September 27, 2021

Dear Data Integrity Workgroup committee members:

The next meeting of the Data Integrity Workgroup (DIWG) of the Chesapeake Bay Program Scientific and Technical Analysis and Reporting (STAR) will be Thursday, September 30, 2021. This meeting will be a virtual meeting in place of our normal face to face meeting due to the remaining COVID 19 restrictions. Meeting logistics are below:

Join from the meeting link
https://umces.webex.com/umces/j.php?MTID=me93356b12cd31e4157b41253f03fb4fd

Join by meeting number
Meeting number (access code): 2622 634 4782
Meeting password: X8nPsRgC7F3

Join by phone
+1-408-418-9388 United States Toll
Global call-in numbers

Join from a video system or application
Dial 26226344782@umces.webex.com
You can also dial 173.243.2.68 and enter your meeting number.
The meeting will be held from 1:00 PM to 3:00 PM. A draft agenda is attached. If you have any additions to the agenda, please bring them to the meeting.

Sincerely,

Cindy Johnson
DI Workgroup Co-Chair

AGENDA
Data Integrity Work Group (DIWG)

Virtual Meeting

Thursday, September 30, 2021
1:00-3:00

1:00-1:10 Announcements, Meetings, Conferences, Webinars:

- VAEE Virtual Mini Conferences - October 23 (Virtual)
- 2021 Chesapeake Watershed Forum - November 1-5 (Virtual)
- CERF 2021 November 1-4 and 8-11 (Virtual)
- A Community on Ecosystem Services (ACES), December 7-9, 2021 (Virtual) – in person moved to December 12-16, 2022.
- The North American Lake Monitoring Meeting will be held in November. https://www.nalms.org/nalms2021/ November 15-19, 2021 (Virtual)
- EPA Region 3 Quality Assurance Workshop – November 4th, 2021 (Virtual) Register here by October 22nd, 2021

Action Items:

- ✓ Workgroup members are to reach out to Durga Ghosh (dghosh@chesapeakebay.net) if interested in being co-chair of DIWG
- ✓ Workgroup members are requested by the CMC to think about the priority locations for their tidal monitoring programs
- ✓ Two topics will be addressed in smaller groups of interested members: 1) Funding - how do you set up a community science monitoring program that can deliver valuable results that is also cost effective and efficient for a small NGO on a budget? And 2) Field variation – what is indicative of drift vs a harmful algal bloom, and identifying pycnoclines.
- ✓ Jerry Frank (frank@umces.edu) requests that everyone share their August split sample Chlorophyll A data directly with Jerry
- ✓ Send topics of discussion for the next meeting to Cindy, Durga and Amy (cindy.johnson@deq.virginia.gov, dghosh@chesapeakebay.net, goldfischera@chesapeake.org)

1:10-1:20 Monitoring and Laboratory Analysis Updates **All**

The USGS Virginia monitoring portion hasn't had any setbacks from past or evolving Covid challenges and has had no delays through Division of Consolidated Laboratory Services (DCLS) or National Water Quality Laboratory (NWQL). Cynthia Stevenson gave an update from the Maryland Department of Health (MDH), saying that their lab was operating as normal, although some of the collectors had issues collecting because they couldn't be in groups. However, everyone found solutions. Nancy Sullivan of Arundel Rivers Federation shared that they could not monitor a section in 2020 because

they weren't allowed on boats. They used state labs to do algae samples and couldn't run tests because those labs were shut down. However, this has been resolved in the last 3-4 months. Cindy Johnson of Virginia Department of Environmental Quality (DEQ) said that the Governor just released a regulation affecting people working in offices that could pose an issue for collection in the cooler weather. Masks and social distancing will be required. Suzanne Doughten of Old Dominion University (ODU) said that they are working on mainstem monitoring and that as of May 2021, full capacity on the sampling boat is allowed, and masks are required indoors.

1:20- 1:45

Enhancement of Nontidal and Tidal Monitoring programs -	
Response to PSC request for monitoring review.	**Tango**
2022 Monitoring Grant Update	**Tango**
SAV Monitoring	**Tango**

The Principal Staff Committee (PSC) was interested in understanding the CBP budget and funding for monitoring. Lee McDonnell shared this information at the last PSC meeting in March 2021 while sharing with them information on everything that goes into the monitoring program. The five monitoring networks discussed were tidal water quality, nontidal nutrients and sediment, Submerged Aquatic Vegetation (SAV), tidal benthic organisms, and citizen monitoring. In the presentation to the PSC, they acknowledged there is a history of resource stresses to sustain and grow the monitoring program, but there is research developments and innovations providing options to address capacity gaps. PSC recognized that the monitoring program needs to grow so they requested information on what is needed to improve the CBP monitoring networks including current status and threats to the networks, what's needed to improve their sustainability, and what is available to address monitoring and assessment capacity shortfalls. STAR will coordinate the response and deliver an assessment and focused recommendations by January 2022. Since the presentation in March, PSC has met with additional groups to address questions regarding the 5 core monitoring programs.

