

CALIFORNIA DEPARTMENT OF WATER RESOURCES

# Monitoring Special Study

MSS Public Meeting #5, October 3, 2023



Bill McLaughlin, P.E., Supervising Engineer

# Agenda

9:00am Welcome & Logistics

9:10am General MSS Updates (includes 5 min Q&A)

9:20am Technical Presentations

9:20am High-Speed Salinity Transect Mapping (includes 15 min Q&A)

9:45am Salinity Point-Source and Ion Sampling (includes 15 min Q&A)

10:10am BREAK

10:20am Modeling: SCHISM 3D, Water Quality Data Integration, Flow Monitoring Activities (includes 15 min Q&A)

10:55am Closing & Next Steps



# Meeting Logistics: In-Person

- Beverages – water, coffee, tea
- Restrooms
- Guest wi-fi access
  - Join “ICF Guest Network”
  - Enter security key: 57JCX49ZZG
  - Read the acceptable use policy
  - Enter your email address and click “Accept”
- To also join Teams Meeting
  - Click meeting link to join
  - Select “Room Audio” and “Appalachian Room”



# Ground Rules

## General

- Everyone is encouraged to participate and with comments or questions
- Facilitator will:
  - Manage meeting agenda and time clock
  - Track order of raised hands (in person and virtual)
  - Intervene when discussions become overly detailed, off topic, or repetitive

## In-Person

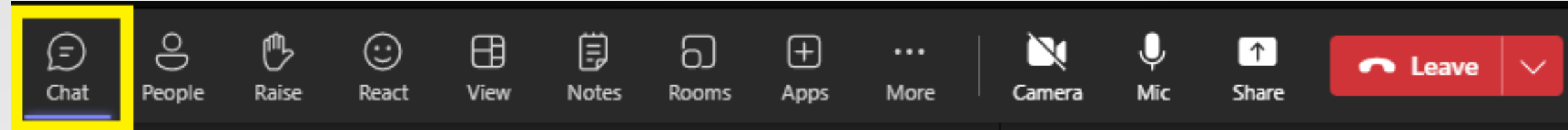
- Raise your hand to speak
- When called to speak: 1. State your name and affiliation, 2. Your question/comment



# Virtual Ground Rules & Logistics

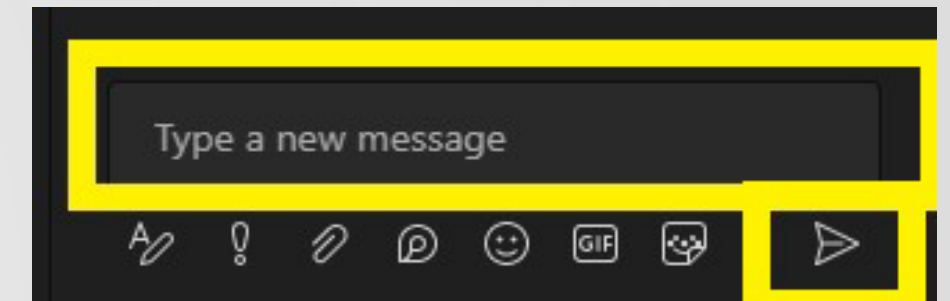
If you have a question or comment:

- Type it in the **Chat** box:



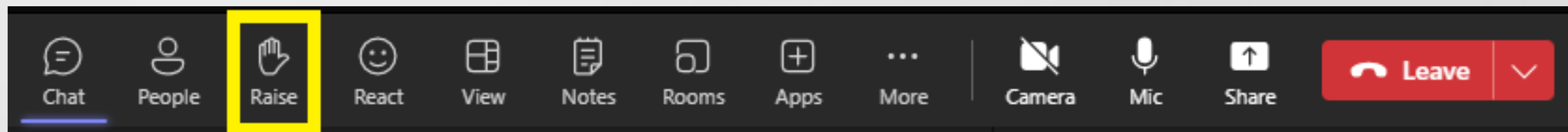
1<sup>st</sup>, click "Chat" in the upper right of your screen

2<sup>nd</sup> type in the chat box that opens on the right & hit "Send"



- OR, 'Raise your hand' to speak. Commenters will be called on in the order in which they 'raise their hands'

- When called on to speak:



1. Unmute
2. State your name and affiliation, then your question/comment

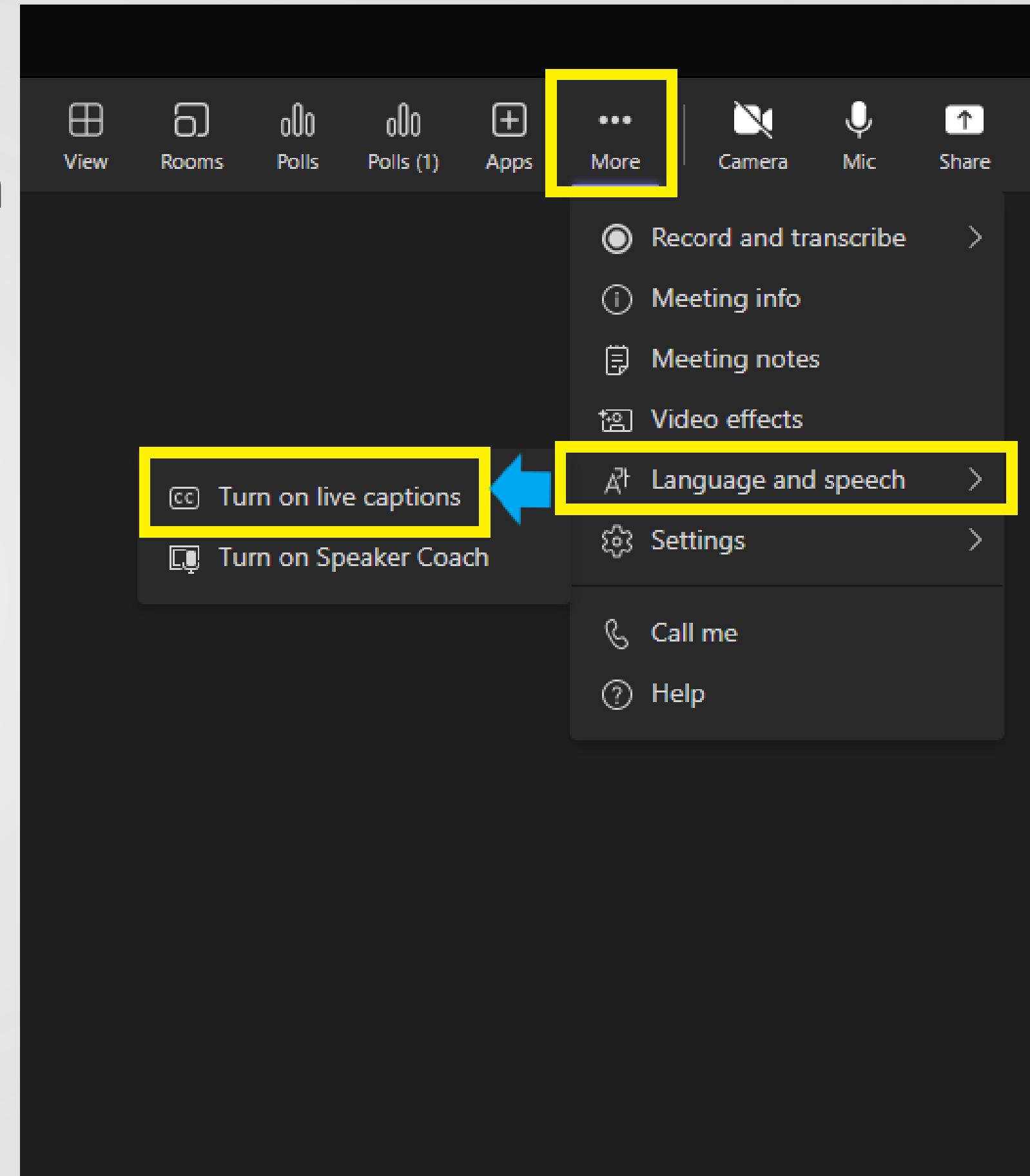


# Virtual - Accessibility

This meeting is being transcribed in real time with closed captions

To turn on closed captioning:

- Click on “More”
- Then click on “Turn on live captions”



# General MSS Updates



# Timeline of MSS Efforts

2018

- The State Water Resources Control Board (State Water Board) adopted the Bay-Delta Plan on December 12

2019

- First Draft of COPMSS to State Water Board & participating agencies in August for comments

2020

- 2<sup>nd</sup> Draft COPMSS to State Water Board & participating agencies in September for comments
- 3<sup>rd</sup> Draft COPMSS to State Water Board & participating agencies in December for comments

2021

- 2 Public Coordination Meetings
- 3 Technical Workgroup Meetings
- First Transect Mapping in September
- First Temporary EC Monitoring Stations Installed for MSS on November 4

2022

- State Water Board directed DWR and Reclamation in January to separate COP and MSS documents
- DWR/USBRE submitted draft MSS Plan on September 19 to State Water Board for approval
- 2 Public Coordination Meetings; 4 Technical Workgroup Meetings
- Ongoing Field Data Collections

2023

- State Water Board conditionally approved the MSS Plan on May 5
- 2 Public Coordination Meetings
- 2 Technical Workgroup Meetings
- Ongoing Field Data Collections

2024

- Conduct Public Coordination Meetings and Technical Workgroup Meetings through 2024
- Circulate draft Final MSS Study Report in summer for peer reviews
- Submit Final MSS Study Report to State Water Board by the end of 2024 for approval





# QUESTIONS OR COMMENTS?

Raise your hand or type in the chat

State your name and affiliation

# High-Speed Salinity Transect Mapping



# High-Speed Salinity Transect Mapping



# Revisiting Study Goals

- Evaluating Reach Compliance
- Model Validation – Ground Truthing
- Station Validation
- Identifying Extent and Tidal Range of Increased Salinity Concentration Related to Null Zones
- Support Decision-Making for Temporary Monitoring Network
- Monitor Salinity Movement Through Tidal Cycles and Different Operational Conditions

