

STATE BOARD MONITORING SPECIAL STUDY

Stakeholder Meeting #3

May 17, 2022

1:00 pm – 3:00 pm

MEETING NOTES

Attendees

Project Team

- Ibraheem Alsufi/DWR
- Eli Ateljevich/DWR
- Jared Frantzich/DWR
- Bill McLaughlin/DWR
- Jacob McQuirk/DWR
- Daniel Deeds/Reclamation
- Patrick Scott/DWR
- Grace Windler/USBR
- Zhenlin Zhang/DWR
- Erika Britney/ICF
- Jenna O’Neill/ICF
- Diane/Captioner

Attendees (listed alphabetically)

- Manny Bahia, State Water Contractors
- Bryan Barnhart/DWR
- Tom Burke/Hydraulic Systems
- Ching-Fu Chang/Contra Costa Water District
- Chandra Chilmakuri/State Water Contractors
- David Colvin/DWR
- Janis Cooke/ State Water Resources Control Board
- David Coupe/State Water Resources Control Board
- Lisa Crowley/Delta Watermaster
- Bill Fleenor/UC Davis
- Erin Foresman/ State Water Resources Control Board
- Michael George/Delta Water Master
- Bryant Giorgi/DWR
- Jelena Hartman/ State Water Resources Control Board
- Kevin He/DWR
- Anna Hegedus/DWR
- John Herrick/South Delta Water Agency
- Tracy Hinojosa/DWR
- Hans Kim/DWR
- Michelle Leinfelder-Miles/UC Extension
- Stephen Louie/State Water Resources Control Board
- Amanda Maguire/DWR
- Maureen Martin/Contra Costa Water District
- Shawn Mayr/DWR
- Michelle Morrow/DWR
- Patrick Scott/DWR
- Nicky Sandhu/DWR
- Nader Shareghi, Mountain House CSD
- Samantha Soto/ State Water Resources Control Board
- David Steffenson/DWR
- Ian Uecker/DWR

Action Items

- Send salinity measurement draft work plan to Bill Fleenor. (Ibraheem Alsufi/Done)

- Provide references for the Data Assimilation methods to Tom Burke [and other stakeholders]. (Zhenlin Zhang)
- Follow up with Jelena to see if she needs copies of past meeting notes and the mural board. (Ibraheem Alsufi/Done)
- Send rhodamine dye study summary to SDWA and Bill Fleenor (and others as requested). (Jared Frantzich or Ibraheem Alsufi)
- SDWA requested to meet with DWR re: dye study and ion sampling. (DWR)
- John asked to label DMC Barrier as “TOR”. (DWR)
- Set-up a follow up discussion with Ching-Fu Chang, Chandra Chilmakuri, John Herrick, and Tom Burke (and anyone else interested) about South Delta Study Plan variables and modeling scenarios. (Eli Ateljevich)
- Follow up with Jelena about expected improvement in how SAV is represented in SCHISM model. (Eli Ateljevich/Done)

Welcome & Overview

There has been a lot of effort this year! Some of the work we’ve completed is initial data collection, research, and stakeholder and technical workgroup meetings. All of this was used to develop the draft Monitoring Special Studies plan.

Meeting Goals:

- Provide an overview of the draft MSS and review technical study updates,
- Review how the draft MSS has been informed by 2021 data collection, research, and stakeholder input,
- Provide the opportunity for participants to ask clarifying questions to inform their written comments.

The Draft MSS is currently available for review. Please submit all comments in writing. Comments can be emailed to Ibraheem Alsufi at Ibraheem.Alsufi@water.ca.gov.

Draft MSS Overview

John Herrick, South Delta Water Agency:

- Please clarify: Why does data need to go through DSM2 before it goes into SCHISM – why can’t it just go right into SCHISM?
 - *Response* (Eli Ateljevich): The inputs to SCHISM or DSM2 are going to be the associated source terms (like agriculture or treatment plant discharges) that put water and salts into the river. That data may coincide exactly with the input we need. In other cases, there could be lots of data in the surrounding area from which we can infer the mass sources in a way that’s spatially consistent with the movements of water and the observed concentrations in the South Delta (i.e., inferred data from mass contribution from the consumptive use and discharges into the channels).
 - John Herrick: Please include us when you are making conclusions about other data sources.
 - Eli Ateljevich: We get that. There’s a maximum amount of spatial resolution that you can have in this process. We can’t attribute things to a particular small section of a channel, but we can on a reach level. So it will be reach-based, something that is at most a couple of miles long. We are very sensitive about the liability concern that comes with doing this, but there will be better and better data as we go along with

this project. The goal will be to get the right amount of mass in the system, not to attribute it to a particular discharge source.

