Fall 2021 NOS Minutes

November 1, 2021. 14:30 – 18:00 EDT.

Introduction (Winston Luke)

Motions:

1) Motion to nominate Mike McHale (USGS) to NOS secretary. Motion by Winston Luke. Seconded by Melissa Puchalski. Mike McHale has been nominated as the NOS Secretary.
2) Direct the Program Office to cease testing of the KJJ sampler and sell the prototype. Motion by Chris Rogers. Second by Richard Tanabe. The motion carries.

QAAG Update: QA and Data Quality Objectives. Camille and Martin.

- AMoN Field QC Samples and Proposed Reduction
  - 2020 AMoN Field duplicates – 361 sets
  - Excellent precision; over 95% of duplicates have Absolute Difference < 0.25 ug/m3 NH3 or ~ 0.125 mg/L NH4
  - More than 95% were below travel blank requirement; very low actual difference between duplicates
  - Travel blanks; over 10,000 during the entire network history.
  - Travel blank trends have been decreasing over the years, especially during the last three years
  - Been performing 500 travel blanks/year for 100-110 sites
  - Propose reducing QC travel blanks; save $10k/year while retain travel blank confidence
    - Have demonstrated excellent cleanliness of field QC for > 3 years and downward trend for >7 years (great precision and low background)
    - Previous WSLH Field QC: had ~3-4 duplicate sets and 5-6 travel blanks per site/year
    - New plan WSLH Field QC: minimum of 3 duplicate sets and 3 travel blanks per site/year (mainly a reduction of travel blanks)
    - Sites can pay extra for duplicates or travel blanks at much higher frequency (i.e., Canadian sites get travel blanks every deployment)
    - Savings:
      - Capacity for 10 new AMoN sites w/o changes to equipment or staff
      - ~$10,000 in supplies per year
      - Save staff preparation and data review time
    - Will still provide well distributed QC across the network through both spatial and seasonal distribution by sending to all sites and spreading over different seasons
    - Review of past AMoN Field QC analysis was performed with Greg Wetherbee, David Gay, and Melissa Puchalski
      - Unclear where original travel blank criteria came from
      - Greg Wetherbee showed statistics that AMoN needs 100 duplicates per year to determine the standard deviation within 10% over 95% confidence.

- The proposed plan will provide 300 duplicates per year.
- The 99th % of 2019 Travel Blank NH4 concentrations is 0.09 mg/L NH4 – similar to the Network Detection Level (0.08 mg/L)
    - 99% travel blanks < 0.1 mg/L NH4 or ~0.2 ug/m3 NH3

- Criteria for field duplicates:
    - Propose field duplicate criteria: 90% of valid field duplicates must have an absolute difference of less than 0.1 mg/L NH4. (< 99% travel blank concentration) and assessed quarterly
    - Duplicate absolute difference over 0.1 mg/L NH4 will be summarized on a per site and seasonal basis to identify trends
    - Note, more than 90% of deployed samples measure above 0.1 mg/L NH4
- Criteria for travel blanks (historical 0.2 mg/L NH4):
    - Propose DQI:
        - 90% of valid travel blank concentrations must be 0.1 mg/L NH4
        - Travel blanks > 0.1 mg/L NH4 will be summarized on a per site and seasonal basis to identify specific trends
    - If criteria are exceeded, the lab will investigate, take corrective action, and may increase frequency/distribution of Field QC samples
- **Motion to reduce field QC to 3 duplicates/3 travel blanks per site using these DQIs was approved by QAAG on 10/19/2021**

- New Approach to Qualifying NADP Data on Web
    - Current Situation:
        - NTN data are presented as Valid or Invalid - only notes codes are presented for invalid samples. Currently "val code" denotes sample type as 'wet', 'wet-dilute'. This doesn't tell you anything about what kind of qualifying was done to that sample causing it to be invalid; it's basically a sample type. It doesn't tell you anything about the data, besides the volume of the sample.
            - A lot of work in the program or in the CAL in house to determine the quality ratings of A and B and C. That's just part of the job with coding the data with the analysis and tracked and determined to be A, B, or C but at the end of the day are only presented as valid or invalid.
            - Main change here – is to provide all the sample qualifiers (continue to designate valid or invalid), but the valid B samples have qualifiers will pass this information to the website so everyone can see these data
        - NTN samples with a quality rating (QR) of A and B are valid with no notes codes
            - B samples have notes codes (qualifiers) due to a variety of issues that imply some uncertainty in the result, but these notes codes are not on the website's data
        - NTN samples with a QR of C = invalid
            - C-coded samples are displayed with notes codes that help explain the invalidation of the result
        - Goals:
            - Provide all sample qualifiers (i.e., notes codes or flags) for both valid and invalid NTN samples on the website's data

