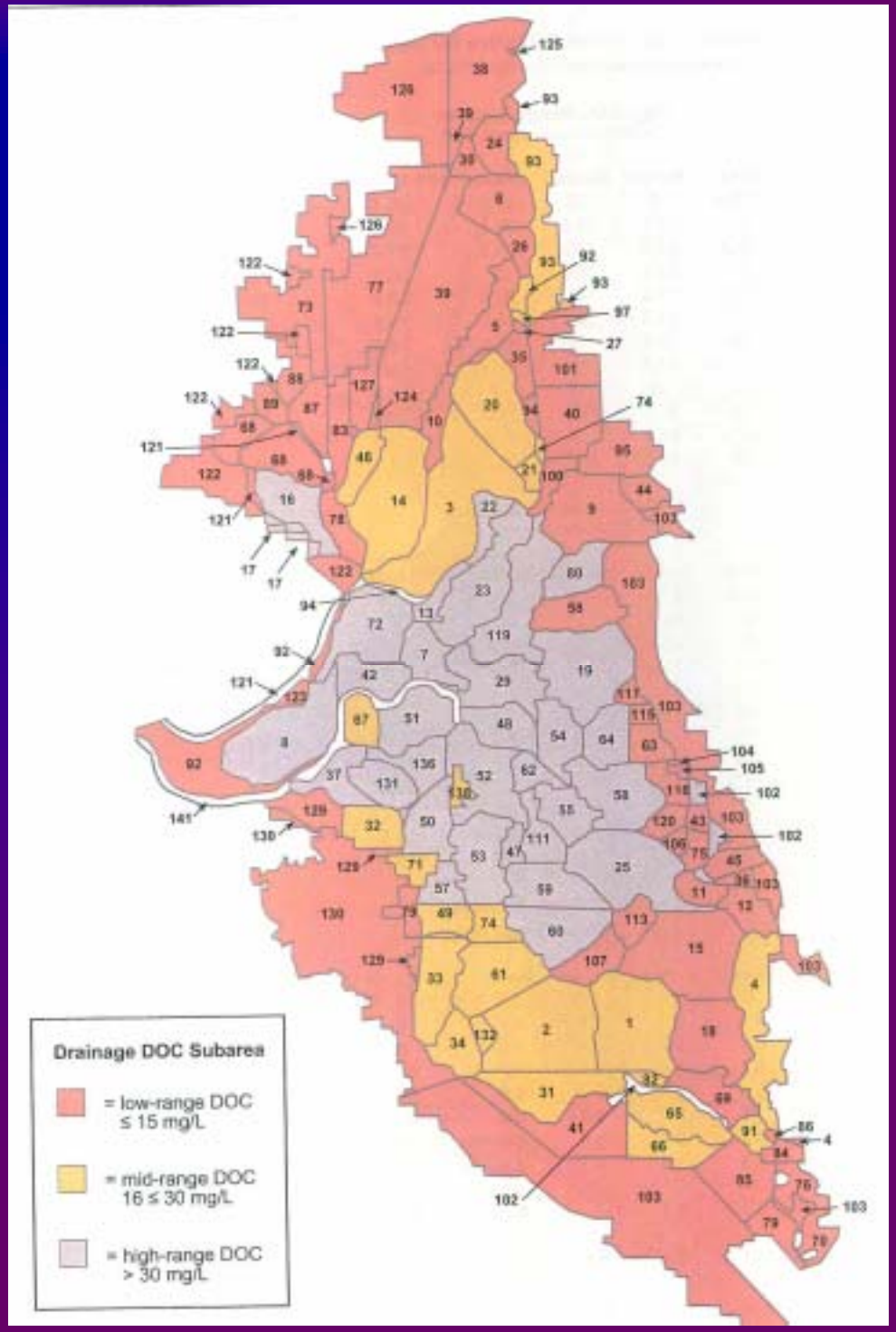
DSM2 Boundary DOC in 2004



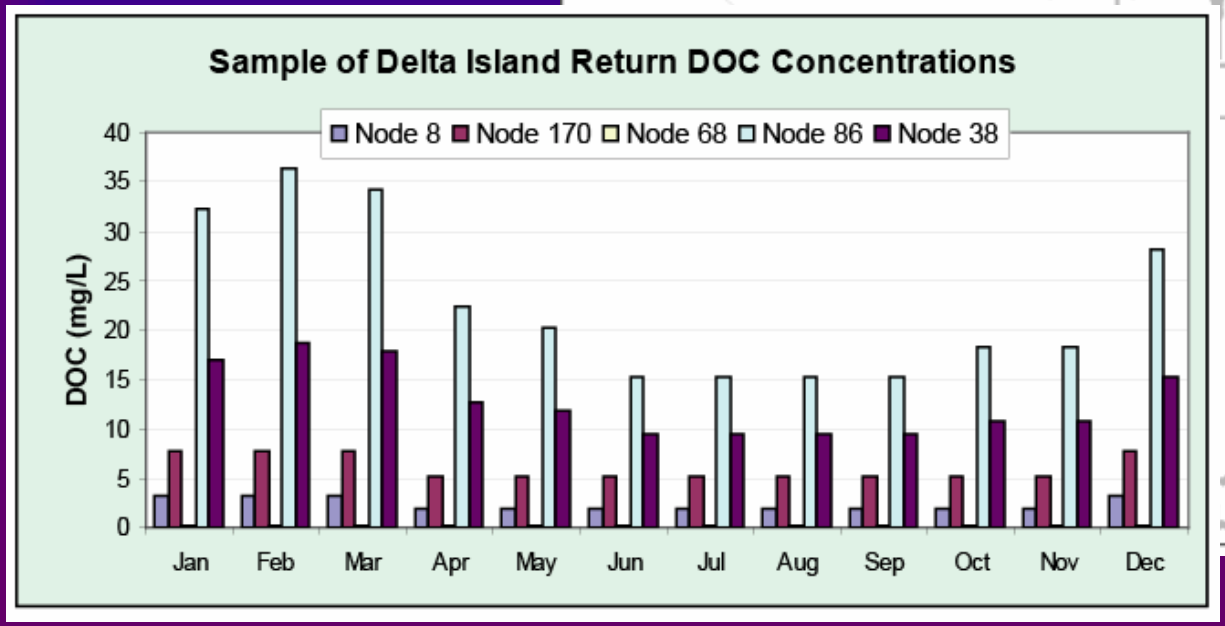
DICU Model & DSM2