Tom Burke, South Delta Water Agency:

- I've been concerned about the data assimilation process, and I don't fully understand how it's being conducted from the previous meetings you've had. I get concerned when you use terms like "inferred data sources or concentrations". It sounds like you are trying to get your model to "fit" your hypothesis, but that doesn't necessarily mean that your model is more accurate. Is there anything that's been written up on the data assimilation process?
 - *Response* (Eli Ateljevich): Data assimilation is a science in and of itself and we don't make it up. We understand that the onus is on us to come up with a fair assessment of the method. We can't go back in a time machine and add data from 2021 that we don't have. All we can do is best available science. We can follow something that's a respected method in the field, we can show that we make inferences that are correct region-by-region, and we can match up to gauged data that is not part of the assimilation process...but that's the only way to go forward with the modeling. We would also need a lot of coordination to measure each of the other individual discharges. In fact, anything that you want to replace, any instrument that you want to put out there that replaces data assimilation with measured flows and associated EC as we go forward....we can do that as the project progresses. That would be a way of making sure that the data assimilation is working well because we would have specific information and we'd be able to look at what we infer and what we actually measure. But we would need data to make those transitions.
 - Tom Burke: I like the idea of gathering new data to CONFIRM past data assessments. I see this data assimilation overall as being a smoothing process to make the model match the data that you see more accurately. But it doesn't mean the model is more accurate, it just means it has a better fit. The goal should be to accurately show what we see in the rivers, not to fit the data to the model.
 - Eli Ateljevich: The data we have will expand a lot over the next two years, and we will work together. If there's anything specific that we can work together as far as establishing the credibility of the method, that's good. As with any modeling, we are sort of doomed to be imperfect from the outset, but we would like to validate it in a way that is as compelling as it can be.

Ching Fu Chang, Contra Costa Water District:

- Have the stakeholder comments been addressed in the draft MSS, and if so, how?
 - *Response* (Ibraheem Alsufi): In this draft you won't see that it's obvious, but stakeholder feedback has informed the draft MSS. Stakeholders comments on the draft MSS will be responded to in a formal document that summarizes all past comments and whether it was included or not.
- How do we avoid commenting on the same thing?
 - *Response* (Ibraheem Alsufi): Comment anyway. We expect that there will be duplicate comments.
- When can we expect DWR's response to comments?

- *Response* (Ibraheem Alsufi): We have not established this yet, but expect around the release of the final MSS.
- Will it end there? Or will we have a chance to follow up?
 - *Response* (Ibraheem Alsufi): It depends on the nature of the comments, but I am open to follow up if needed for a particular comment. We will make that determination at the time.

Bill Fleenor, UC Davis (via chat):

- Is there more detail on the fast salinity measurements?
 - *Response* (Ibraheem Alsufi, via chat): Hi Bill, yes there is. **There is a draft work plan out which I can send you via email.** Jared Frantzich, who is speaking next, will also present some details on this effort in a few minutes.

Jelena Hartman, State Water Resources Control Board (via chat):

- Is there a link to the mural board or other documentation of comments that you could share?
 - *Response* (Ibraheem Alsufi, via chat): Jelena, yes there is a copy of the Mural Board and prior meeting notes. These use to be posted on our public website though that is temporarily down. **I can follow up and send you those documents via email if interested.**

Technical Studies

High-Speed Salinity Transect Mapping

Tom Burke, South Delta Water Agency:

- Are you doing high-speed sampling on a monthly basis?
 - *Response* (Jared Frantzich): Yes, that's up next in my presentation. We have several routes we are taking, minus Middle River because of access issues. I'll talk more about this next.
- Do you have something written up on the rhodamine study?
 - *Response* (Jared Frantzich): **Yes, we are finalizing a summary of that study and we are happy to share it with you.**