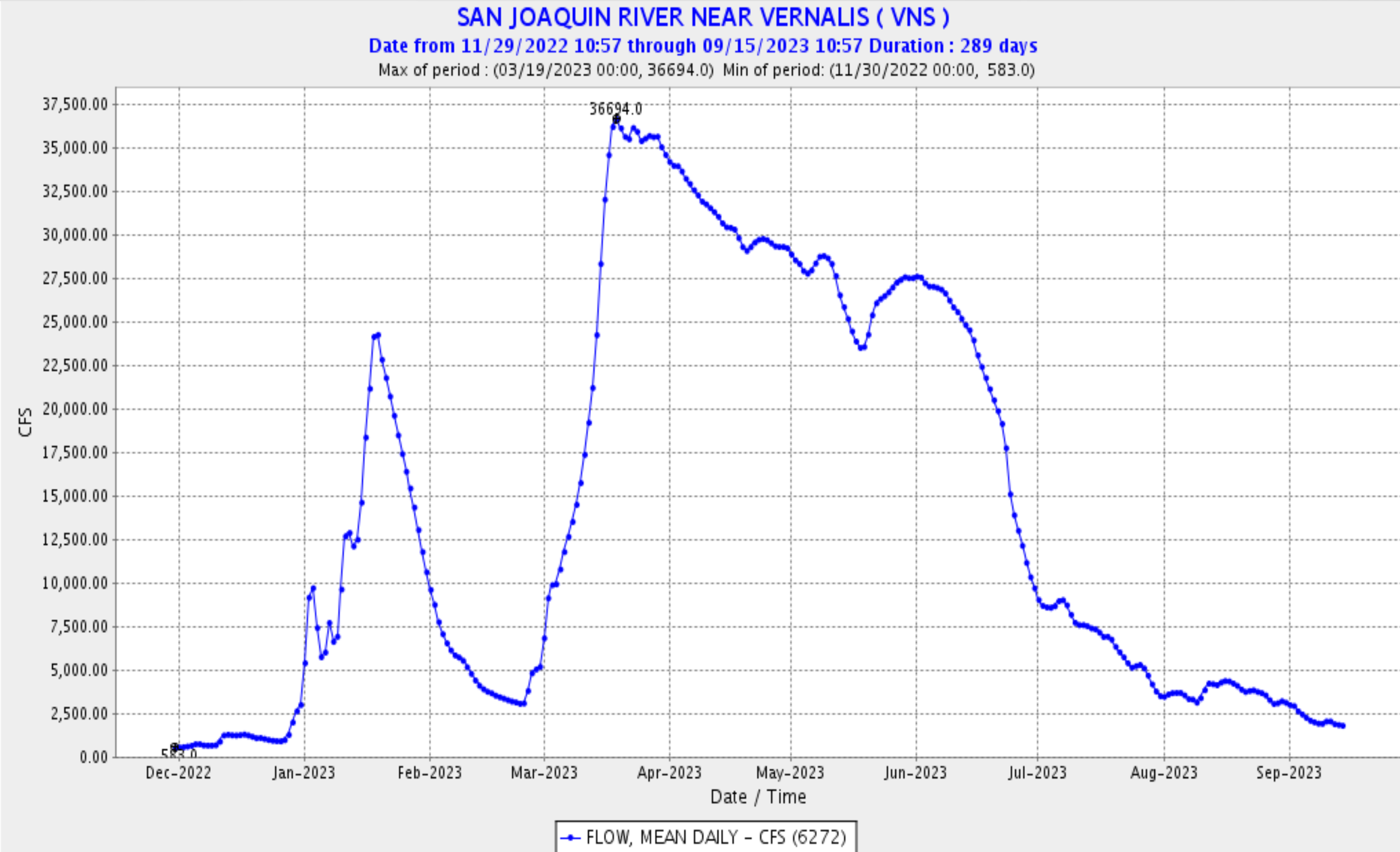


# High-Speed Salinity Transect Mapping

## Water Year 2023

### Challenges and Opportunities

- Very high flows at Vernalis from January through June
- Planned transects curtailed during high flows.
- Paradise Weir overtopping when Vernalis flows reach 16-17,000 cfs. March to late June
- Most south Delta channels flushed of salinity
- Began weekly transects as flows dropped in June

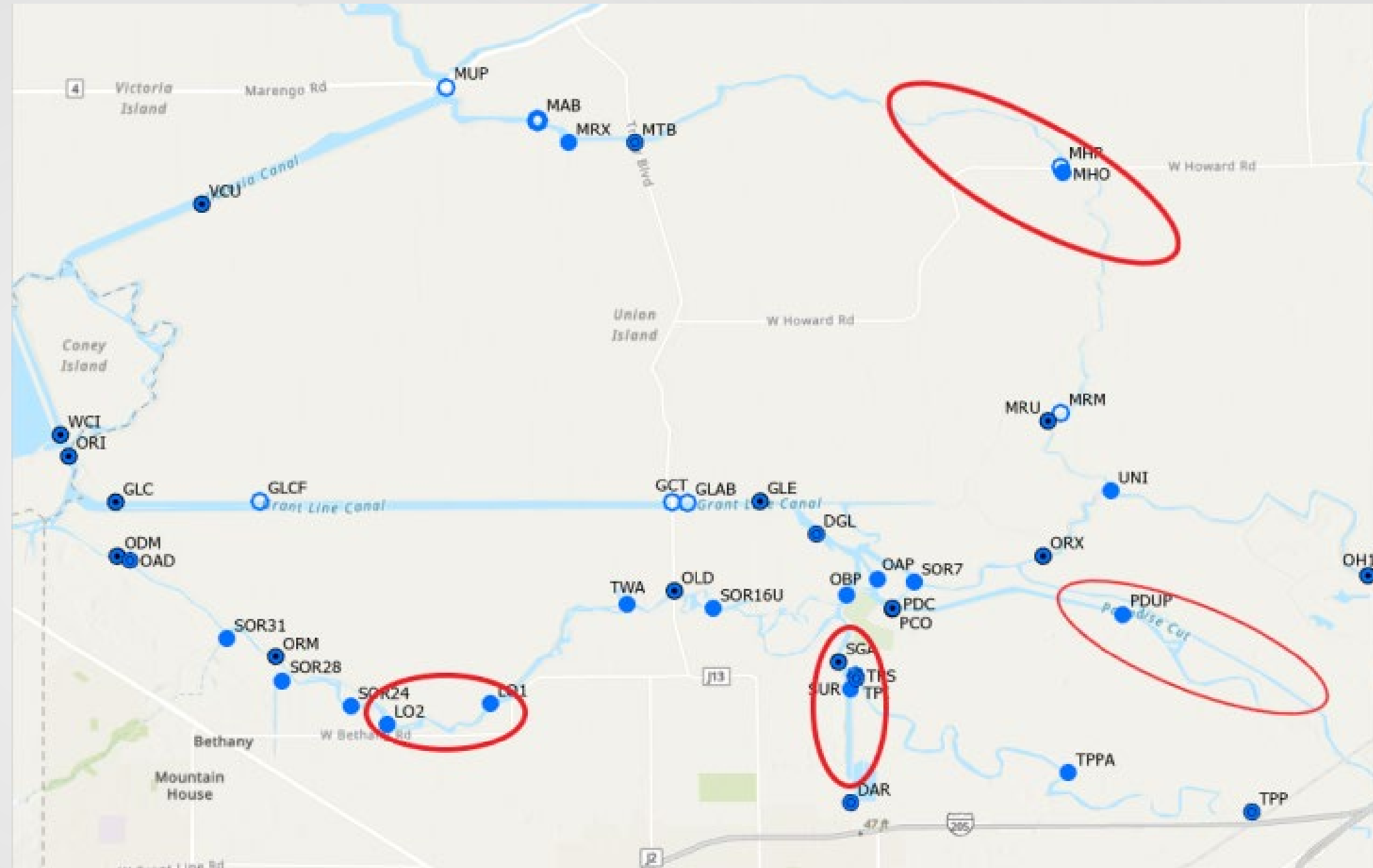


# Paradise Weir Overtopping 6/6/23 - DWR Aerial Imagery



# Rebound Monitoring

- High flows of 2023 provided an opportunity to monitor flushing and salinity rebound in south Delta channels
- 10 transects completed from June to September to characterize salinity rebound after high flows
- 3 additional transects slated for October to capture late, dry season conditions prior to wet season
- Intensive transect monitoring of south Delta Channels began on June 22<sup>nd</sup> while Paradise weir was still overtopping
- This period of monitoring included all channels of the south Delta with emphasis on known low-flow areas associated with historically higher salinity concentrations



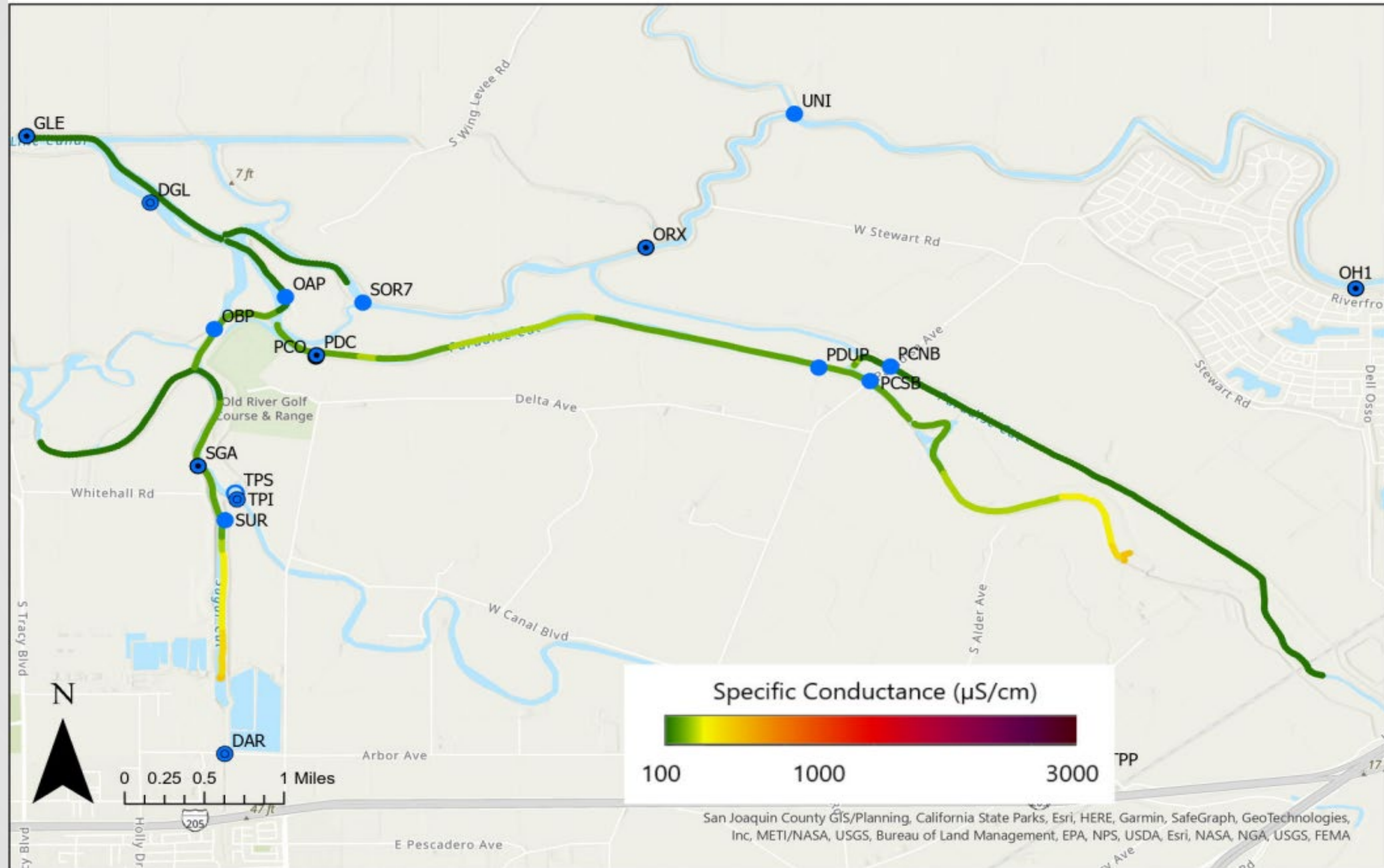
Initial areas expected to see increasing salinity concentrations as Vernalis flows decreased



# South Delta Salinity Transect

## 06/22/2023

- Targeted Slack flows during Low-Tides
- SpCond increasing at PDC as flows over the weir decreased
- South branch of Paradise was navigable to its terminus. SpCond had increased to  $>500 \mu\text{S}/\text{cm}$ . Was getting flushed during drone flight of 6/6
- Upstream reach of Sugar Cut remained elevated in SpCond through high flows