        - Make all networks consistent
    - AMoN data are different, they have quality ratings of A, B, or C with notes codes provided for all samples
        - Also, there's replicate QR and notes codes.
        - Propose valid or invalid instead of A, B, or C – so the QR code would not be shown any more; but would continue to show the notes codes.
        - Make consistent with other networks
    - MDN: presented with QR as A, B, or C and with notes codes.
        - MDN would also move to valid or invalid and report notes codes
    - There was a motion approved by QAAG to only report valid or invalid on the website for all networks; also including the notes codes.
- Field deployment times and field/lab hold times.
    - Decided to look at hold times because mercury sample field hold times were much shorter than what was allowed for NTN.
    - Changes proposed:

Network	Preserv.	Prep	Field Deployment Time Flagged	Field Hold Time Flagged Receipt	Lab Hold Time Flagged Analysis
NTN	4-6°C (at lab)	Filtration	>8 days, 2 hours = QRC	>16 days after off date = QRB >60 days after off date = QRC	>30 days from receipt = QRB
AMoN	Frozen (at lab)	Extraction	>15 days = QRB >30 days = QRC	>30 days after off date = QRB >60 days after off date = QRC	>30 days from receipt = QRB
MDN	1% HCl (in field)	Oxidation/Distillation	>8 days, 2 hours = QRB >15 days = QRC	>16 days after off date = QRB >60 days after off date = QRC	>60 days from bromination = QRB

    - Changes to Field Deployment and Lab/Hold Time Flagging were approved by QAAG
- QA Documents.
    - All 2020 and 2019 QAR documents are finished and uploaded to the NADP website. QMP has been reviewed, but still needs additional edits.
        - Motion to approve 3 QARs and QMP after minor edits – Approved by QAAG
        - All QARs revised and posted on the new website now
    - Changing review schedule.
        - External QA review happened in September 2021
        - Propose future NADP Lab and Program Office review together going forward because there was overlap between Laboratory and Program Office work. Program Office review in 2022

        - Laboratory/Program Office review in Year 3 (2024)
        - Combine external review into one period – spend less money and overall reduce the time commitment of volunteers to perform the lab/PO review.
        - In years of no external review, the internal WSLH lab review will proceed as normal with an additional PO audit component
        - This was approved by QAAG
- Lab QC Occurrences 2021.
    - Take note of any recurring or significant problems observed within the system called the occurrence management system. Any time there's a recurring or significant problem that could affect the samples, we put it into this system. We review them regularly with staff so they're rare and this helps us to document and go back and follow up with different issues.
        - pH probe issues – cord malfunction, standard carryover
        - Total Hg blank issues – reagent reaction causing high background
        - MDN methyl Hg instrument (over) issues – power related?
        - MDN methyl aliquoting issue – minor LIMS miscalculation due to volume removal
        - ICP internal standard/drift issues – resolved by extensive preventative maintenance and acid rinse
        - NTN filter blank exceedances – contaminated apparatus
        - FLID contamination – lids are notorious for issues, but linked this to Henry Mall construction – Ca, Cl, K; not enough cleaning of the bench tops
        - MDN reports to site sent out blank to some sites – resent to sites, now PDFs spot checked before sending
- Data Quality Objectives (DQO) Initiative.
    - Systematic planning process for efficiently generating environmental data sufficient for an intended use. Set expectations: effort, costs, and outcomes. Define tolerable error/uncertainty rates and decision risks. Establish data quality objective goals.
    - Options (in lieu of formal DQO process)
        - Enhanced use of existing field-based and inter-laboratory data quality indicators. Re-imagining of protocols outlined in the 2007 NADP DQO document (Data Quality Objectives for the NADP)
        - Development of new data quality metrics
        - Detailed assessment of the sources of uncertainty – (using either existing data or limited new evaluations)
        - Evaluation and reporting of uncertainties on all NADP data products
        - <u>Want a robust data product with a well-defined error term.</u>
    - MQO/DQIs
        - Comparability
        - Completeness
        - Representativeness
        - Sensitivity
        - Uncertainty
            - Precision
            - Bias

- Brief history of DQO at NADP, document drafted in 2007, but not ratified. DQOs re-emerged in 2013, but consensus was 2007 process was overly complex.
    - In 2015, Gary Lear examined data completeness criteria in great detail – an exceptional study
- DQO Core Work group consisting of Camille Danielson, Martin Shafer, Marcus Stewart, Greg Wetherbee, and Chris Worley
    - Survey to 40 scientists sent; results were mixed, small core DQO workgroup is working on specific areas to move forward. There was a DQO virtual summit in January 2021.
- Proposed DQO workgroups: trend measurements, data completeness, deposition/precipitation, overall network uncertainties, parsed/component network uncertainties.