John Herrick, South Delta Water Agency:

- We would like to see more on the dye study. Videos showing it back and forth would be nice, if that's possible. Just remember that some of us are color blind and cannot see colors like red. Also, it seems like the focus has been on Tom Paine and Paradise Cut, and I had expressed early on that we not focus in on one area. I'd like to discuss at some point with who's making the decisions and see if there's any flexibility or mid-ground here because we don't know if groundwater further downstream from Old River is causing a concentration problem in the subject area or not. I'd also like to talk to someone about this ion sampling because I'm not sure if pulling a sample tells us anything except that there are those ions in the water, but not what the percentages or sources are. **South Delta Water Agency would like to sit down and discuss this more and make sure we are all on the same track.**
 - *Response* (Jared Frantzich): We are not just focusing on one specific area. We are covering different inputs so we can cover all channels and their ion signatures so that we can address this concern of yours. That is why we added in Vernalis and San Joaquin sources, as well as Grant Line Canal on the Sacramento side.

- In discussions with The City of Tracy and Pescadero, Pescadero said that they can see groundwater seeping into Upper Tom Paine Slough under various conditions. And the City of Tracy said that the slope of the groundwater is going a certain direction, and they actually have quality data on it. There is a lot of stuff out there that we need to discuss whether or not it can be used and possibly expanding the scope here a little bit.

Jelena Hartman, State Water Resources Control Board:

- I am grateful that you started with point source and ion sampling because this study is really big and I appreciate what a large effort this is.
- Regarding the Rhodamine dye study, I'm curious to hear about groundwater. Based on reading the attachments in the draft, it's important to get a better understanding of the transport and dispersal rates in the upper reaches of Paradise Cut. Will understanding the dynamics in those upper reaches be enough to tell us about the dynamics further downstream near the confluence? Do we know how that water will react when it gets to Old River? I suggest that adding something in these main waterways where we have the poorest understanding of what the tidal pump does and where those flows go and sometimes swirl. Would we get more bang for our buck if we do the dye studies further downstream and closer to lower Old River where it splits? I'm wondering if our biggest gap in understanding is further downstream than where some of this initial study has occurred.
 - *Response* (Eli Ateljevich): You're correct: It doesn't measure dispersal into Old River, and that's not what we were trying to accomplish here. What we've noticed with our modeling is that when you get to these dead-end sloughs, there is sensitivity to the net flow direction. We are pretty sure, having seen the sum-total of the agricultural returns that come in between the bridges where we did the study and Old River, that ultimately there is a net flow going downstream. The big question is what is the water doing above most of the known agricultural discharges? What's happening in that upstream reach where it bifurcates into a north and south? The dye studies were to get at that question, and produced some answers related to that.
- Regarding drone imagery and continuous EC: Can we do more flights into the Doherty Cut area, from lower Old River into the Grant Line Canal, and then on Old River itself (both drone and continuous sampling)? There's a meandering channel there that was in DWR's 2012 Transect Study. That study suggested some sort of water quality impact on the current compliance location. If there's something there, how do we look at it better?
- And then, in terms of adding all of those ion sampling locations in Tom Paine Slough, do we expect those ion fingerprints to be different enough among those stations to help us distinguish from each other? It seems like we've saturated sampling in that slough, but would we get a little bit better picture of what's going on going into these more controversial areas that Eli was describing, where lots of things happen?
 - *Response* (Jared Frantzich): One of the better ways we've found for understanding salinity and tidal dispersion in that area is doing those high-speed transects over different tidal periods. We've seen interesting data here. These transects might be more helpful in this area. We've also added two continuous monitoring stations near the confluence to both upstream and downstream of Paradise Cut to look at how salinity may be moving in and out of that slough under different conditions. And then with ion sampling, I think it is kind of bulked up in Tom Paine, but Tom Paine is connected at the bottom to Sugar Cut, so that's circulating and moving in and out. A lot of the work we are doing is to assess data quarterly

so that we can make decisions about how to spend our time. Some changes may come, but it's new and we don't know yet.

Bill Fleenor, UC Davis (via chat):

Please include me on the tracer study report. I have done over 100 Rhodamine tracer studies.