# South Delta Salinity Transect

## 07/12/2023

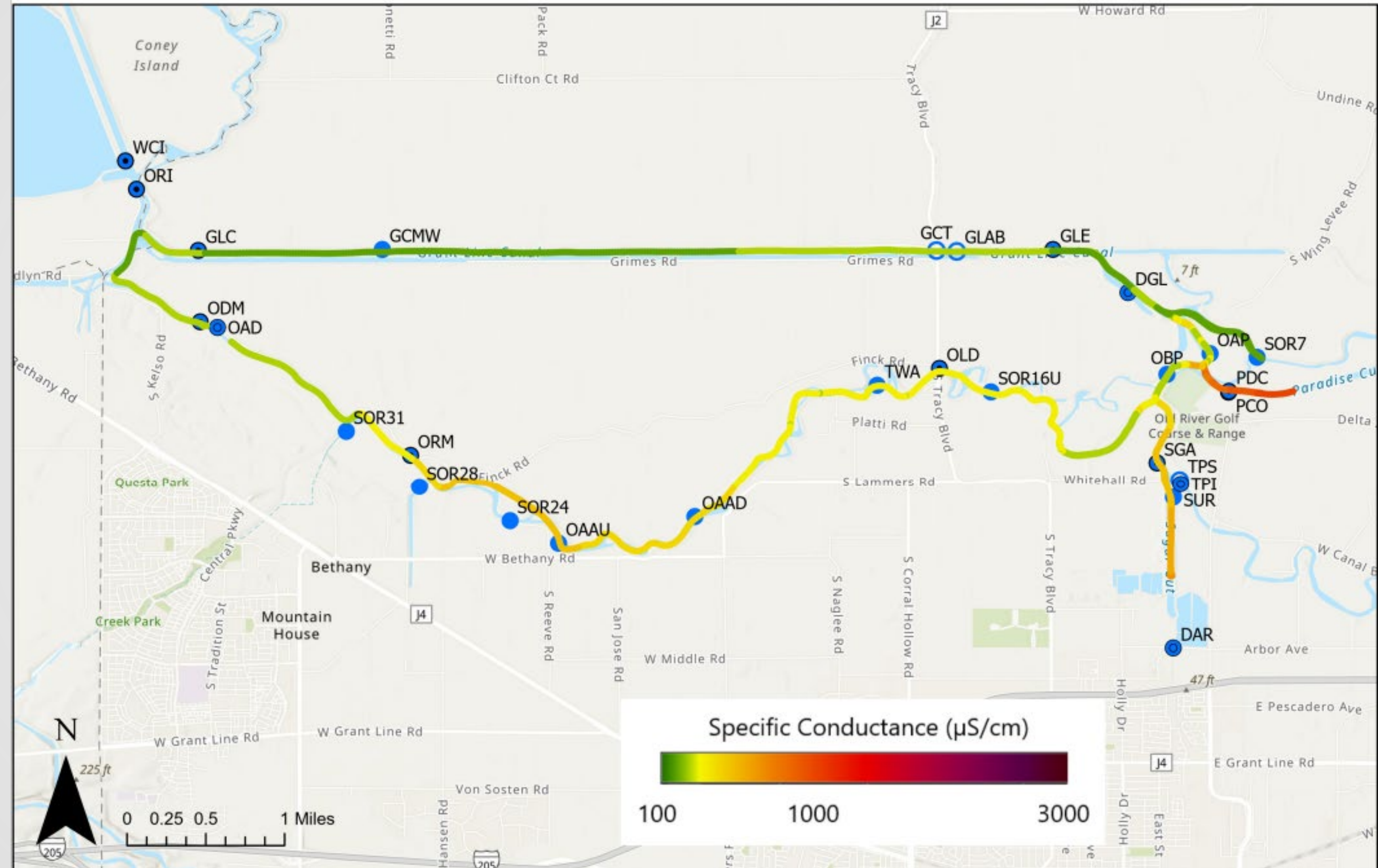
- Paradise cut down stream of PDUP increased to 1,000  $\mu\text{S}/\text{cm}$
- Rebound to 1,000  $\mu\text{S}/\text{cm}$  occurred in 2-3 weeks
- Higher SpCond throughout 5-Points region, downstream of Doughty Cut / Old River Confluence
- SpCond near OLD is still very low



# South Delta Salinity Transect

## 08/24/2023

- SpCond nearing 350  $\mu\text{S}/\text{cm}$  in the vicinity of OLD.
- Highest SpCond ( $\sim 575 \mu\text{S}/\text{cm}$ ) in Lower Old River is near the low flow zone between Wicklund Cut and Lammers Rd.
- Upper Old River SpCond was  $\sim 170 \mu\text{S}/\text{cm}$
- Grant Line Canal was between 190-230  $\mu\text{S}/\text{cm}$



# Middle River Monitoring

- Increased monitoring in Middle River completed to meet conditional approval of MSS Study Plan
- Boat transect was attempted on March 8<sup>th</sup>
- Levee-side point sampling pilot conducted on June 29<sup>th</sup>
- Two additional transects performed on July 26<sup>th</sup> and September 8<sup>th</sup>
- Last transect planned for October



# Data Available on DWR GIS Atlas

- WY 22 Transect QC'd data is publicly available through ArcGIS Online
- Post-Processing of WY 23 Transects is currently underway
- Goal is to have all datasets available in early January 2024



AGOL Link:

<https://www.arcgis.com/home/item.html?id=c2b6fe1bd21d4a86b3052fac01b212f1>

Direct Service URL (ArcGIS Pro):

[https://utility.arcgis.com/usrvcs/servers/c2b6fe1bd21d4a86b3052fac01b212f1/rest/services/InlandWaters/i12\\_Salinity\\_Transects\\_SouthDelta/MapServer](https://utility.arcgis.com/usrvcs/servers/c2b6fe1bd21d4a86b3052fac01b212f1/rest/services/InlandWaters/i12_Salinity_Transects_SouthDelta/MapServer)



# QUESTIONS OR COMMENTS?

Raise your hand or type in the chat

State your name and affiliation

# Salinity Point-Source and Ion Sampling



# Salinity Point Source and Ion Sampling

## Overall MSS Goals

1. Characterize the spatial and temporal distribution and associated dynamics of water level flow, and salinity conditions in the southern Delta waterways
2. Identify the extent of low or null flow conditions and any associated concentrations of local salt discharges
3. Development of Long-term Monitoring and Reporting Plan to meet reach-based compliance of south Delta salinity objectives

## Point Source Study Objective and Goals

- Use additional high-resolution salinity monitoring and mineral/ion monitoring to better determine the origin of salts and how varied seasonal hydrodynamics may contribute to the exchange and increase in salts in Lower Old River
  - **Expanded spatial and temporal monitoring of south Delta salinity – incl. low/null flow regions**
  - **High-Speed EC Transect Mapping Validation**
  - **SCHISM 3-D Model Validation – Ground truthing**
  - **Provide additional data for Data Assimilation Modeling Input**
  - **Support for Evaluating Reach Compliance**
  - **Support Decision-Making for Long-term Monitoring Network to meet Salinity Objectives**