In spring 2021 efforts were focused on understanding the status of programming, and vulnerabilities to target and address with existing networks. In summer 2021 innovations were assessed (ie SAV, chlorophyll, light limitation assessment). Efforts were also made to understand financial gaps - how much is needed, how do we address the gaps, and long term needs that we can't address with the range of resources. In fall 2021 efforts are focused on evaluating limitations, sharpening financial elements (which involves talking to grantees), and talking to the broader community regarding innovations and recommendations. The final product delivered to the PSC will include a succinct executive summary, extended network portfolio summaries, and some information recognizing elements beyond the 5 core networks.

Peter Tango reminded the group of the 8 questions: Network status? Vulnerabilities to sustaining network operation? Programming management strategy? Monitoring information gaps? Monitoring program options for filling gaps with existing resources? What innovations are available? Who are the partners for operationalizing the

innovations? Financial perspective for sustaining, growing and innovation needs for our network? And in addition, beyond these core 5 networks, additional program needs.

Key findings to date

Tidal water monitoring program:

Within the water quality standards attainment our long-term monitoring program has been able to capture enough data to evaluate 30 day mean, and in some cases, instantaneous minimum assessments. The DO criteria is 1 day mean, 7 day mean, and the instantaneous minimum for many designated uses. We have not had the monitoring in place that we need to address all of those since they were established in 2003. This is a longstanding gap that is being addressed in two ways:

The 4D Interpolator: We are in the case study phase and initial methods are being tested. At the next meeting we will present a case study on methods we think will work for the Bay. There is also an understanding that we need vertical water quality measurements in high temporal frequency. There was a GIT-funded pilot study in 2019 and 2020 with more affordable and efficient ways of getting the infrastructure out into the bay with small scale, robust systems. Since then, NOAA has invested in 2 arrays and the Hypoxia Collaborative is supporting where to put these 2 arrays. Some possibilities are the Lower Potomac and the Lower Rappahanock, and they are looking for feedback on this.

Advanced monitoring: There is a STAC funded workshop coming up in December 2021 to look at opportunities for satellite imagery. SAV has been a target since 2018. The workshop will look at chlorophyll and light limitations and the advances that have been made in algorithms and opportunities for use in the Bay. This is consistent with important elements used in water quality standards attainment used in our models and expanding into new resolutions that we haven't had, complementing our goal of building support for expanded monitoring with new techniques.

Nontidal water monitoring program:

Deer Creek monitoring station will be funded for another year. In the possibility that we have level funding going forward and have to make difficult decisions about which stations to prioritize, we are working with Matt Cashman and Qian Zhang on an optimization exercise, but also recognizing that each state in the meantime can provide initial insights on short-term steps. In the long term – questions about evolution & continued expansion of continuous monitoring stations. How many, where should they go, how much should we grow the network. Considering also advances in tech such as nitrate sensors and turbidity sensors.

Tidal benthic monitoring program:

Historically had a spring and summer funded program but as a result of changes in funding distribution spring sampling was abandoned. States would like to and are able to continue with summer monitoring but there is no interest or support in resuming with the spring monitoring program.

SAV monitoring program:

The funding is stable overall. Support needs will be evaluated out of new recommendations out of the upcoming December workshop. There was a workshop on satellite-based assessment of SAV in 2019-2020, chaired by Peter Tango and Brook Landry of Maryland DNR. The report was released in 2021. It was done because in 2018

the weather was so bad the contractors could only get about 85% of the surveys done. The researchers at VIMS looked at all available satellite info and were able to fill in 9% of the missing piece and make a more complete assessment. It helped us in the workshop to ask more rigorously, could we use satellites to conduct the whole program? Pilot work was conducted by EPA from 2020 into 2021, and this is in review while researchers are continuing to look at recommendations coming out of the report for use of other satellites as well as artificial intelligence to interpret images more quickly and cover more complete data sets. In December we'll review the latest findings from the report and update with recommendations. While we are not necessarily taking on assessment with satellites tomorrow, we're looking at how close we are based on the pilot work done and new research that will be brought to the table later this year.