Salinity Transect Mapping

John Herrick, South Delta Water Agency:

- For ease of understanding, **can we label the DMC Barrier as Tracy Old River Barrier (TOR)**? That's a more common and understandable reference.
- For your Fabian tract circuit, are you staying in Fabian Bell Canal, or going in Grant Line Canal, or both?
 - *Response* (Jared Frantzich): My understanding is that we are driving through the primary channel there on Grant Line because it is easier to navigate. But there are several inputs along the Southern Channel as well. This is more for navigation purposes. Is there interest in looking at the secondary channels as well?
 - John Herrick: I don't know the answer. After talking with the City of Tracy, we may have groundwater salinity inputs along different areas, so depending on where the high-speed monitoring goes, we may miss some concentration that's closer to the shore. Let's just talk about that. I am not criticizing, just thinking out loud here.
- The data seems to reflect what we understand, but it's important to remember that tidal action in the South Delta is very confusing and not always predictable. I've seen weird things going on there because of the volume and restrictions in the channels.
 - *Response* (Jared Frantzich): Tides are definitely tricky out there. We have a lot of stations out there to track and document tidal directions and net flow direction. We will see connections between these.

Tom Burke, South Delta Water Agency:

- How long does it take to do that circuit? For getting the whole loop measured?
 - *Response* (Patrick Scott): It depends on vegetation and other conditions and whether the barriers are in. In March without barriers, the whole circuit took 3-4 hours.
 - Tom Burke: And if barriers are in, it takes longer?
 - Patrick Scott: We haven't done it yet, but this is what we are anticipating. It's tricky to figure out timing.
 - Tom Burke: My concern is whether you'd be able to accomplish all that on an incoming or outgoing tide to be representative of those conditions.

Michael George, Delta Water Master:

- Do you follow those transects in one direction, both directions, or does it matter?
 - *Response* (Jared): We try to do whatever is quickest and whatever is possible. I'm not sure if it matters too much when you're thinking of data as an input to modeling. The real benefit is how it's being used in the modeling.
 - Eli Ateljvitch: I would prefer something that's fairly disciplined as far as repeat runs. I'd rather see a well-calculated flood cycle and ebb cycle in one particular stretch where we want to look at something specific. Timing does matter a little bit.

- Patrick: We are trying to do both. But the direction isn't as important if tidal cycle and flow are accounted for in the analysis. Models can provide some interpretation of time.
- Eli Ateljvitch: I like the idea of catching the same reach in a flood and an ebb, where the timing has been carefully delineated.
- Patrick Scott: Yes, we are planning to catch multiple tidal cycles. It just becomes an issue of resources (light, etc.).

Nicky Sandhu (via chat):

- Does the transect data consist of the GPS locations, timestamps, and the water quality? Any other pieces that are measured?
 - *Response* (David Colvin, via chat): In general, yes, there are other parameters too (boat speed, direction, and a verification sonde sporadically used containing a full suite of probes).

Jelena Hartman, State Water Resources Control Board:

- An iterative process is great! For stakeholders to be able to give meaningful feedback, we do need those initial outcomes in order to contribute as we go along.
- I want to make sure that text in a few places suggests that maybe transects would be targeted during certain parts of the tidal cycle. I also advocate for including the flood tide. Some locations can be a source or a sink depending on time. We can't just focus on the ebb tide.
- The text didn't characterize it the way things are being discussed here – that it's going to be all parts of the tidal cycle – and I think that would be really helpful.
- If there are transect routes through those sloughs, I think it would be helpful in showing us how far do these salinity sloughs make it downstream. Because preliminary data show that it's very salty in the upper reaches of certain cuts and sloughs, but not as salty further downstream.

SCHISM 3D Hydrodynamic and Water Quality Modeling

Jelena Hartman, State Water Resources Control Board (via chat):

- Eli, what are thoughts about the need for lateral study of EC and velocity?
 - *Response* (Eli Ateljvich): Generically, if it was a wider, deeper channel, we have enough experience in other places to have confidence that we will get a good lateral snapshot. But it's highly local, so it may just be anecdotal. There also tends to be an issue with the 3D structure of the flow, we may need upward looking instruments.