Group Discussions:

Greg Wetherbee: There were many motions from QAAG that were put forward. Do these motions need to be ratified here in NOS or do we think that the executive committee can accept the report from NOS?

David Gay: QAAG reports directly to Exec, there's no reason why they can't send motions directly.

Mark Olson: Camille is going to go over the motions tomorrow and in Joint and in her subcommittee reports, so I think that's the proper place.

Camille Danielson: I wanted you to know that they will be one-sentence (motions), tomorrow, so I wanted to you guys to have a background on all of them so that you understand what we're doing. Tomorrow there will be five motions.

Greg Wetherbee: Ok, that sounds good to me if we're going to present tomorrow in Joint and then approve in Joint. That sounds appropriate. This is a big deal because for years we've had these QR codes that people have been using in evaluating their data. Can you show the motions now?

David Gay: Is NTN the model that you're proposing for all networks?

Camille Danielson: Sort of, except NTN hasn't given any of the qualifying notes codes for the B QR codes. So only if it's invalid does it get any qualifier, so that's part of my frustration is that we're working hard to tell you when there's a B sample (with some uncertainty), but those flags/ notes codes are not transferred over to the website for NTN now, so we want to add that. But otherwise, all three networks would be the same valid/invalid and all notes codes for each sample provided. We do not want to cause any issue to researchers so you You can try to determine if there is a problem that would affect your research.

David Gay: Just so I'm understanding, QAAG is proposing that each data set would have three separate variables, a valid variable, an invalid variable, and then a notes value.

Camille Danielson: Probably the easiest. I don't know how Bob was going to do it exactly, but he said it should be easy on the new website

Martin Shafer: But it would be just valid or invalid being one column and then there would be a column or a listing of the notes codes.

David Gay: That's my question, did QAAG say one way or the other?

Camille Danielson: No, we didn't talk about how it was going to be presented.

Bob Larson: What I thought would be easiest to do is to have a single variable that's validity, and could be V or not; like the old system did, you'd have the notes code so it would all be captured in two variables.

David Gay: Right, and that would be my preference and the only thing I would add to that would be that if there are no flags that some mark be put in that variable space. You know, like a star, a period, or an end for a non or something called star. I'm trying to think of this like a programmer and I think that blank variables lead to problems. So it would be valid/invalid "A" "F" 1 0 or something like that. Would be a variable, one of two answers, and then a notes code, but I would fill in the notes code with something if there's no notes. A period or negative nine.

Greg Wetherbee: I think another important detail to add as a friendly amendment to this motion might be to have Bob and David discuss how long this might take. I would say we need to establish a due date.

Bob Larson: I would say the major change would be from going from ABC to valid or invalid. And that's going to be pretty straightforward. There may be a bit of a workload in the LIMS system.

Greg Wetherbee: I want this to go on record that we're not getting rid of the QR codes, so when we go back, we'll still be able to look at the QR codes if we need to in the future.

Camille Danielson: It will still be part of the process on the lab data review side, it just won't be shown on the website is my understanding.

Greg Wetherbee: Oh, so it's not going to save you any work in trying to determine between A's and Bs.

Martin Shafer: Most of that is hard coded at this point I think.

Camille Danielson: No, it's not going to save work, but it's going to get all the qualifying information to the end user for all samples – not just the invalid samples. And people will more clearly know that the data are valid or invalid and if there is significant uncertainty for a valid sample (QR B).

Greg Wetherbee: Ok, that all sounds good.

David Gay: One more question, are we talking about all data or all data going forward?

Camille Danielson: I think this would be for data going forward - I don't know how we would do that retroactively.

Chris Rogers: I think it should be all data. If the idea is to have one system through 2021, it's going to then change into something else.

Camille Danielson: Well, that might be a much bigger workload.

David Gay: Maybe the way to go forward on this is for NOS to make a motion and pass it and if it passes, to clarify how they would like to see this done.

Martin Shafer: It would make the most sense to have all data.

Greg Wetherbee: I agree. But maybe you could pick a date for moving forward, and then another date to retrofit all the historic data.

Bob Larson: I think we need to give users advance warning that we're going to make a major change and not just throw this out there.

David Gay: I was going to basically say the same thing.