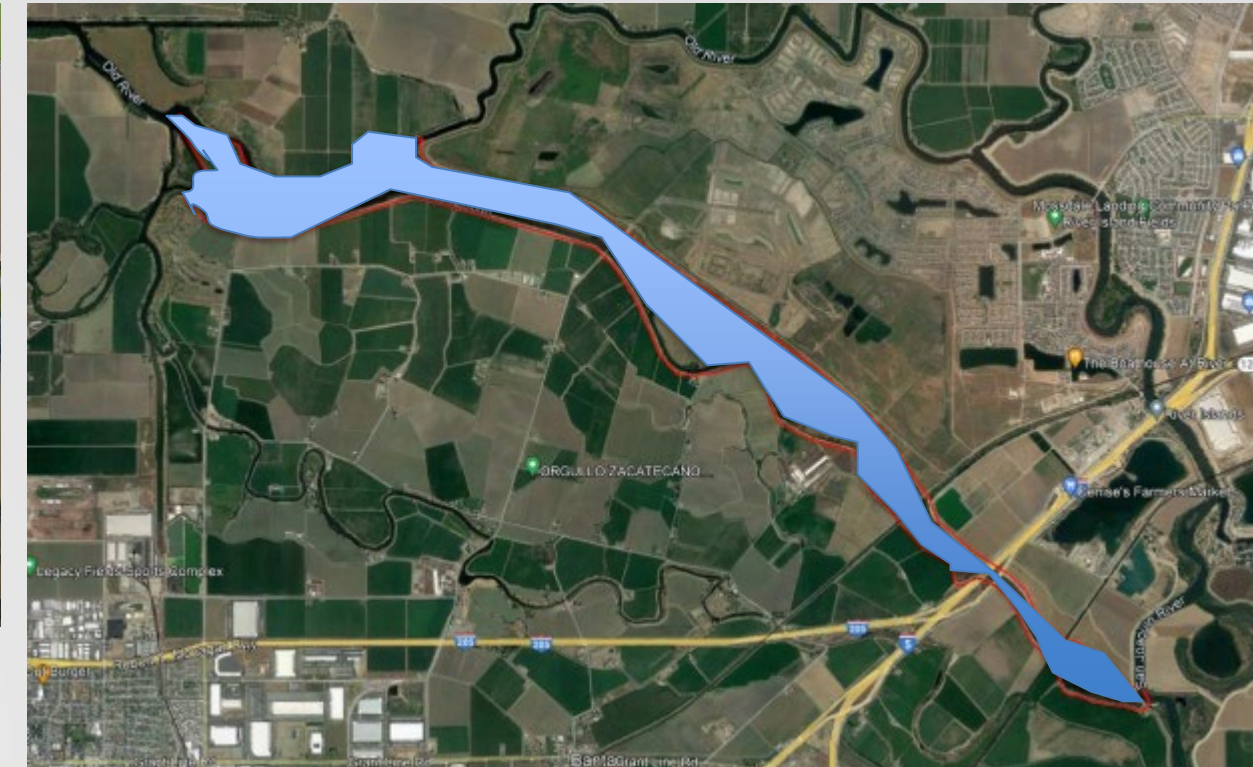




# Salinity Point Source and Ion Sampling

## Study Plan Updates:

### 1. Drone Imagery

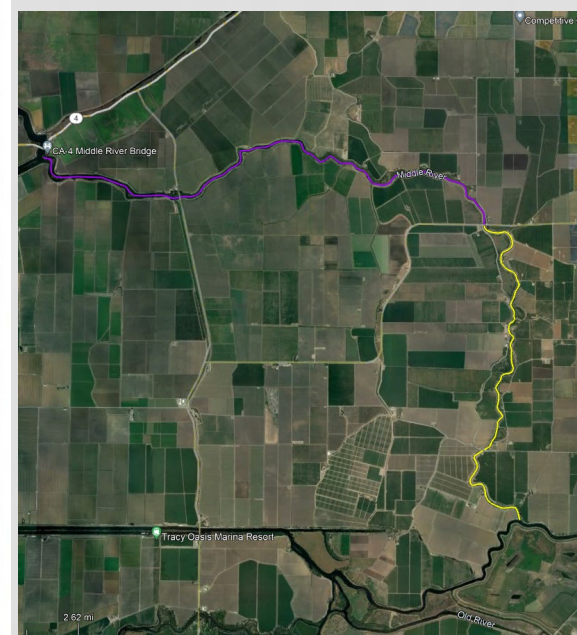
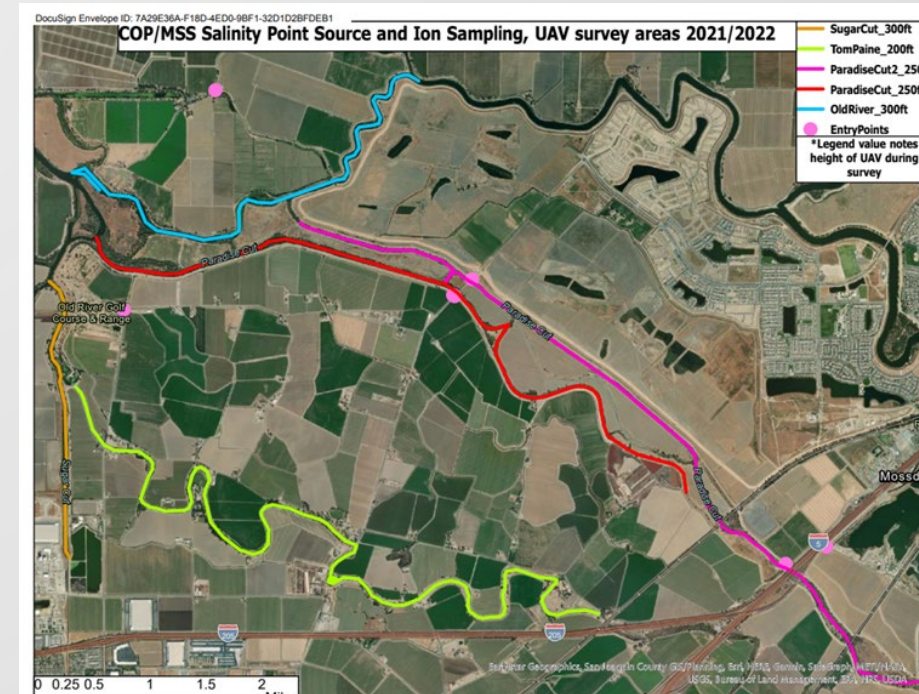
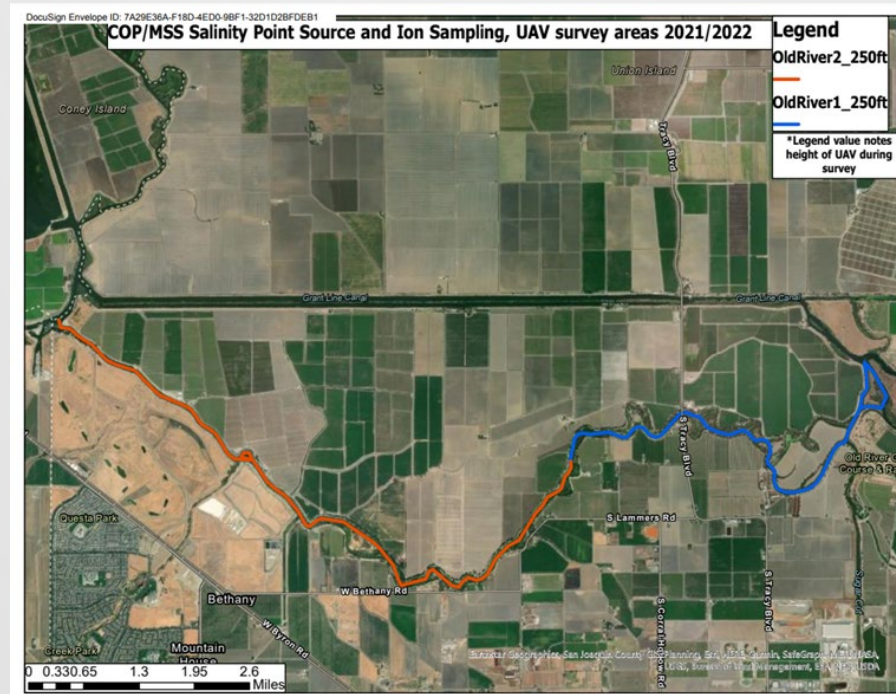


**DWR – NCRO UAV (Drone) Videos YouTube Channel:**  
[https://www.youtube.com/@NCRO\\_UAV/videos](https://www.youtube.com/@NCRO_UAV/videos)

- *Paradise Cut High-Water Drone mission for development of survey grade photogrammetric data, \*imagery photomosaics, video, and Digital Elevation Model (DEM) data acquisition.*

	Drone Flights	Location	Conditions
1	11/17/2021	Paradise Cut	Temporary Barrier, High Vegetation, low water
2	11/22/2021	Upper Old River	
		Sugar Cut	
3	4/19/2022	Tom Paine Slough	Pre-Temporary Barrier, Low Vegetation
4	4/20/2022	Paradise Cut	
5	5/5/2022	Upper Old River	Pre-Barrier
6	4/6/2022	Sugar Cut	
7	7/19/2022	Lower Old River	Temporary Barriers, Ag Season
8	8/30/2022	Upper Paradise Cut Dye Study	
9	3/8/2023	Upper Paradise Cut Due Study	Pre-Barrier
10	3/30/2023	Middle River	
11	6/6-7/2023	Paradise Cut	Pre-Barrier, High-water, Weir Overtop
12	8/9-10/2023	Paradise Cut High-Water Event	Temporary Barriers, Low-water

13	~11/1/2023	Paradise Cut	Temporary Barrier, High Vegetation, low water
14	~11/1/2023	Upper Old River	
		Sugar Cut	
15	~11/1/2023	Tom Paine Slough	
		Middle River	



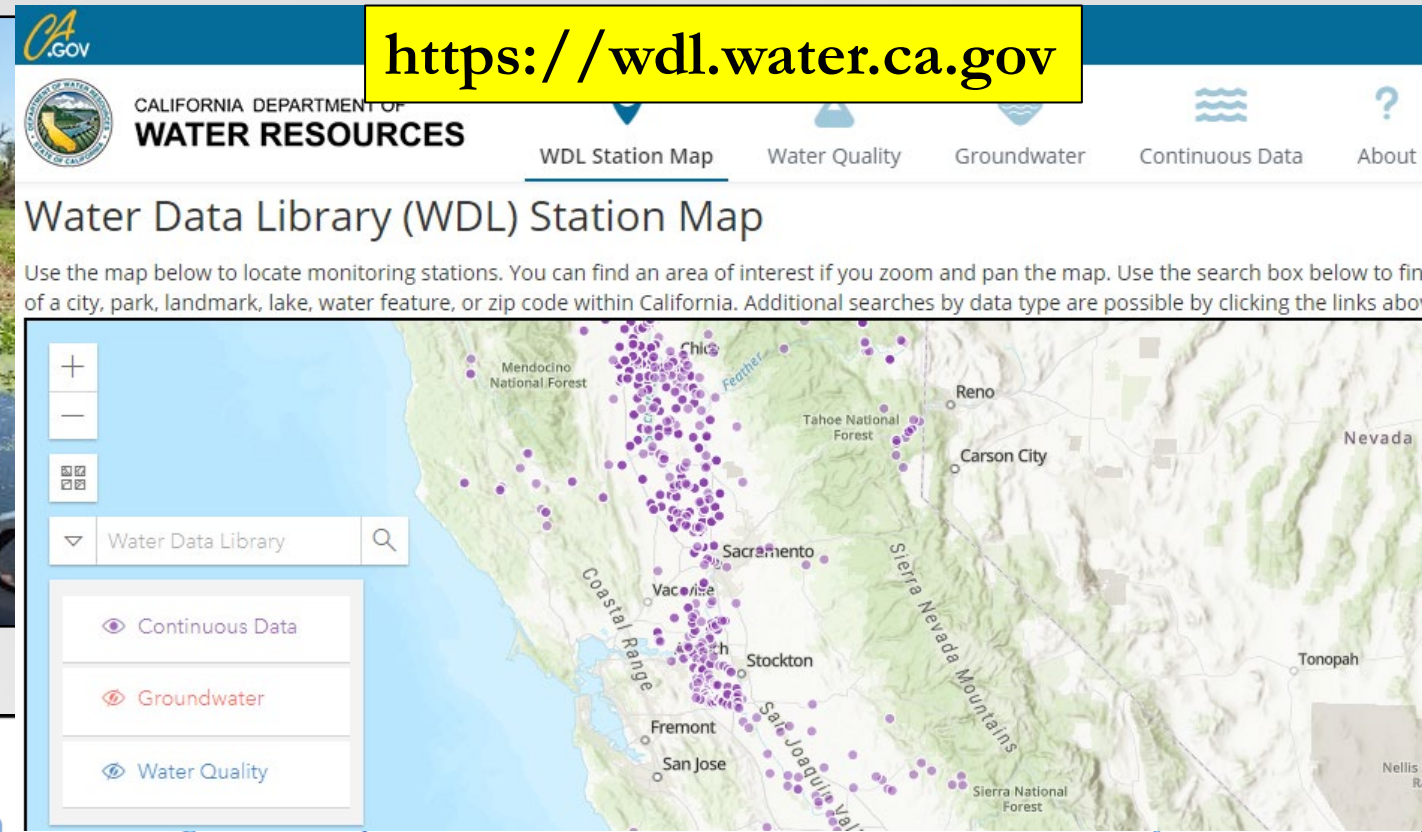
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**Data Availability:**  
**DWR Atlas Website**

[https://gis.water.ca.gov/arcgisimg/rest/services/Aerial\\_Photos](https://gis.water.ca.gov/arcgisimg/rest/services/Aerial_Photos)