Community science monitoring programs:

Citizen science has made exciting contributions. The Chesapeake Monitoring Cooperative (CMC) just received a second award so no new resources requested at this time. They have done outstanding work on tidal water quality monitoring supporting a variety of needs including water quality standards attainment. Their nontidal macroinvertebrate sampling is helping stream health outcome data gap. They are working with state people and local agencies with salt watch, bacteria monitoring and more. The new award is helpful in leveraging other resources. The CMC is coordinating with the EPA Laboratory, and they were able to get additional funding through the Chesapeake Bay Trust, and align the work with the stream health monitoring needs of the CBP. Together that gives additional work on watersheds we haven't been able to assess in the past. Next week they'll be meeting to put together the volunteer monitoring protocol on picking samples. The CMC is coordinating with the National Fish and Wildlife Federation (NFWF) on habitat assessment protocol for stream health monitoring sites. The needs of the water quality networks go beyond to a range of many outcomes in the Watershed Agreement. Those needs cut across many WGs and GITs. This is documented through the Strategic Review System (SRS). There is have an active database of science needs and research gaps. Today's STAR meeting was with a range of groups updating their science needs information in the database.

Grant outlook:

Peter Tango has near daily interactions with CBP leadership on funding for sustaining existing programming and growing our monitoring program. Peter Tango, Lee McDonnell and Scott Phillips receive input from groups and communicate this input in the budget requests. There are no immediate changes to the level funding outlook to report. Depending on bills in Congress (particularly Infrastructure Bill) there are some possibilities for increases in CBP funding in the monitoring and analysis realm. This PSC review was a specific ask of state leaders so they could help us with filling data gaps.

1:25 – 1:45 Citizen Monitoring **Donovan & Iliff**

Caroline Donovan commented that the DIWG has supported the CMC's technical questions. Caroline shared updates that with the new grant funding, the CMC is working more directly with groups on their monitoring, QAPPs, SOPs, uploading data, checking out their field work and field equipment. In the past the CMC was focused on facilitating,

while now the CMC has more flexibility to help with the technical side and do hands-on work with the monitoring groups.

Caroline shared that the CMC had some questions about the Chlorophyll A fluorescence monitoring. A lot of groups have probes or sondes that can do Chlorophyll A but it's not a grab sample. Caroline shared a summary of outcomes from a call over the summer with members of DIWG including Carl Friedrichs, Mark Trice, and Cindy Johnson. There is a history of chlorophyll A and fluorescence sondes data being used to monitor local processes happening in different parts of the Bay, but it's not used as a regular monitoring tool for groups particularly in a broader geographic context. For example, MD DNR doesn't measure it on their profile data. Whereas if you're doing something like continuous or data flow data, high resolution local data, that is where you'd use these types of instruments. At this meeting members talked about current potential uses for this data. For example, the water clarity criteria assessment would use it to get to the Kd model, for monitoring Harmful Algal Blooms (HABs), and some remote sensing work. It is great if the groups want to do this monitoring as it is important for scientific studies answering specific questions, but they don't need to do this during their regular, fixed site sampling.

Caroline Donovan made a request of the DIWG members to prioritize areas where they are looking for DO assessments or specific water quality parameters in the tidal areas in 2022-23 and let the CMC know what their needs are so the CMC can focus on those groups. The CMC is slated to update their prioritization process soon so it is important to know what the monitoring needs are, and the CMC has more funding and time now to make sure the data is up to the quality CBP needs for assessments.

Cindy Johnson commented that Virginia is in the process of updating their monitoring plans for the upcoming year, although they won't have the details until December or January but will keep the CMC posted.

Caroline Donovan stated that it would be helpful if DIWG members could tell CMC the tributaries from some of the major river systems that they need monitoring on so that CMC could find some groups that could be tier 2 or tier 3.

Caroline Donovan discussed a recent issue that CMC groups have been running into while trying to update Tier 3 QA/QCs: calibration. The manufacturers of equipment have not been the best support for troubleshooting and give different answers for what the calibration is saying and how often to do it. Caroline stated she thought there was a set understanding of how often people should calibrate, when they should do it, how long it should take, what those ranges should be. If we can provide those groups with more confidence that what they're doing is right that would make everyone feel better. Does CBP/DIWG have instructions?

Jesse Iliff, Riverkeeper from the Arundel Rivers Federation stated that they are in the process of revising their QA/QCs. Their standard process is to calibrate before every outing and afterwards within 24 hours. However, they got a newer model of equipment

and the manufacturer stated that calibration was only required every 90 days, although that 90 day guideline depended on what it was used for and one's tolerances for drift. Jesse reached out to Caroline Donovan, Durga Ghosh and Elizabeth Ward and asked what is an appropriate calibration interval for CMC groups wanting to maintain Tier 3 certification as well as continue to support river report cards, and would spot checks after outings be necessary?