Zac Najacht: I wanted to let everybody know that the QR codes aren't going away for review or for preliminary reports that go to the sites. So the operators who are used to seeing A, B, and C are still going to be seeing A, B, and C and this is for website data only.

Martin Shafer: Data users will be able to see the notes codes associated with the data and all the notes codes that leads to greater transparency for the user.

Winston Luke: This is a critical item to discuss, should we consider follow-up tomorrow in Joint overflow.

Mike McHale: As a data user, I'm much in favor of flagging all of the data instead of only the most recent data. It would make a difference to me whether or not it applied to all data or just data moving forward as to which way I would vote. I would be much in favor of all data otherwise this would be confusing.

Winston: Let's table this discussion for now.

Network Equipment Depot and Equipment Testing. Mark Olson, Dana Grabowski, Wyatt Sherlock, and Richard Tanabe.

- New hire in the NED, Wyatt Sherlock, worked for CAL at U-Illinois. Ran the Bondville site (IL11), which was our Eagle Heights testing site. Ran a Tekran speciation system and a MARGA. Hired for a 3-month term, then extended to 24-month term.
- Gage, NTN, and MDN samplers: WI93, 93WI, EX93.
- Have upgraded all Belforts with egages, except: MI99, WA03, OK17, MS19, and TN19. Told site operators that support for Belfort will end in 2022.
- NADP Collector history: AeorChem goes back to 1978.
    - Modified in 1996 for MDN
    - NCon sampler evaluated in 2008 and approved in Oct 2010
    - AeroChem closed, Loda picked up assembly, shutdown
    - Anderson designed a similar rain gage with two buckets, sold to Tisch, sold to KJJ

- NCon is the only NADP approved NTN or MDN sampler available
- KJJ was evaluated for use in the NTN network
- KJJ collector evaluation:
    - Advantages: linear actuator for motor, cycle count meter, exposure hour meter, wet/dry side toggle
    - Disadvantages: improper lid seal, open cell foam; no manual provided; grid sensor (birds love it – bird guano makes continuity).
- KJJ to NCon Exposure. June through August 2021.
    - KJJ has more exposure resulting in 17 more hours than the NCon over 3 month sample period.
    - Vast differences between collector cycles. KJJ had 26,000+ more cycles than NCon.
    - Found that during light rain events, the KJJ will cycle open and close very frequently, but provide very limited exposure hours.
    - 11 out of 19 samples would have been invalidated due to dry exposure
- KJJ grid sensor testing
    - Birds love the KJJ sensor (warm their feet on it?).
    - Added a bird deterrent, did not help.
    - Would like to cease KJJ testing and replace with PFAS Hi-Vol sampler
    - May end up selling the KJJ on the open market.
- Sensor styles. Grid sensor must stay above freezing until wet.
    - KJJ – 6/8 grid sensor. PO "does not pass Muster"
    - NTN AeroChem 7 Grid sensor.
    - MDN AeroChem 11 Grid sensor.
        - NADP knew 11 grid sensor would be better than NTN's 7-grid sensor, but didn't want a shift in the data, so NTN remained with 7-grid sensor
    - NCon Theis sensor. IR activated, the best of the bunch.
- Thies (NCon), AeroChem, and KJJ comparison – May to October 2021 at WI93
    - KJJ sensor opens too many times. Looking at June 1-15 cycles.
    - Theis sensor (main WI93 NTN collector) = blue; 93WI = orange
    - Theis sensor is more sensitive than the E-gage (rain gage) grid sensor.
- AeroChem sensors and motorboxes.
    - Out of 125 AeroChem collectors in NTN (50%), about 40 AeroChem collectors in the MDN.
    - In 2019 replaced 67 (40%) of sensors and 86 (52%) motorboxes.
    - In 2020, replaced 56 sensors and 71 motorboxes.
    - Through October 2021, 42 sensors and 64 motorboxes; seasonal demand, highest in cold weather – when operators see their sensors covered and not melting snow
    - Some collectors are 40+ years old
    - AeroChem collectors will be around for a long time
- Step 1. Need to improve the grid sensors.
    - Need to improve sensor to decrease number of missed samples due to equipment failures – getting about half a season out of these sensors
    - Reused arms and grids from old sensors
    - In process of upgrading 100 sensors

- Improved Grid Sensor Board
    - Identical size as old circuit boards
    - Solid state surface mount components
    - Molex ® connectors for plug and play replacement
    - Single potentiometer for wet exposure adjustment
    - Waterproof coating
- Grid Sensor Boxes, Plates and Heaters
    - CNC milled Delrin.
    - Machined plates.
    - Custom adhesive heaters.
    - Quantity of 100 components.
- Upgraded sensor performance 7 Grid: 7 Grid (old vs new) – Eagle Heights 93WI
    - Upgraded one performs a little better than older style.
    - Newer style averages much warmer temperatures; maintains about 10 degrees F warmer than standard (old) ACM while dry
- Step 2. AeroChem motorboxes.
    - New circuit box board prototype.
    - New circuit board.
    - Improved clutch design.
    - Working towards using a linear actuator.
    - Continue to have Mech Eng students modify AeroChem for linear actuator – Capstone Project
    - Hope to finish by end of school year.