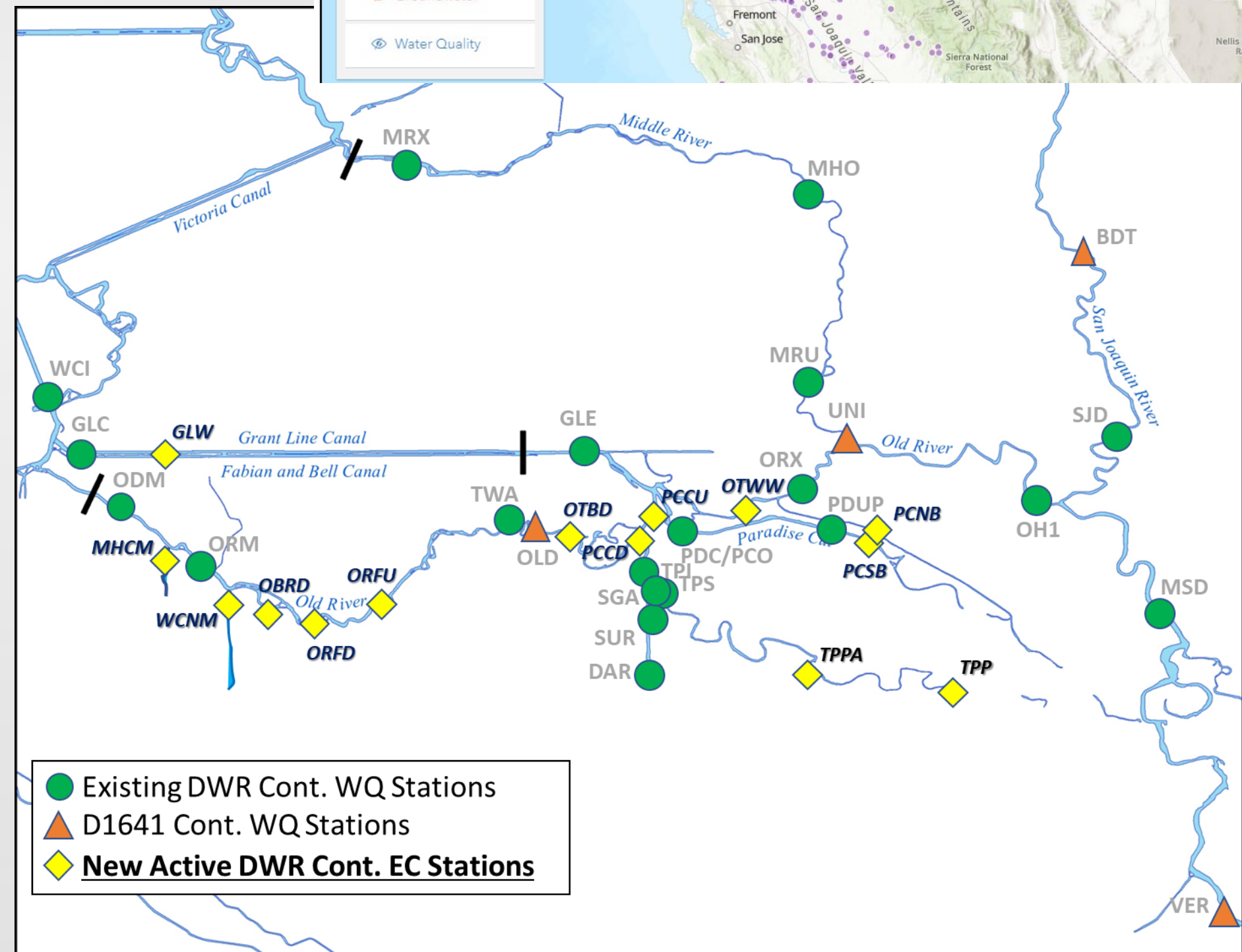
# Study Plan Updates:

1. Drone Imagery
2. Continuous EC Monitoring



	Station Name	Station Code	Region	WDL Station Code	Data Record
1	Old River at Bethany Rd Drain (SOR24)	OBRD	Lower Old River	B9537400	9/17/2021 - Current
2	Old River upstream of Tracy Blvd Drain (SOR16U)	OTBD		B9538100	12/16/2021 - Current
3	Wicklund Cut near Mouth (SOR28)	WCNM		B9537100	12/16/2021 - Current
4	Mountain House Creek (SOR31)	MHCM		B9536900	2/23/2022 - Current
5	Old River Anchored at ADCP Downstream	OAAD		B9537500	6/15/2022 - Current
6	Old River Flux Station Upstream	ORFU		B9537600	6/15/2022 - Current
7	Old River downstream of Tracy WW outfall (SOR7)	OTWW	Upper Old River	B9538900	11/4/2021 - Current
8	Old River at Paradise Cut Confluence Downstream	PCCD	5-Point Confluence	B9538500	11/4/2021 - Current
9	Old River at Paradise Cut Confluence Upstream	PCCU		B9538600	11/4/2021 - Current
10	Paradise Cut Upstream at South Bridge	PCSB		B9541060	2/15/2023 - Current
11	Paradise Cut Upstream at North Bridge	PCNB	B9551070	2/15/2023 - Current	
12	Tom Paine Slough near Pescadero	TPP	Tom Paine Slough	B95425	1/13/2022 - Current
13	Tom Paine Slough at Paradise Ave	TPPA	B9542400	1/19/2022 - Current	
14	Grant Line Canal West	GLW	Grant Line Canal	B9529700	2/7/2023 - Current

**\*\*All temporary EC monitoring stations for the MSS will continue operation through December 2023**



● Existing DWR Cont. WQ Stations  
▲ D1641 Cont. WQ Stations  
◆ New Active DWR Cont. EC Stations



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# Study Plan Updates:

1. Drone Imagery
2. Continuous EC Monitoring
3. **Ion Sampling**



<https://wdl.water.ca.gov>

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WDL Station Map | Water Quality | Groundwater | Continuous Data | About

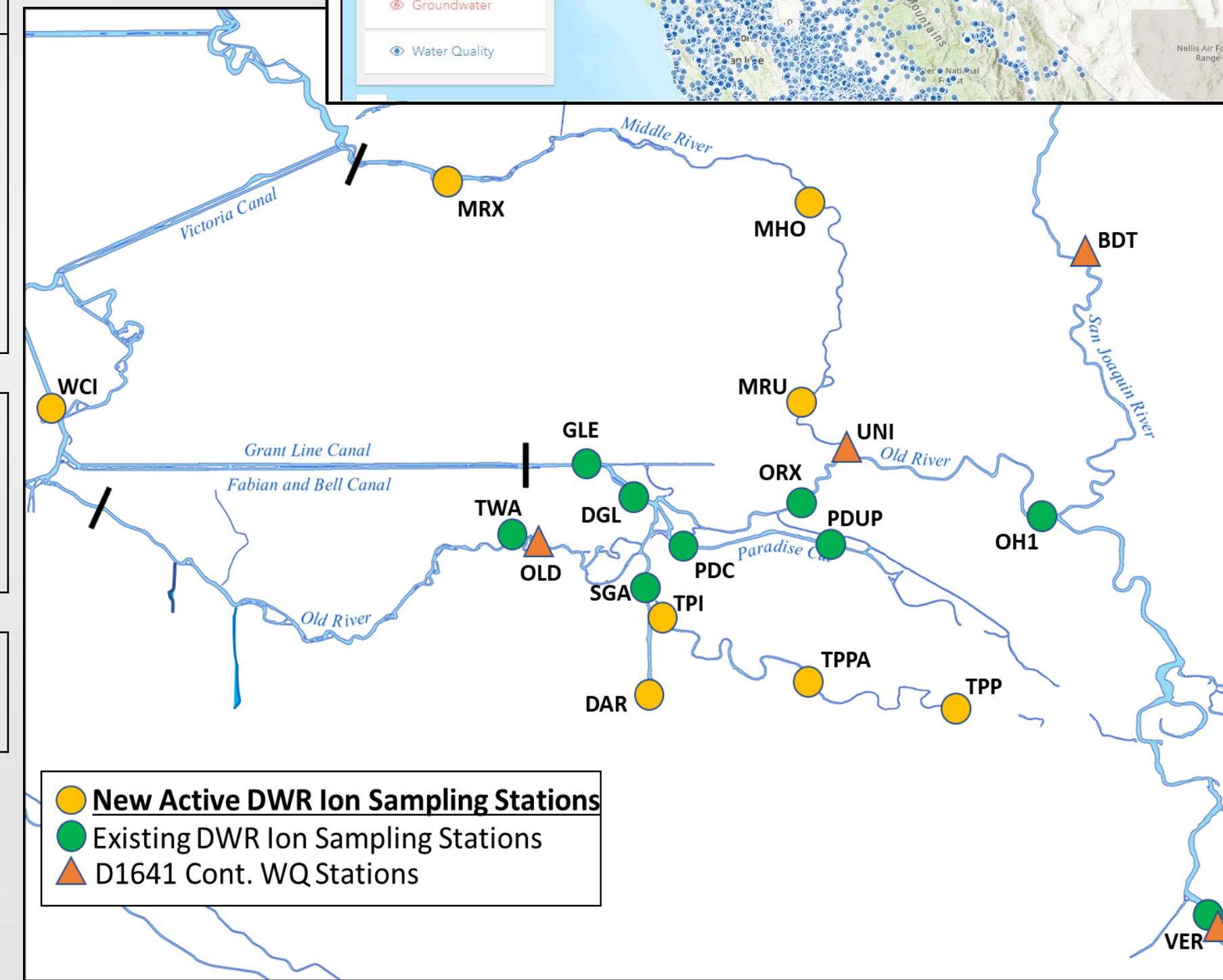
### Water Data Library (WDL) Station Map

Use the map below to locate monitoring stations. You can find an area of interest if you zoom and pan the map. Use the search box below to find a city, park, landmark, lake, water feature, or zip code within California. Additional searches by data type are possible by clicking the links below.

Station Name	Station Code	WDL Station Code	Data Record	N
1 Paradise Cut Upstream	PDUP	B9D74811224	7/11/2018 - Current	56
2 Paradise Cut	PDC	B9D74811247	6/20/2018 - Current	57
3 Sugar Cut Downstream of Tom Paine Slough	SGA	B9D74761253	6/20/2018 - Current	57
4 Old River below Headwaters	OH1	B9D74851200	6/27/2018 - Current	60
5 Old River above Doughty Cut	ORX	B9D74871232	6/27/2018 - Current	65
6 Grant Line Canal East	GLE	B9D74921261	6/27/2018 - Current	62
7 Old River at Tracy Wildlife Association	TWA	B9D74821274	7/2/2018 - Current	69
8 C10A - San Joaquin River near Vernalis	VER	B9D74081159	4/1/2005 - Current	364

9 West Canal Above Clifton Court Intake	WCI	B9D74991332	11/18/2021 - Current	24
10 Tom Paine Slough near Pescadero	TPP	B9542500	1/19/2022 - Current	19
11 Tom Paine Slough at Paradise Ave	TPPA	B9542400	1/19/2022 - Current	19
12 Drainage at Arbor Road	DAR	B9542300	1/19/2022 - Current	19
13 Tom Paine Slough above Intake	TPI	B9542100	1/19/2022 - Current	18

14 Middle River near Tracy Road	MRX	B9D75291280	3/8/2023 - Current	8
15 Middle River at Howard Road	MHO	B9D75261229	3/8/2023 - Current	8
16 Middle River at Undine Road	MRU	B9D75011230	3/8/2023 - Current	8



- New Active DWR Ion Sampling Stations
- Existing DWR Ion Sampling Stations
- ▲ D1641 Cont. WQ Stations