Ching-Fu Chang, Contra Costa Water District:

- Regarding your slide with the cube and three different variables...is that just an illustration, or are you doing a gridded search in the various variable space?
 - *Response* (Eli Ateljvich): No, in fact my conversations with you have made me think differently about this. There are different combinations of flows that can contribute reasonable combinations. We are not going to go so far away from historical values that we re-write everything. And we can, to a reasonable extent, expand on that set of reasonable combinations because part of this process is to explore what is possible. So, we want to go a little beyond what has historically happened. I'm willing to define the boundaries of that and check in with you (I normally would have checked with you regardless because you've expressed an interest), but anyone who would like to hear about that and what's the range

explore, I'd be happy to share that before we start modeling. **Ching-Fu Chang and Chandra Chilmakuri are both interested in this.**

Tom Burke, South Delta Water Agency:

- I like what you are trying to do with this model and it makes sense. I do question whether it's appropriate to go to a 3D model for a system that's dominated by one-dimensional flow. Everyone is struggling enough to process everything. Is it really giving us more accurate data, or just MORE data? My biggest concern is the amount of time and resources to run SCHISM; this might be beyond the capabilities of some of the stakeholders and knock some of them out of the system.
 - *Response* (Eli Ateljevich): This is a reasonable question. If, at the end of all of this, it seems like DSM2 is doing as well as SCHISM, then that would be an interesting finding too. One of the things that SCHISM can do is to bring some resolution. So, we can resolve the dispersion that happens in the 5-Points region. The resolution of DSM2 is a bit coarse for these regions. We've had to refine DSM2 past its fault to get it to work. SCHISM scales well, so it doesn't take much to include the vertical dimension. It's done well as a bulk estimator, but it's required some refinement. Don't assume that because it's a 3D model, it's slower. It doesn't take a long time to run a few days.

Jelena Hartman, State Water Resources Control Board (via chat):

- Eli, could you talk a bit about characterizing the submerged vegetation- what is your sense of the expected improvement for the southern Delta? If our current EC modeling is off by, say 30%, could you comment (quantify) on the expected improvement?
 - *Response* (Eli Ateljevich): I would not normally say that the vertical dimension would be the most important in here. SCHISM scales well, so it doesn't cost much to include the vertical dimension in some complexity. The vertical dimension plays an important role with vegetation. We are able to model the dynamic of a vegetation canopy: with the flow rising up and over the canopy and a somewhat higher speed flow above the canopy during higher tides; and that dynamic is part of the model. DWR has published a paper on it and an ongoing effort with CDFW's vegetation folks to improve the way that we interpret remote sensing pictures. Incorporating sav (the vertical dimension) always seems to improve the modeling when we get it in there

Water Quality Data Assimilation Modeling

John Herrick, South Delta Water Agency:

- This is another issue of preconceived notions: We can't say that did not come from the Vernalis direction because that means the salt that accumulates there would only be a result of the then current flow down Vernalis. You have to look at the longer-term operations – 100s of 1000s of tons of salt being put on the land and the water not placed on land contributes to groundwater. If the model says there's more salt here than we think, then let's look into that.
 - *Response* (Eli Ateljevich): We agree, we should look into this. If we show that the assimilated sources are higher and you want to react to that by going and measuring certain areas, I don't think there would be resistance to that. However, if you want us to look at 2021, we don't have the data we need, so inferences are needed.
 - John Herrick: The reason that water quality was okay in 2021 was that there was more water in the San Joaquin River than was consumed in the South Delta. When there isn't

more [water] than is consumed, the main stem runs backwards, Middle River runs backwards, and all the salt that's draining down the river starts moving in a southwest direction towards the pumps. And then you have the barriers and water coming in on the tide that's greater than local diversion. You have water flowing upstream, and all the salts flowing downstream and that's why it collects there. It doesn't matter what the EC at Vernalis was in this time period. It was the additional volume of fairly good quality water. The specifics of where the salt is coming from, and how it mixes is important, but it's simple physics: If the water coming into the system is less than the local demands, we know the salt is going to collect somewhere.

- John Herrick/ Eli Ateljevich: Back and forth dialogue ensured related to modeling flows, EC and accumulation of salts, and what modeling results might yield. SDWA advocated for modeling to provide information on flows needed to fixing salinity issues in the South Delta. DWR clarified that modeling would be used to quantify intermediate flows regimens in the South Delta that fall between extremely high flows known to improve salinity in the region, and very low flows that allow for salt to accumulate.