Group Discussions:
Tim Sharac: Seeing that the upgraded sensor operates at a higher temperature, will this upgraded sensor use more electricity?

Mark Olson: Have not done a power consumption study, but should be more efficient than older sensors.

Greg Wetherbee: Is there a plan to move forward with this to refurbish sensors as they come back and send them out into the network?

Mark Olson: We need to continue to do some testing, but the problem we're seeing is that the sensors are lasting for half a season. So every time a sensor fails, we lose two weeks of samples so we're trying to reduce the frequency of missed samples, but we continue to do testing.

Greg Wetherbee: If this upgraded sensor is operating at a different temperature and if it runs a little differently, do you think this sensor is opening sooner?

Mark Olson: I think what we've done is tried to reduce the gap between the plate and the grid so I don't think it's opening sooner, but I think we can get it to close sooner by playing with the temperature, the high temperature setting.

Greg Wetherbee: I'm wondering if this will impart any bias in the chemistry and if you don't do a collocated study to know how to determine that there was no difference in the variability between two collocated collectors with the old seven grid and the new seven grid, which is what the collocated program did for years. So, if there's going to be a shift, it should be quantified. Theoretically there shouldn't be a shift. But it seems like you need collocated data here to make sure you're not imparting some sort of shift in the data by putting out a new sensor. Normally quite a process to approve a new sensor like we did with the Theis sensor, so you're basically putting out a third sensor for us.

Mark Olson: We can make this sensor perform as poorly as the old NTN seven grid sensor and we can reproduce that data or we can make it closer to the Theis sensor or the 11 grid sensor; but we needed to do something to address the high failure rate.

Greg Wetherbee: I'm not suggesting we want the sensor to perform as badly as the old version, I'm saying we need to quantify this difference.

Mark Olson: I agree with you, we need to quantify this difference. But do we track when a site changes from an AeroChem to an NCon? Because there's definitely a step function change there. And this step-function change will be much greater than any grid to grid sensor change of any style.

Greg Wetherbee: We should. Back in 2010 or so, we asked for a tracking table to be put on the website which hasn't happened yet, even though we approved it in NOS. [It was supposed to] show all the different changes we made to the network. We should be tracking these changes at each site. The reason we don't need to do a study on AeroChem is because I published a paper in Environmental Pollution that documents and quantifies the shift and bias back in 2017. I want to make sure we're not putting out another sensor that may put more variability in the network. TDep and CLAD make maps and make decisions with these data and there's variability and bias and no one pays attention to it.

Chat:
Greg Wetherbee: By the way, while I applaud us doing more testing, I've published USGS QA Reports comparing these sensors for years and a paper in Environmental Pollution (2017) that quantifies the bias in the chemical concentrations due to these sensors. See USGS website and scroll down to 2017: https://bqs.usgs.gov/PCQA/Reports/Bibliography_list.php. When I do a study, I search the literature first to see if someone else has already published on the subject.

Mark Olson: I agree, we have a sensor study going on right now at Eagle Heights that's comparing the two, what we could do is have one of the old sensors for NTN and one of the improved sensors set to the old standards and then have one of the improved sensors said to the higher temperature.

Richard Tanabe: We can continue to keep replacing 60-70 sensors a year and keep rebuilding them. They're failing and now you're running into undefined samples because they're

invalidating data because they're sitting there in an open state and not closing. Based on one of Mark's slides, we saw that there's three different configurations of the 11-grid sensors, there's three different configurations of the board that's in there. Different components - so it's not like every sensor and every grid was exactly the same.

Greg Wetherbee: How much is it to retrofit a sensor?

Mark Olson: Around $100 total. But this is probably less manpower in the end to continue testing, taking these boards out, test components, and redo a new one.

Greg Wetherbee: I understand that if it's a non-line power, you need to have a grid sensor, but if you have AC power, why not suggest that they buy a Theis sensor? I know they are $600 rather than $100, but we have that sensor in the network, already established. That is a better sensor. Why not upgrade the site with an approved, better sensor? We know how to run an AeroChem on a Theis sensor, but you have to be on line power.