**\*\*All ion sampling for the MSS will continue through December 2023**



# Study Plan Updates:

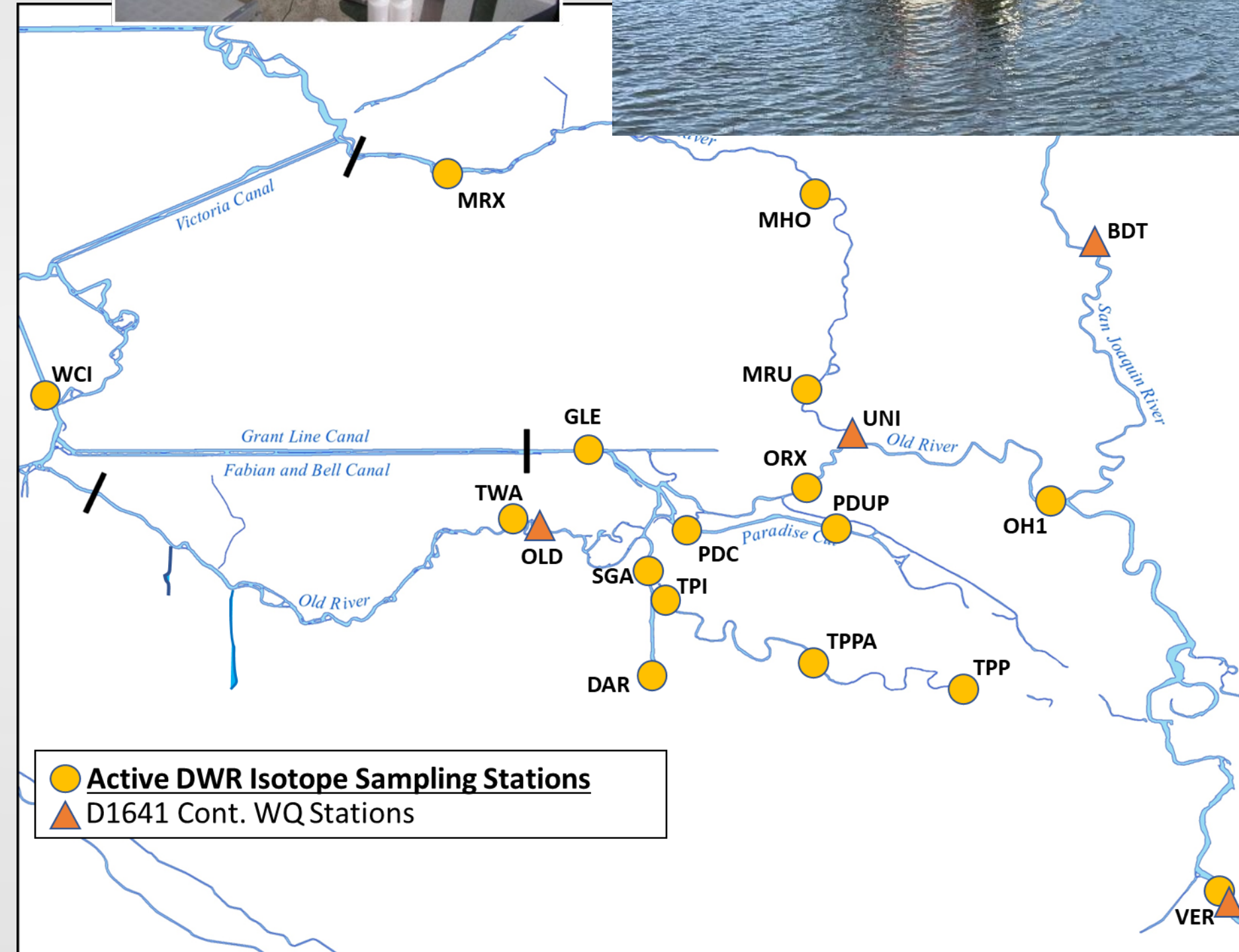
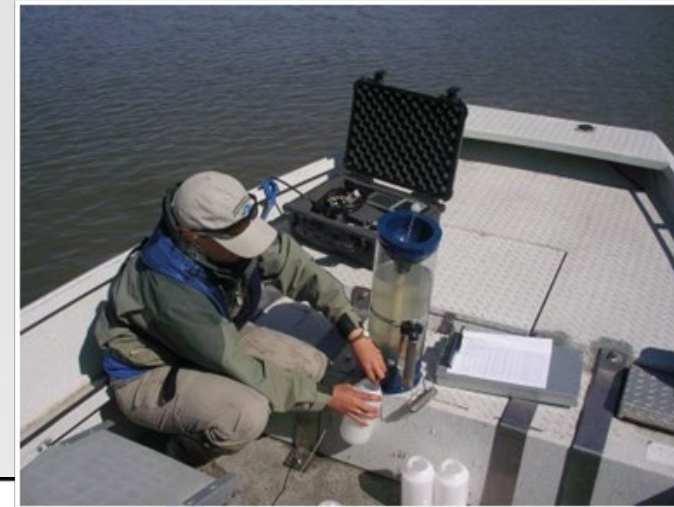
## 3. Ion Sampling

## 4. **\*\*Stable Isotope Sample Collection**

- Collaborative effort w/ DWR and USBR – started monthly sample collection March 2023
- Hydrogen (d2h) and oxygen (d18O) stable isotopes sample collection was added as an additional measure for fingerprinting differing waters sources
- Also, as indicator for source waters that have undergone significant evaporation (such as water found in dead-end sloughs)

	USBR Station Name
1	DMC Headworks
2	Ripon (Stanislaus River)
3	Vernalis
4	Check 13 (O'Neill Intake)
5	Union Island
6	Rio Vista
7	San Andreas (SJR)
8	Victoria Island
9	Port Chicago
10	Mud Slough
11	Salt Slough

	DWR Station Name	Station Code
1	Paradise Cut Upstream	PDUP
2	Paradise Cut	PDC
3	Sugar Cut at Golden Anchor	SGA
4	Tom Paine Slough Above Intake Structure	TPI
5	Tom Paine at Paradise Avenue Bridge	TPPA
6	Tom Paine near Pescadero	TPP
7	Drainage at Arbor Road	DAR
8	West Canal at Clifton Court Intake	WCI
9	Grant Line Canal East	GLE
10	Old River at Head	OH1
11	Old River at TWA	TWA
12	Old River above Doughty Cut	ORX
13	Middle River at Udine Road	MRU
14	Middle River near Howard Road Bridge	MHO
15	Middle River near Tracy Blvd	MRX



● **Active DWR Isotope Sampling Stations**  
▲ **D1641 Cont. WQ Stations**



# QUESTIONS OR COMMENTS?

Raise your hand or type in the chat

State your name and affiliation

# Modeling and Data Integration Update

Eli Ateljevich and Zhenlin Zhang

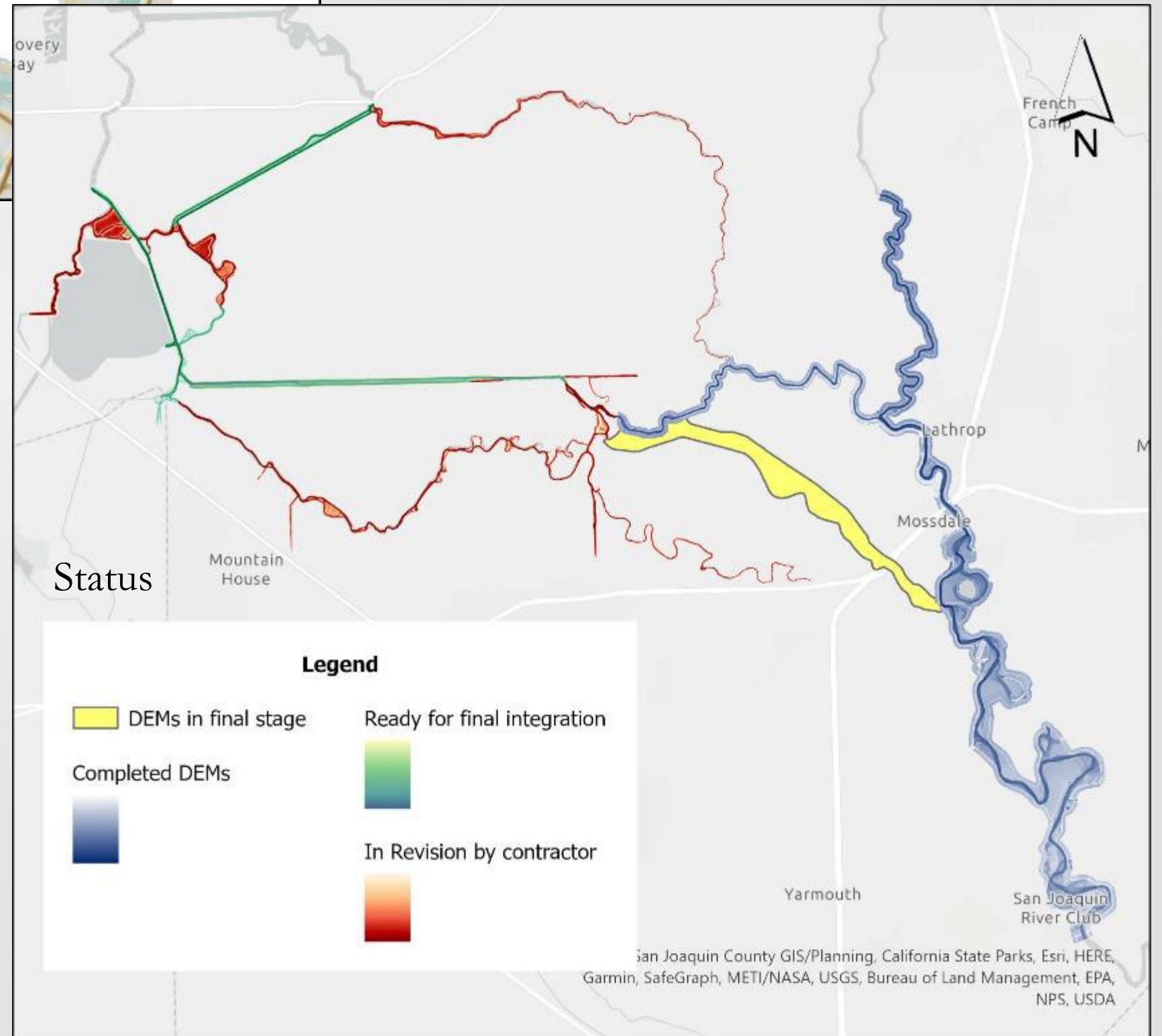
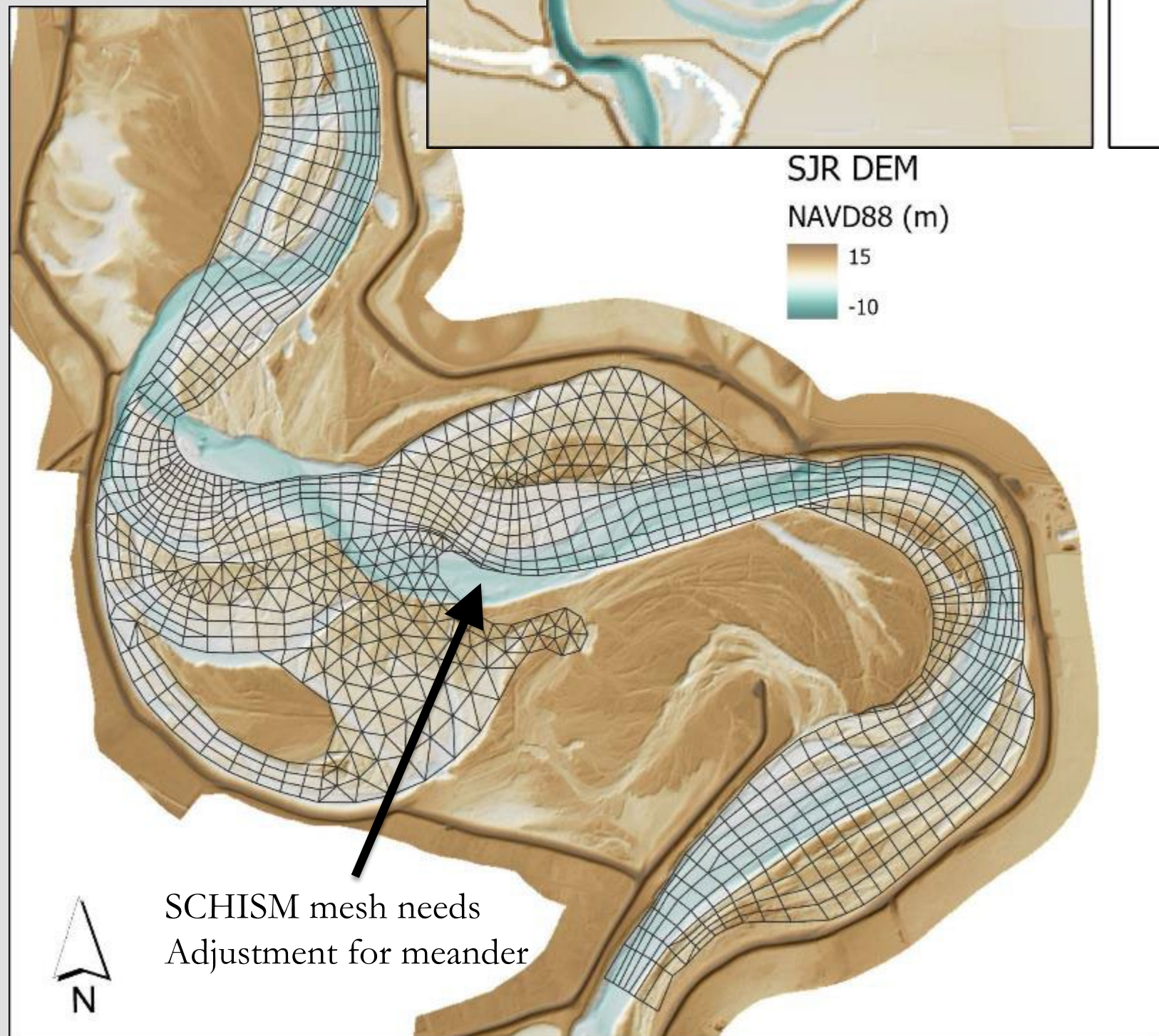
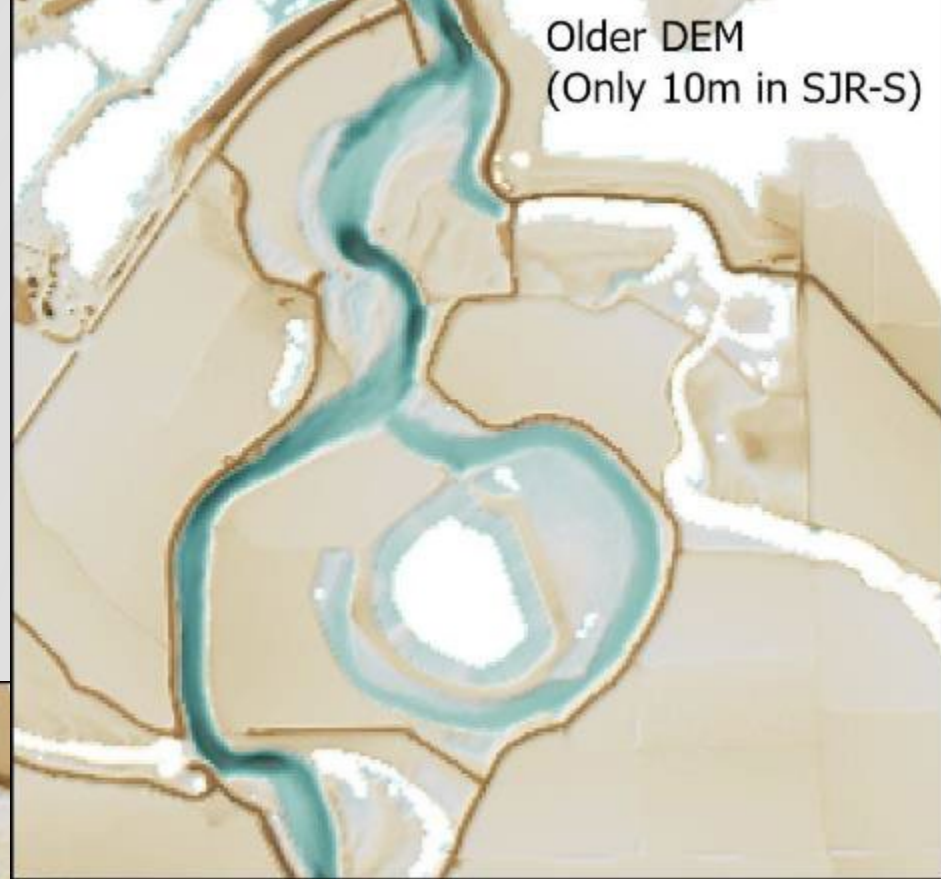
October 3, 2023