Jesse noted that this is an unfunded program for the Arundel Rivers Federation and that they have not gotten foundational or government grants to support the monitoring program, and as such have to do cost benefit analysis themselves to determine what is appropriate. Jesse stated that this calibration issue merits a broader discussion with this group and other NGOs that work in this space - how do you set up a program that can deliver valuable results that is also cost effective and efficient for a small NGO on a budget?

Doug Chambers pointed out the USGS has well-defined guidelines for calibration and maintenance of multi-parameter water-quality sondes, which are available at this link.

Caroline Donovan asked what is the minimum calibration requirements need to do be Tier 3? The CMC QA/QC is clear that you have to calibrate before going out, and you have to do a post sampling check, usually once a week. However, each group has their own QA/QC, using the CMC QA/QC as a template. Caroline stated she was hoping for a standardized way of writing it in the Tier 3 QA/QC.

Durga Ghosh stated that she agrees there are variabilities using different sondes and probes, but the Bay Program has a pretty clear guidelines in the methods manual. These guidelines require groups to calibrate before and after and have specifications on the variability you would notice pre and post calibration. This information can be found in Table 2.2 in the Methods Manual. It is very important that the calibration standards are kept constant despite the variability of instruments we are using. Durga also remarked the funding question will be discussed on the side outside of this group.

Caroline Donovan asked for clarification if groups should still calibrate 24 hours before monitoring and 24 hours after monitoring even if the manufacturer states that calibration can be done every 90 days and results would still stay within an acceptable amount of drift.

Durga Ghosh responded yes, that is the case, and provided the justification which is that it is much worse to have to qualify 90 days of data should after 90 days you find there is large drift in your values, than to spend a bit of extra time calibrating. It is important to make sure that the number of qualified data that you have after your monitoring period is overall minimal, and the data you have collected is quality assured. That's why all groups collecting Tier 3 data have the same rules so we can use these data for various things and not have to worry about any variability.

Caroline Donovan asked for clarity if groups pre-calibrate on Tuesday morning and sample on Tuesday and on Wednesday morning, can they post calibrate Friday or do we have to calibrate in between?

Durga Ghosh responded that for the smaller citizen monitoring groups, if they do multiple sampling events in a given week, they can calibrate on Monday before they set out, and Friday after they're done. For larger groups, like MD DNR, who go out on cruises, CBP recommends they calibrate the day of sampling, and then the day after the cruise is complete.

Peter Tango asked Mike Mallonee - does DUET have some filter checks that could guide Jesse? And Mike replied that DUET has some range checks built in for the 5 parameters that are used in the WQ assessment dataset (DO, CHLa, salinity, secchi, and wtemp).

Jesse Illif also asked what to do about in the field variation, giving the example of seeing supersaturation figures of 130-140% for dissolved oxygen (DO) in the field. It would be helpful to have a reference to check indicating whether variation was more indicative of an equipment malfunction or a bad algal bloom, and if every time DO was above a certain level they need to do a grab sample and assess for chlorophyl to rule out the possibility of an algal bloom. This would be particularly helpful to know when coding excel macros that flag questionable data during data cleaning. They are currently revisiting these macros, and parameters for these. Jesse asked for thoughts on what parameters to look for and the reasoning behind those decisions.

Peter Tango commented that there should be some duel or multi-parameter considerations going into this, ie water is very green, pH is 10 or more but oxygen is near zero - it might happen early in the morning but in general you would expect high DO, high saturation levels.

Caroline Donovan stated that maybe it comes down to looking at location specific historical data and historical ranges.

Jesse Illif noted that it would be helpful if these reference ranges were divided up by ecosystem, for example mesohaline vs polyhaline. Jesse also commented that they have been doing quarter meter sampling hoping to identify where there is a pycnocline present, although the Maryland tributary assessment documents state that half meter intervals or meter intervals at certain depths would be sufficient for an assessment of DO, but they also recommend keeping an eye out for pycno clines. Jesse asked for thoughts on whether you could identify the presence or absence of pycnoclines with these broader depth intervals or not.

Caroline Donovan followed up by asking if the quarter meter data set from the past 10 years is useful.