Chris Rogers: Would like to offer a motion to stop testing the KJJ collector and authorize to sell it.
Motion seconded by Greg Wetherbee.
****Motion to cease testing the KJJ precipitation collector and sell the existing collector****
Motion carries.

Chris Rogers: Would like to add a topic to get some ideas from people in identifying another collector because that issue hasn't gone away. So that's something to talk about.

Impacts of COVID-19 and Extreme Weather Impacts. (Postponed)

Virtual Operator Training and Outreach. Richard Tanabe.

- Improve operator engagement.
  - Address increasing changes in site operators.
  - Virtual session every other month, started in February 2021.
  - Cover a wide range of topics: site support, sampling, equipment, and data products.
  - Do a brief presentation followed up by a Q and A, kind of open forum to whatever topic was so they can ask other questions. Try to have PO/CAL/HAL on the call to answer any questions.
  - Calls are recorded and made available on the website.
  - Reached 1-year of bag sampling.
  - Approximately 50-60 participants per session. In 2022, we'll try moving the days around (Monday = best day for PO, but not the best for site operators).
- Outreach
  - Operator turnover is a continuing challenge. Many sites are good about updating info, but many are not. PO reaches out to new site operators.
  - Created a section on the NADP website, "I'm a New Operator: NADP 101".
  - Richard created a New Operator Welcome Email, includes metadata and many training links.
  - One-on-One training via Zoom, FaceTime, or phone for new and existing operators.

- Operator Recognition Award.
    - PO wants to recognize those operators that go above and beyond. Anyone can nominate an operator. Inaugural award will be announced.

Operator Recognition Award – Francis "Hoss" Parks – Smith Island, MD15 site operator since 1995

- Winston Luke and Richard Artz: nominated Francis "Hoss" Parks for operator recognition award for 25 years of dedicated service.

Siting Criteria Workgroup Update. Tim Sharac.

- Making good progress towards teasing out influences unrelated to siting criteria factors.
- The 2020 EEMS Audit Report shows that NTN and MDN had 19% sites passing siting criteria vs 24% in 2019
    - Earlier work looking at sites with poor data completeness observed many sites with few if any siting criteria violations
    - We've ironed out a process to tease out siting criteria impacts from non-siting factors.
- Next steps include:
    - Evaluate siting criteria pass/fail impact to QR C % with a Chi-square contingency table
    - Identify siting criteria failures that impact data completeness, sample chemistry, and contam codes.
    - Explore how windy sites may benefit from wind shields on the **collector** as needed to improve data completeness at very windy sites.
    - Consider – how to document and explain to data users that real impact from siting criteria violations – do we flag the data as a nonconforming site?

Update on Hg Passive Pilot Study. Sandy Steffen.

- Global Passive Pilot Study
    - Started up again.
    - Network of Networks.
    - Tekran MerPAS ®
    - First year of data have been analyzed (2019-2020)
    - Included as a method in the "Guidance on monitoring of mercury and mercury compounds to support evaluation of the effectiveness of the Minamata Convention"
    - The Guidance document was introduced this morning at the Plenary COP4.1 by Minamata Secretariat
    - 46 sites across 23 counties. Partnering with Toolik, AK; Sequoia and Kings Canyon, CA; Marcell, MN; Mingo National Wildlife Refuge, MT; and Beltsville, MD
- Sampler deployment. Send pail of equipment to each site including 3 samplers (2 samples/1 blank), instructions, mounting equipment, gloves, etc.
    - Samples left out for 3 months:
        - Q1 (Jan, Feb, Mar)
        - Q2 (Apr, May, Jun)
        - Q3 (Jul, Aug, Sep)
        - Q4 (Oct, Nov, Dec)

        - Once sampled, sent to ECCC for analysis.
        - 41 sites have had data analyzed, mostly by Tekran because of COVID-19 disruptions to entering the ECCC lab.
    - Preliminary Global Results: global average 1.32 ng/m3 (SD = 0.26).
        - Highest concentrations observed in Q3 (Jul – Sep) and lowest in Q2 (Apr – Jun)
        - Preliminary data for US sites, data look good. Little error.
        - North American coverage: 1.42 ng/m3 (SD = 0.24).
            - Q1 = highest conc – 1.64 ng/m3 (SD = 0.21)
            - Q3 = lowest conc – 1.33 ng/m3 (SD = 0.15)
        - Next steps: get through backlog of samples. Continue expand monitoring locations. New sites coming: Caribbean, Australia, and South America. Missing Africa, Russia, Asia.
    - Intercomparison with Taiwan sites – 2022 Q1 and Q2. Start an intercomparison with NADP.
    - Will NADP take over these sites?