# Main Activities

- Bathymetry soft release
- Improving SCHISM regionally\*
  - Bathymetry
  - Selective refinement of mesh
  - Modeling assumptions results
  - Vegetation
- Data Integration
  - December workshop
  - Soliciting requests now

\*Acknowledgment: Hans Kim

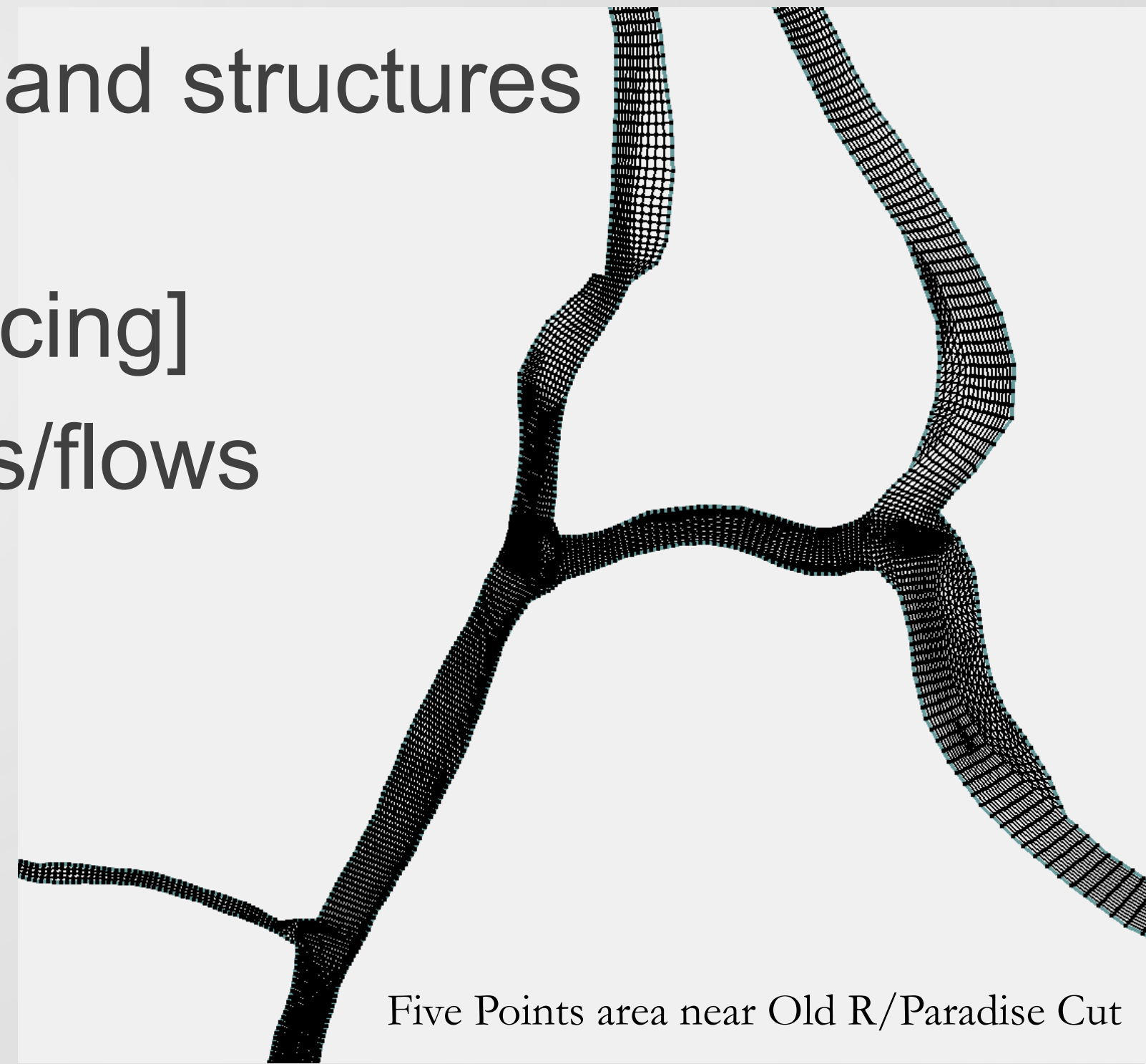






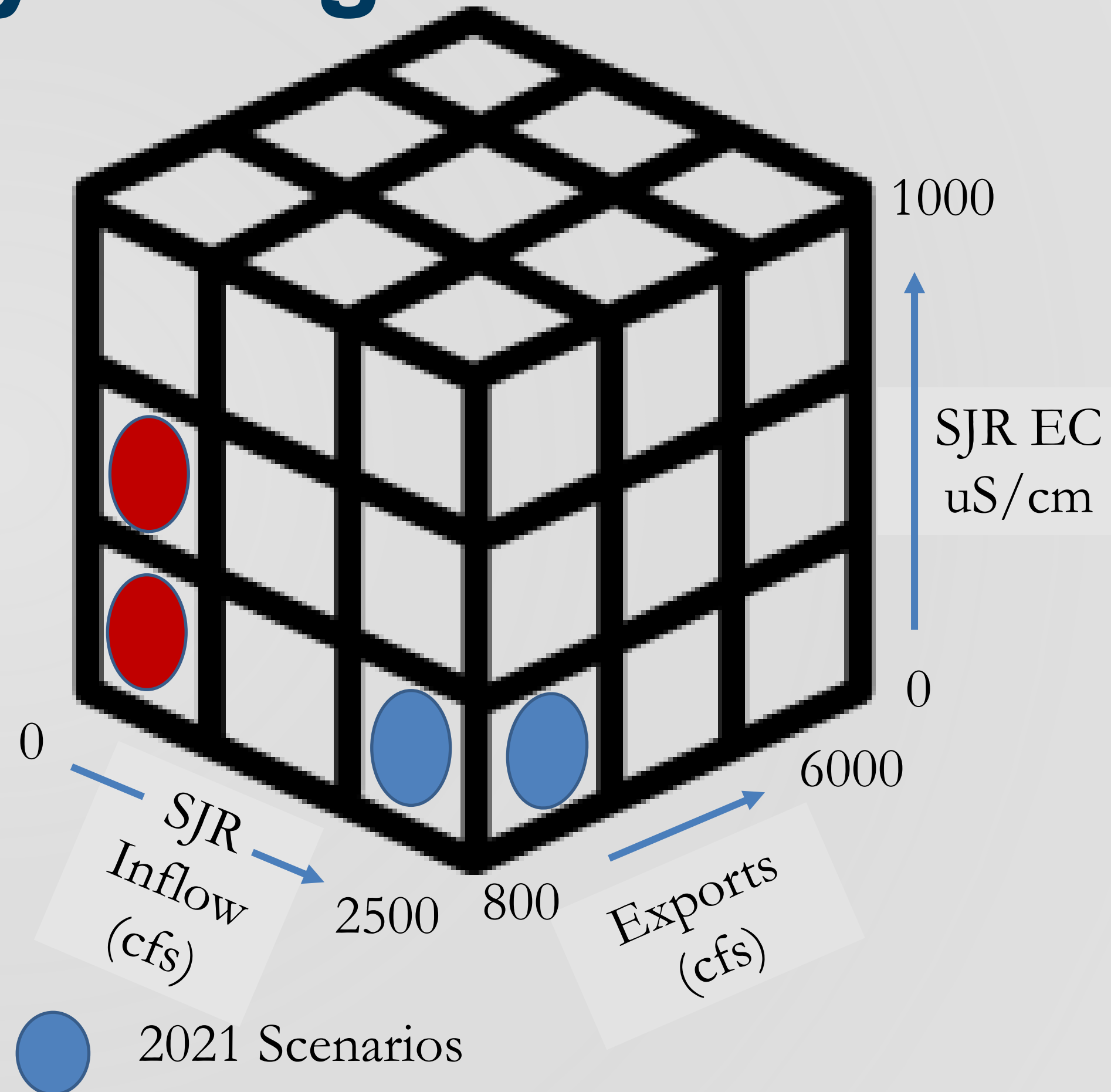
# SCHISM South Delta Improvements

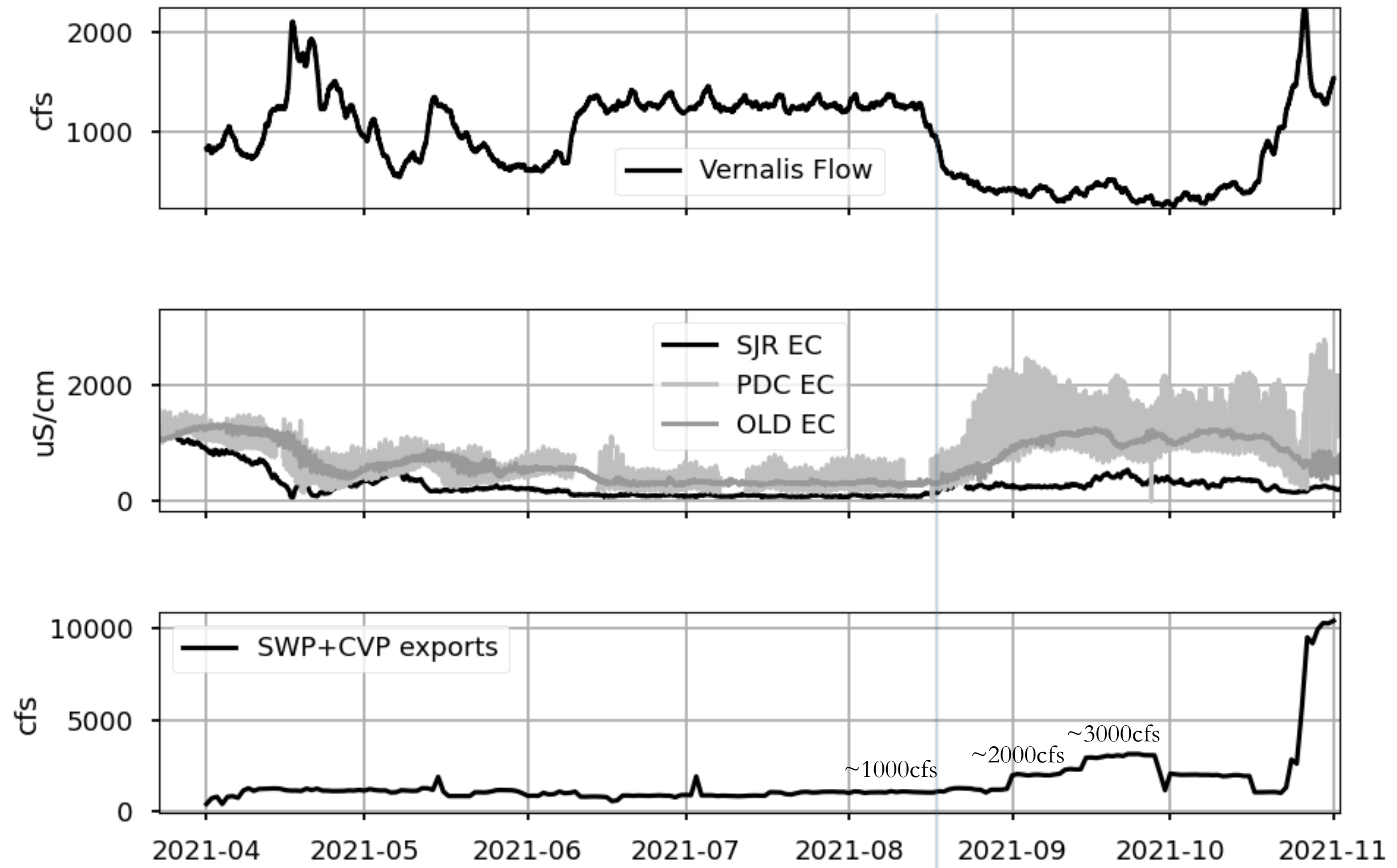
- Higher resolution where dispersion is critical
- Measure and recalibrate barriers and structures [modeling assumptions document]
- Incorporate bathymetry [commencing]
- Fill in knowledge gaps on sources/flows [data integration]



# Export – SJR Study Design

- Vary:
  - SJR Inflow
  - SJR EC
  - Exports
- Seeking:
  - Right flows categories?
  - Other scenario covariates?
  - Small workgroup





# Data Integration

- Workshop planned for December (Doodle poll coming)
- Data assimilation/ inverse modeling topics
  - What is the goal? **Infer source terms sufficiently for main study**
  - What are the flavors? **Nudging, Response-based, Kalman**
  - Challenges? **Uniqueness, sensitivity to discharge**
  - Compared to calibration
  - Physical vs making models happy
- Example data assimilation results at the workshop, but focus is on discussion and explanation.



# QUESTIONS OR COMMENTS?

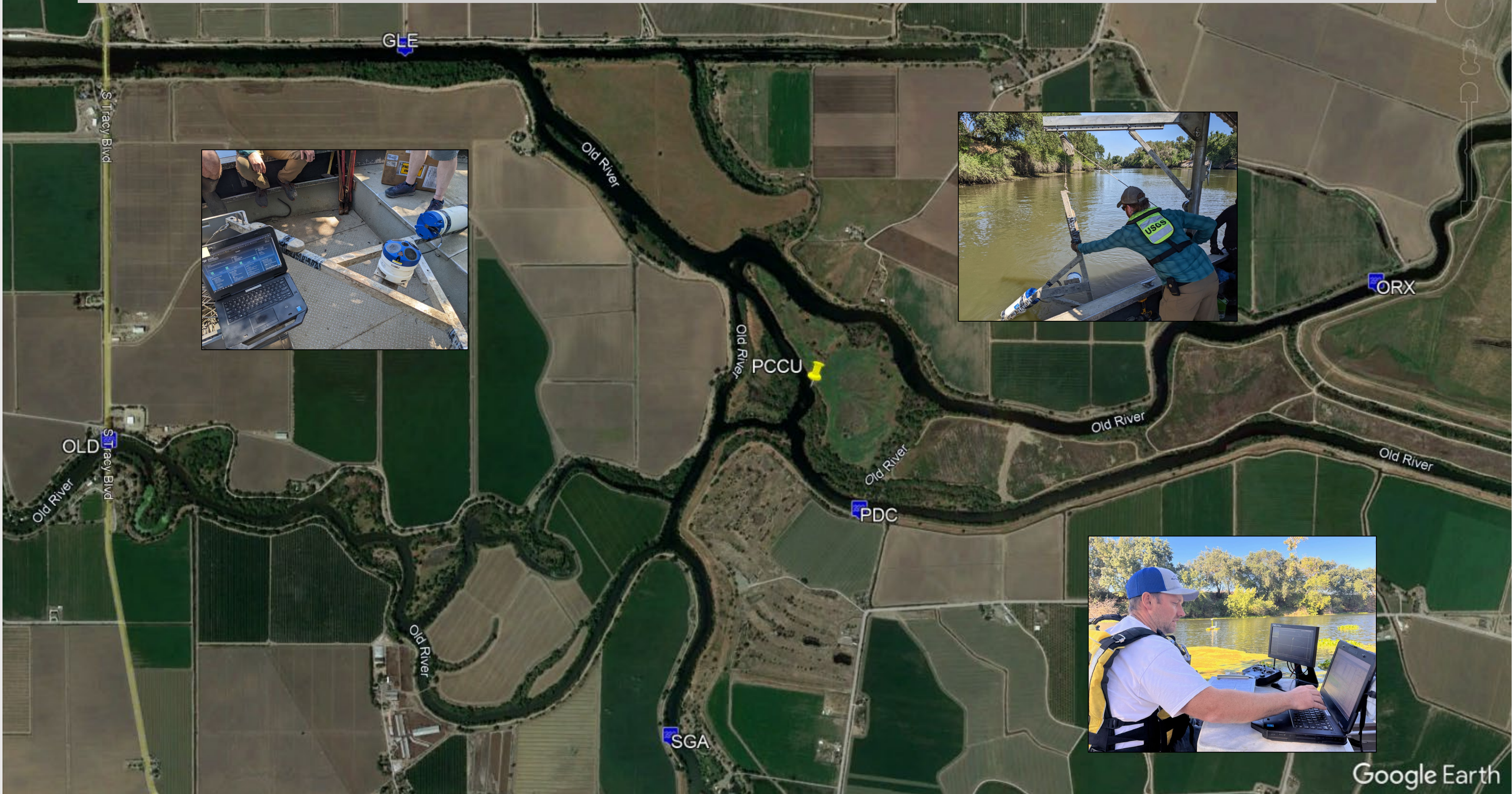
Raise your hand or type in the chat

State your name and affiliation