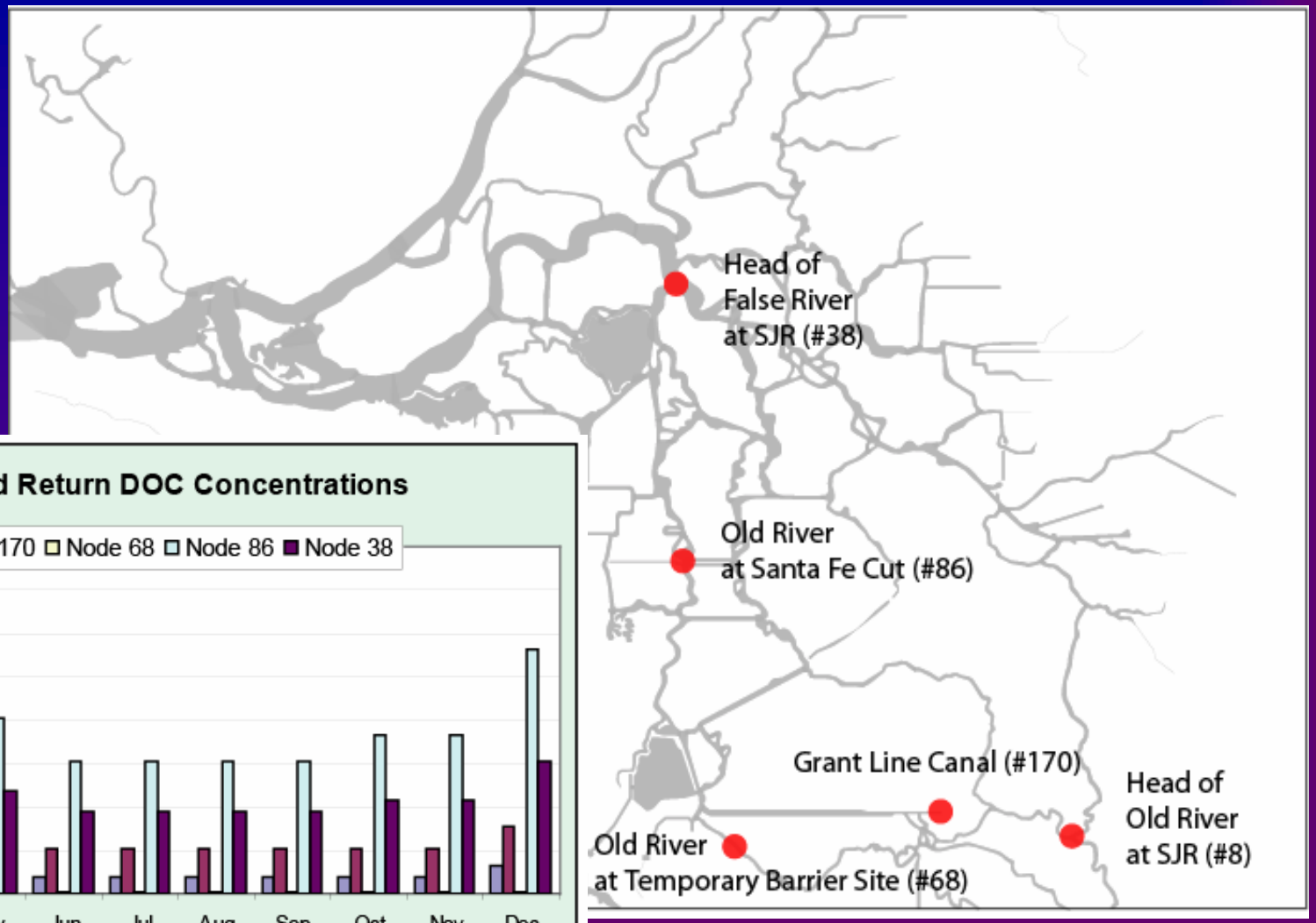
DICU STEP 1
Historical Precip. & Pan Evap. Used to Determine Monthly Average Diversions and Returns (Varies by Monthy and Year)

DICU STEP 2
Concentration of DOC Associated with Return Flows based on Field Studies like Jung, 2000 (Varies by Month Only)