Group Discussions:

Winston Luke: How much would it cost to operate these units on an annual basis?

Sandy Steffen: Unknown because the first big chunk of analysis was done at Tekran so that's not our normal cost. Shipping was about $5000-6000/year because we ship quarterly? Budgeted around $10k-15k for analysis. Also need to purchase the samplers and replace samples. Unclear, analysis and shipping costs vary. Maybe $30,000 for the entire network/year for 56 sites.

Chris Worley: Saw your MerPas units at about a foot above the ground. What are you doing with that?

Sandy Steffen: This is measuring above the permafrost. Trying to understand the differences between when there's snow there vs when there's no snow in the summer to see emissions of mercury from the permafrost. We generally try to put them at 3M above ground like the Tekran, but people generally put them on top of a roof or fences, so 6-7 feet.

NADP Dry Deposition project updates. Janice Brahney.

- Atmospheric Dust
    - Community routinely measures particles < 10 microns
    - Most dust events have bulk mass > 10 microns; unclear what's in dust
- Dust composition of the American West.
    - Pilot sites at NADP: (ID03, WY06, UT95, UT09, UT99, NV05, AZ03, CA67, CO98, CO10, CO02); expanded to include ID02, MT05, CO15, CO96, NE15, NM07, TX22, AZ03, CA75, and Beaver Mtn.
    - What is dust made of?
        - As expected, a lot of more first organic matter, minerals, pollen, charcoal, bits of bugs, spores, unexpected was plastic and tires.
    - What are regional dust deposition rates? Range from 4-74 g/m2-yr.
        - The highest location is UT09 site which is really a function of the really high deposition rates. Approximately twice as dusty in the last two years.
    - What are atmospheric P loads?

        - TP deposition ranges from 4-60 mg/m2-yr.
        - Highest rates at UT09; though may be inflated due to sampler being on the ground.
    - How available is dust P?
        - 50% of phosphorous deposited was bioavailable.
        - Ranging from 37 – 70% of total P is bioavailable, depending on the season and site
    - How does dust composition vary in space and time?
        - There's a seasonal shift in the pH of dust (lower in Winter)
        - Also seasonal shifts in sodium
        - Strong relationship between elevation and deposition of organic P, bioavailable P, total phosphorous, and organic carbon
    - Can we identify dust sources?
        - Looked at microbial species from different locations
        - N isotopes see more enriched isotopes in winter than in summer.
- Next steps:
    - How does dust deposition/composition vary in space and time?
    - What is dust made out of?
    - How bioavailable is dust P?
    - Can we identify dust sources?

Group Discussions:

Doug Burns: Did you see any wildfire impacts at any of your sites?

Janice Brahney: So, CO98 in the summer of 2020 had had a big fire and close proximity, we collected ash and that dust sample, all the way through the early winter months. So a good six months after the fire ended. And a lot of our sites in California, Utah, Colorado, they all have a fair amount of ash in the past two summers.

Donna Schwede: I think we would be interesting in using this in CMAQ evaluation.

David Gay: Did you say you saw lots of P in charcoal?

Janice Brahney: Yes. So, in our own samples but also with Alex Panetta, we collected wet deposition at several different locations in the summer of 2020, and whenever we had rain intersect smoke plume, there was higher phosphorus concentrations in the rain sample, and it also correlated to the amount of ash that was present in that particular portion of wet deposition. And, we're seeing the same for our dry deposition, which was expected because charcoal tends to have high phosphorus concentrations, and it's easily oxidized in the environment so becomes bioavailable really rapidly.

Greg Wetherbee: What kinds of testing and additional work do you think will be needed to move this sampling protocol forward so that we might consider it for NADP network deployment in the future?

Janice Brahney: I guess that's up to you guys. I know we went through pretty extensive testing early on and we published that paper, and you know I have a PhD student working on the

nutrient loads and the bio availability in these experiments. So, his timeline might not necessarily match your timeline. You know he has a student's timeline. So, it's not going to be as rapid as a contractor timeline, for example. So yeah, we can definitely talk about that, but I think it would be up to you guys to decide whether or not testing was complete.

Greg Wetherbee: I guess, maybe this is something for QAAG to take up next time we meet. We could talk about what kind of analytical protocols we need to look at. For now ,getting to see who would do this kind of an analysis. Would it be Utah State? Would it be the CAL? You know, we need to also think about customers, and who would pay for this kind of monitoring, also the logistics of creating the dry side inserts getting those made and then shipping them for deployment. I mean, it is a lot that will go into thinking about this as a potential network. So I'm not suggesting this is something that happens overnight, but I think that once the paper is published, we need to be thinking about how we should deploy this as a network, and I think all the answers are Yes, we should. And. I think that there's got to be a way that we can come up with to make it happen. So, I think that that's kind of the next step after we see your results actually published.