Ching-Fu Chang, Contra Costa Water District:

- Maybe we should schedule another time offline to discuss all of this, so we aren't limited by time.
- There was a slide showing 3,000 red dots. The dots are potential salinity source locations, right? And then there was a test run testing the concept of data assimilation by comparing the with assimilation outputs with data and showing a good agreement. To me, this seems like something people usually do in the field of groundwater hydrology called inverse modeling. With that, there's a common problem, which is that you start with a prior assumption and get a matching result and use the matching result to support your prior assumption. But that doesn't mean there are no other sets of prior assumptions that could lead to equivalently good match of the results. So, I'm wondering whether the location of these red dots...is that justified by something, or is that going to be informed by more sampling studies that you mentioned, like the dye study?
 - *Response* (Zhenlin Zeng): The choice of those potential salinity source locations was based on previous transect data where we observed this surge in EC, these areas are identified as EC hotspots. As for accuracy of the position of each dot, it's not super accurate: if you move 100 feet upstream or downstream the results are probably going to be similar. We can't get to the level of a few hundred feet, that's something we can't do with the model. However, we can tell, on a reach level, over few miles whether there is a source, or not. In my experiments, while the location of the red dot is inferred, the model feedback has been that they must be positioned in a reasonable location for the model to work (tested by deliberately placing them in unlikely areas - the model fails to run). It is a version of inverse modeling.
 - Some of these are very specific when you get down to the point of some of these high-speed transects. There are some places where we do see a lot of locality of source, the plumes move with the tides, but they are quite local as they pass certain prospective discharge locations.

Bill Fleenor, UC Davis (via chat):

- Ag drainage from Fabian Tract is on the north side. They weren't potential sources?
 - *Response* (Zhenlin Zheng, via chat): So far, the 2016 test has been focusing on Old River. I agree that we can put a source location on Fabian Tract to assimilate the source.
 - *Response* (Eli Ateljevich, via chat): Bill, in response to your question about Fabian Tract, the perturbation of sources from DCD in the first cut didn't include that area. However, there were the usual model sources in some of our runs.

Maureen Martin, Contra Costa Water District (via chat):

- How about ways to improve net flow outside of additional water? Can we use the model to evaluate options like pumps and re-circulating flow when there are low flow conditions? Is an engineering solution possible to ensure salt continues to be advected away when Vernalis flows are low? Pumps on barriers, etc.? It would be great to keep our work focused on ways the project and stakeholders can improve water quality in the South Delta and identify solutions that can improve compliance with water quality objectives.
 - *Response* (Zhenlin Zhang, via chat): Yes, I agree with what Maureen suggested. We can include potential solutions as model scenarios.
 - *Response* (Eli Ateljevich, via chat): Maureen, I think we are developing improved tools that can be used for this. One mandate of the MSS is understanding, but we could move on from that.

COP and MSS: explanation of the separation of the COP and the MSS documents

John Herrick, South Delta Water Agency:

- Has the State Board waived the COP time deadline due to it being past due?
 - *Response* (David Coupe, State Water Resources Control Board): I am not aware of any waiver. There hasn't been any specific change to say that the current language has changed at all. We are ardent and optimistic about the work that's being developed as part of putting these technical studies together, but no, the language hasn't changed and it remains the same.
 - John Herrick: This is important because operations will be a way of also gathering data, if there were proposals and changes to operations to try to address these things along the way, we'd have even more data by now.

Jelena Hartman, State Water Resources Control Board (via chat):

- Eli, let me know about expected improvement with aquatic vegetation.

Closing & Next Steps

- Comments on the draft MSS are due by May 27. Please send comments to Ibraheem Alsufi at Ibraheem.Alsufi@water.ca.gov
- If you didn't get a chance to ask questions, send them to Ibraheem. We will process and respond to comments. We don't have a date yet. This will depend on additional discussions we may or may not need.
- We will have more stakeholder meetings, but there is nothing scheduled at the moment.
- The MSS website is being updated and split into two different websites for the COP and MSS. We will let you know when that is complete.