# Flow Monitoring Activities



# Five-Points Flux Study - 2024



# QUESTIONS OR COMMENTS?

Raise your hand or type in the chat

State your name and affiliation



# Closing & Next Steps

- Technical Workgroup Meeting #9: 1<sup>st</sup> or 2<sup>nd</sup> week of December
- New MSS Web Page: [Monitoring Special Study \(ca.gov\)](https://www.water.ca.gov/monitoring-special-study)

**THANK YOU!!**



# QUESTIONS OR COMMENTS?

Raise your hand or type in the chat

State your name and affiliation

# Contacts

Bill McLaughlin, PE  
Department of Water Resources  
Division of Operations and Maintenance  
Water Initiatives Planning and Management Branch  
[William.McLaughlin@water.ca.gov](mailto:William.McLaughlin@water.ca.gov)  
Phone: (916) 902-9899

Teresa Trinh, PE  
Department of Water Resources  
Division of Operations and Maintenance  
[Teresa.Trinh@water.ca.gov](mailto:Teresa.Trinh@water.ca.gov)  
Phone: (916) 902-9898

Grace Windler, PhD  
U.S. Bureau of Reclamation  
Regional Water Quality Coordinator  
Interior Region 10 - California-Great Basin  
[Gwindler@usbr.gov](mailto:Gwindler@usbr.gov)  
Phone: (916) 978-5088

Erika Britney, PMP  
ICF  
[Erika.Britney@icf.com](mailto:Erika.Britney@icf.com)  
Phone: (206) 801-2802

## Website

The website is currently down for maintenance. Contact Bill McLaughlin if you need access to any documents.



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