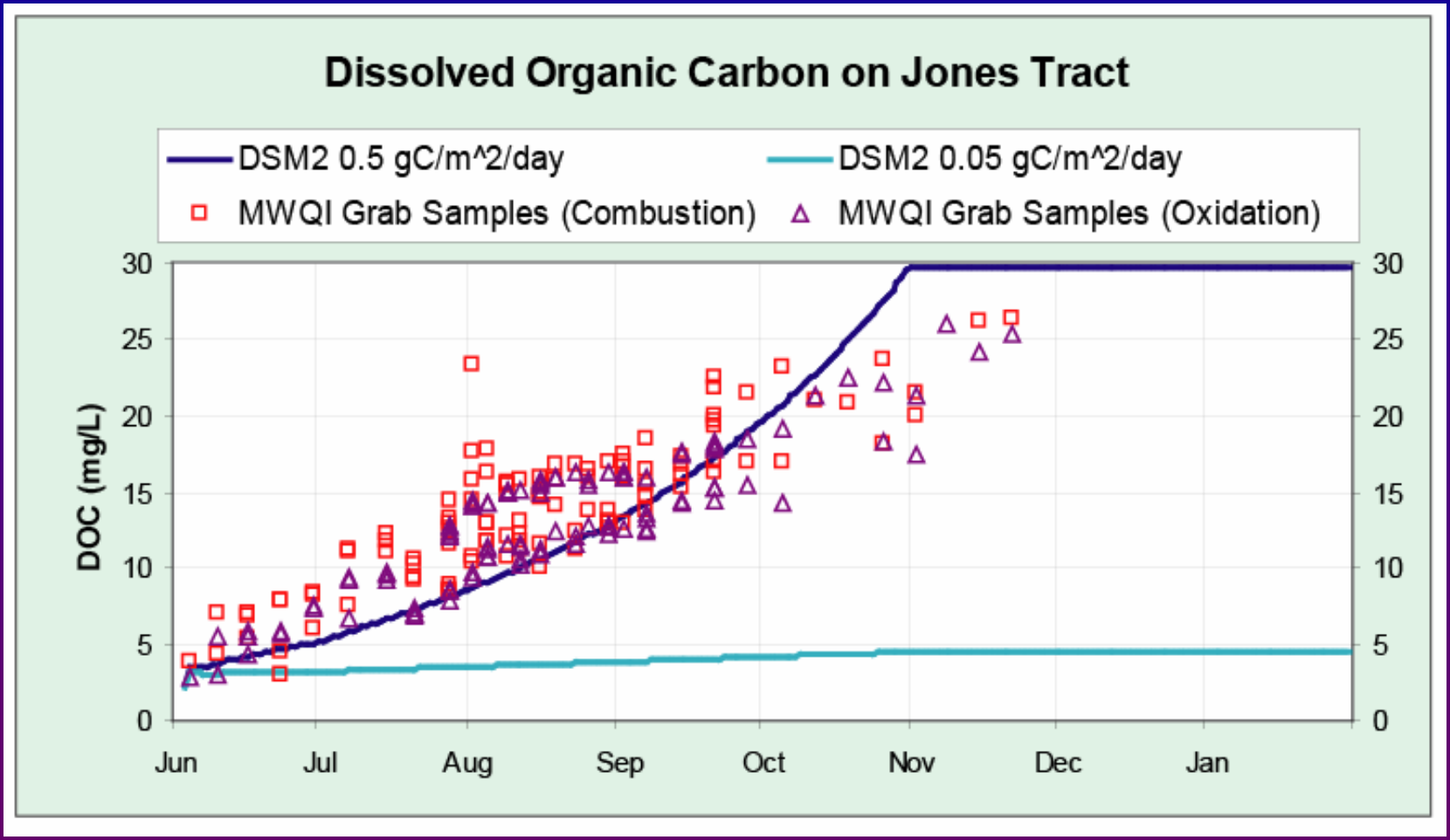


Delta Island Return Quality

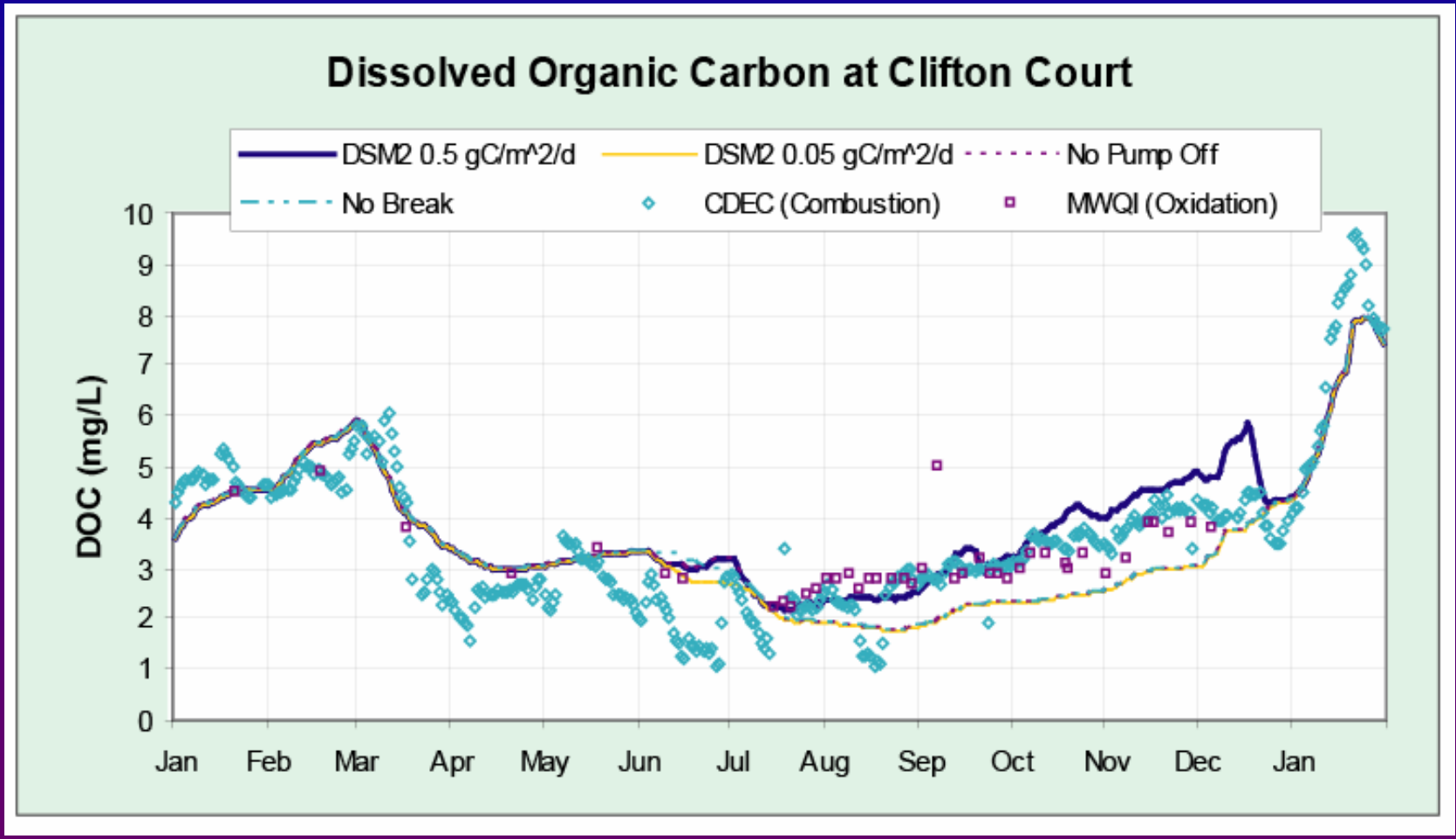




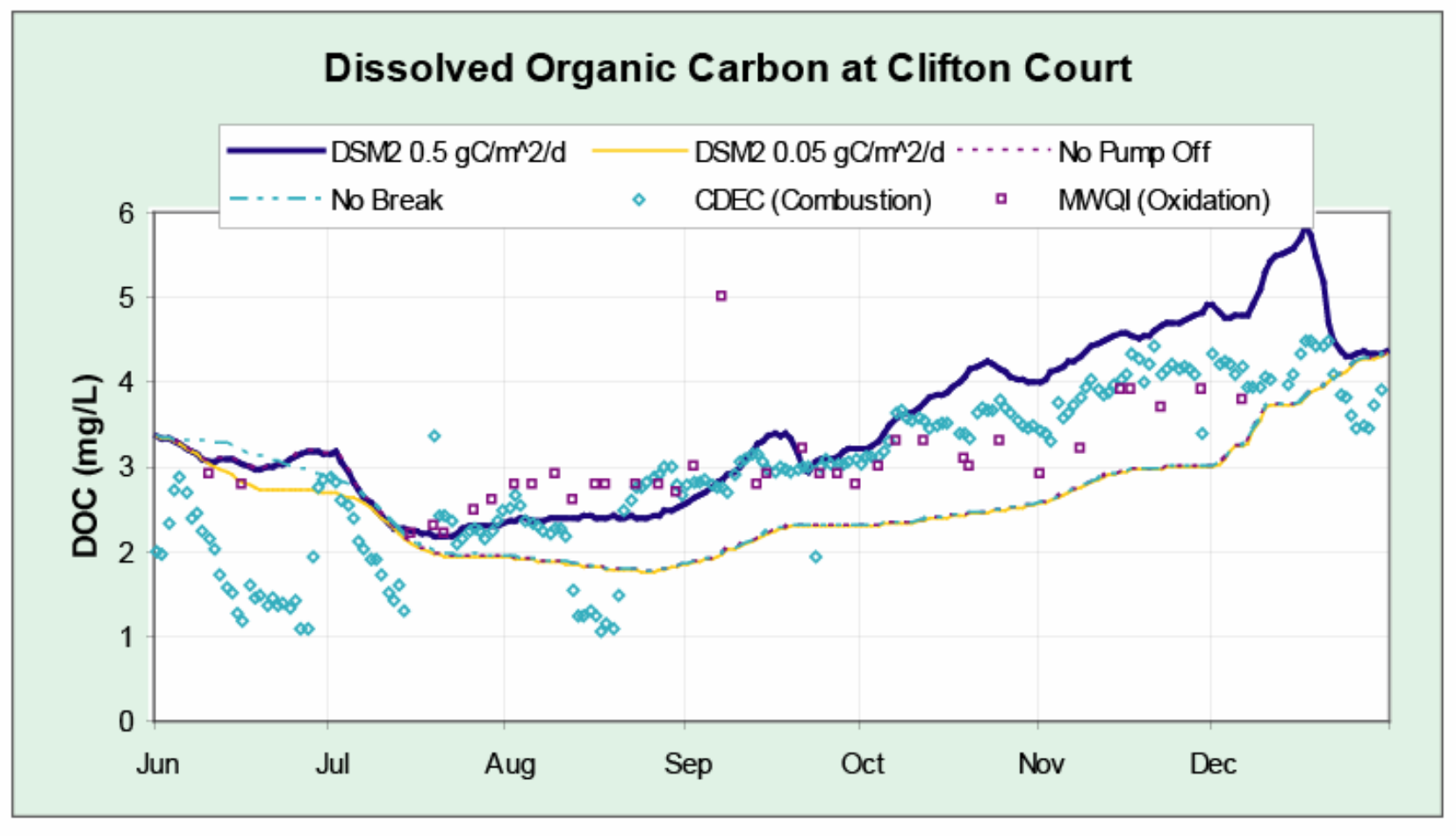
Jones Tract DOC



DOC at Clifton Court Forebay



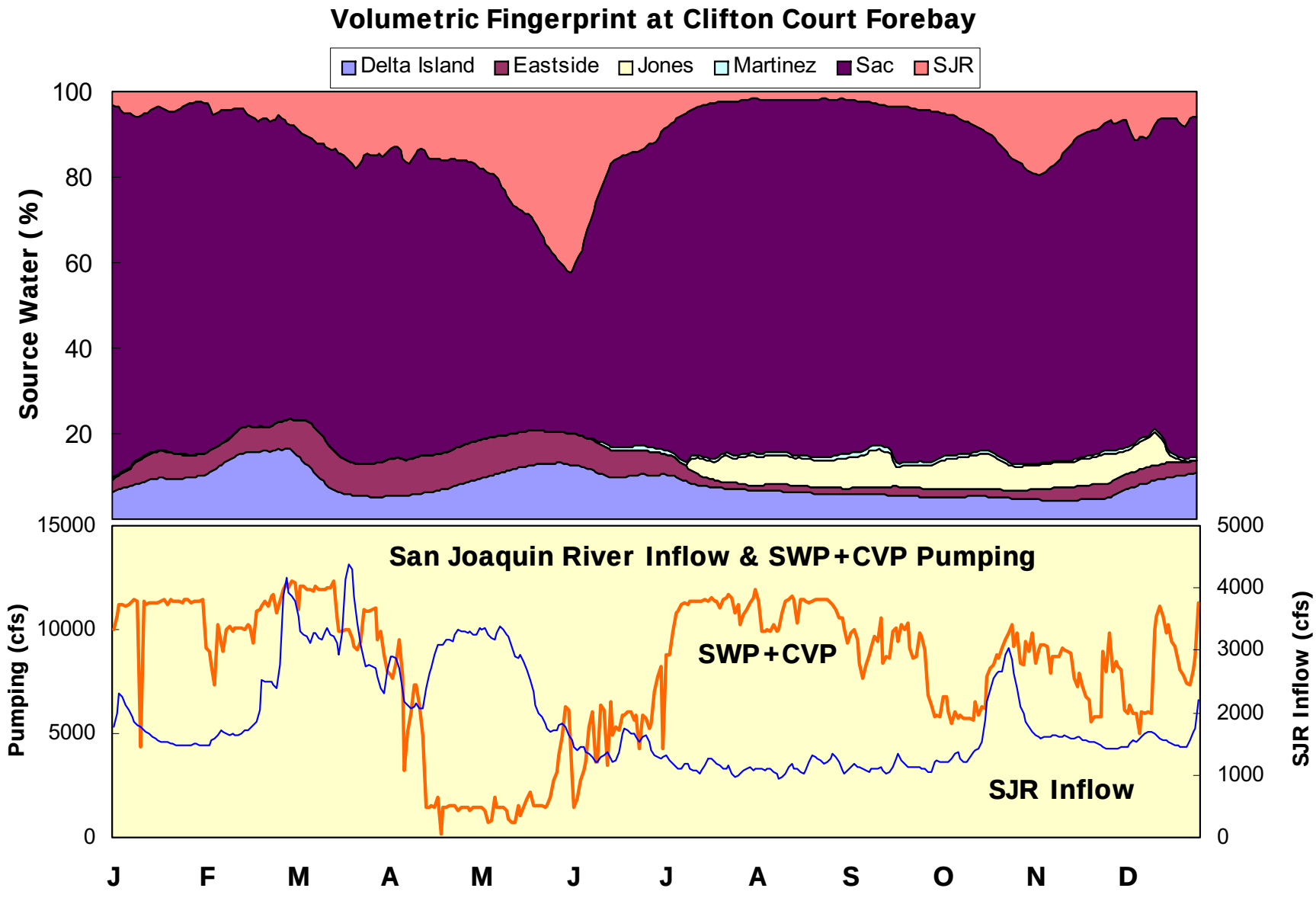
DOC in Clifton Court after Break



Water Quality Response

(Volume Fingerprint)

Sources of Water at Clifton Court Forebay



DSM2 Summary

- DSM2 generally underestimated EC.
- DSM2's DOC simulation with a 0.5 $gC/m^2/day$ growth rate was validated with field observations.
- It is important to consider source water when evaluating model performance.
- Concentration of Delta Island return flows is important to accurately model.

Jones Tract Conclusions

- Jones Tract Flood Event raised the awareness of the water quality impacts of flooded islands.
- Hydrology and Operations may have played an important role in the water quality response.
- Excellent effort to collect water quality data, but hydrodynamic geographic data collection was limited.

Modeling Lessons

- Reporting and modeling specific timings of events may be important.
- Having *timely* event data for multiple locations and replicates is useful.
- Having more observed data in the Delta will improve the quality of modeling results and our understanding of the Delta.

Future Directions

A description of the methodology used in DSM2 to simulate the 2004 Jones Tract break and a more detailed analysis of the hydrodynamic and water quality results will be included in a future annual "*Methodology for Flow and Salinity Estimates*" report.