Peter Tango responded that quarter meter data would be a valuable and informative data set given there are differences in terms of depth intervals. It would aid in understanding

what the best resolution is when putting out new vertical high frequency arrays and therefore data like that are hugely valuable. While states have worked with larger resolutions (1 and 2 m), we have new instruments which this will be helpful for.

Jesse said he is working with Mike to get the data uploaded for anyone to use.

Cindy Johnson suggested that a smaller group of people who have been collecting profile data – like Suzanne Doughten, who has an equation they have been using to determine pycnocline while they're out on the cruises - or shallow water monitoring partners can help with Jesse's questions regarding what constitutes an algal bloom or what might be indicative of drift in measurements.

Caroline Donovan commented that the CMC has a new bunch of groups that could be Tier 3 groups pending field audits. Caroline also noted that monitoring groups were able to be flexible with the pandemic and train people virtually.

1:45 – 2:05 QA Audits and Updates **Ghosh**

Durga Ghosh provided an update on field audits. The audits have been on hold for a while due to the pandemic, and they are hoping to start back in early spring of 2022. In the meantime, they are reaching out to agencies individually and ensuring internal audits are being carried out to the extent possible given restrictions. Durga is also ramping up oversight of performance testing samples, blind audits, and coordinated split samples. It used to be an annual overview and still will be but Durga has been checking in more frequently. Overall, there is no reason for concern and most of the data looks good. Nearly 80% of the continually submitting data labs are accredited labs. The other labs will be priority for audits next year when we start back up, with audits for potential Tier 3 groups top priority. Durga suggested that field audits could be done for multiple groups on the same day as a pooled event because there are several groups on Maryland, at least for an initial evaluation.

Caroline Donovan agreed that auditing multiple groups in one day is a good solution.

2:05- 2:25 Coordinated Split Sample Program

- May 2021 Mainstem Results **Mallonee**

Mike Mallonee shared the Mainstem Results from February-May 2021.The 2021 samples from February and May sampling have been added. As of May there is a 5th full time data provider doing mainstem split sample collection. There was one concern regarding Chlorophyl A values. Jerry Frank of Chesapeake Biological Laboratory (CBL) at UMCES said they had values that were alarming because of their difference from the others. However, they are confident they've isolated the issue and are doing a corrective action, the results of which they will forward to Bay program. The issue was with one analyst who was there for a short time and made procedural mistakes on a relatively small set of samples that caused this large difference. CBL will let everyone know once they know the extent and the impact of this issue. Jerry Frank requested that everyone

share their August split sample Chorophyll A data directly with Jerry so they know they've completely addressed the issue and haven't missed anything.

- June 2021 Tributary Results **Mallonee**

Mike Mallonee shared Tributary Results from December 2019 to June 2021. There were no concerns, just a note from Mike and from Jay Armstrong of Division of Consolidated Laboratory Services (DCLS) that their June 2021 PN value looks like it is 0.00 because of how the line on the graph is going through it, but it is actually 0.06.

2:25-2:45 Blind Audits **Frank**

Jerry Frank shared a progress update on blind audits. The report for FY21 is being wrapped up, just waiting on a few labs that need to review data that is not in line with cohort. Overall things looked good. They are starting to see better agreement on chlorophyll for the second report in a row. Hope to get the report out to everyone in the next week, and the next round of samples will be sent out in 3rd week of October. Jerry stated that for those who don't do the full suite of parameters, if they're interested in expanding the tests they usually do for the study they should let Jerry know so he can include those samples in the next round.

Mike Mallonee noted that Mike has been working with CBP team on an update to DUET, which would be version 5.0. This shouldn't necessitate changes to data providers upload files - it's just updating the technology and moving away from stored procedures they have for checks and hardcoding things. In a month or two Mike will ask some of the data providers to look at the new QA report they're developing which will be more informative than the current one. The update will be released early next year.

2:45 Topics for Next DI Meeting **All**

Next meeting will be in January on the week of the 20th although depending on the mainstem cruises.

Participants:

Heather Wright, Amy Goldfischer, Cindy Johnson, Rachael Pan, Jay Armstrong, Elizabeth Ward, Cynthia Stevenson, Keri Maull, Durga Ghosh, Jaclyn Mantell, In Ji, Peter Tango, Jerry Frank, Doug Chambers, Jesse Iliff, Barbara Johnson, Nancy Sullivan, Kathy Knowles, Mike Mallonee, Michael Mueller, Caroline Donovan, Suzanne Doughten, Keith Eshleman, Doug Moyer, Cody Madison, Kelly Crock, Carl Friedrichs, Tammy Zimmerman, Cynthia Caporale, Kim Blodnikar, Pam Higgins, Kyle Kessler