Motion to Nominate the next NOS secretary

Winston Luke proposes a motion to nominate Mike McHale (USGS) to NOS secretary. Seconded by Melissa Puchalski. 35 respondents out of 50, all responding in the affirmative.

Mike McHale has been nominated as the NOS Secretary.

Hg Litterfall 12-point plan. Doug Burns.

- Giving the 12-point plan a lot of thought.
  - Been working with MELD and Colleen Flanagan to get the 12-point plan for the mercury litterfall network in the final form.
  - Wanted to mention a few things that need to be resolved by NOS
    - Data quality criteria – valid/invalid. Can apply to deposition and concentration.
    - USGS published data in summarized form – how will data be published by HAL/PO? (should these USGS data be posted to NADP website?)
    - Individual reports to site sponsors?
    - How to make old data available?
    - How to include litterfall data in annual report?
  - The network has been approved as permanent and so it's sort of handed off to the mercury lab and to the PO to deal with.

Group Discussions:

Richard Tanabe: What I think you were starting down the road on was trying to make the 12-point plan meet with the network, and you're right, the 12-point plan is what is needed to be approved to get an initiative going. And that's been done, and was accepted. We're at the point where it's an accepted network. But I wouldn't change the original 12-point plan.

Richard Tanabe: As far as your question about the data - So right now, on the website, we do have a link to the USGS data for 2007 to 2009 and 2012 to 2015.

Doug Burns: I have some updated links I could share with you.

Greg Wetherbee: I think there's a quality assurance plan that needs to be done for the network at some point and that the 12-point plan is a great basis for that document.

Doug Burns: There are things that can be addressed down the road. Daniel Obrist suggested that the network should collect litterfall year-round (which might not be practical) instead of for two to three months in the fall, but that should be explored.

Greg Wetherbee: Sandy Steffan did do sample exchanges between those two laboratories to see how these data compare for an added quality control practice - an interlaboratory comparison.

Martin Shafer: We did that as part of the validation study and an ongoing program would be helpful; did with USGS-Middleton with John DeWilde.

Greg Wetherbee: As far as what to do with the data, that's up to the site sponsor. Since these data are well down the road, maybe you just publish in the annual report every year and make sure the site sponsors get that annual report.

Doug Burns: Marty Risch had a tradition of giving each site an individual report as a way to make the site sponsors happy with their investment. Fairly straightforward produced in Excel.

Mark Olson: We sent those out for last year's data. So, they were individual site reports.

Doug Burns: Marty's peak was 27 or 28 sites, but we're not up to that yet.

David Gay: Beth Boyer had 10 sites in Pennsylvania.

Greg Wetherbee: Mike McHale and I are going to reach out to David Gilligan in the near future, who gave a great presentation in the symposium about monitoring. Looking at ecological observation sites. This fits in with ecological monitoring, phenological monitoring, and tying in with other approaches.

Group Discussion - Everyone

<u>Spring 2021 NOS Minutes</u>

Minutes were not sent out for a vote yet. Will send out the minutes tonight and we can vote on it tomorrow afternoon in Joint.

<u>Extreme weather update – Richard Tanabe</u>

MT95 – Northern Cheyenne tribe. NTN collector was destroyed by a wildfire.

AeroChem Rebuild – Mike McHale

Right now there's one manufacturer for the NCON and it sounds challenging to find another manufacturer. Wondering if you see using the AeroChem rebuilds as a viable second source and do we need to keep looking for another supplier for the AeroChem? Do you see yourself keeping these old units going into the future and for how long?

Mark Olson: What we do with the old AeroChems is we cannibalize them for parts to keep the others going. And when people upgrade to NCONs; not sure we can put a date, but we can keep them going for the next five or 10 years probably. We can still find motors and things like that so we're good at rebuilding them. But not comfortable in the Program Office only having one supplier being NCON. Got a bunch of texts to convert the KJJ sampler with other sensors to make them NADP-worthy. Unclear whether KJJ would be willing to modify their sampler. For the near future, we're comfortable getting these AeroChems going.

Richard Tanabe: Working with a student and his capstone project with a linear actuator was approved to retrofit the AeroChems, but not sure what happened with that.

Martin Shafer: Maybe we could talk with KJJ about improving their sampler.

Richard Tanabe: From talking with the KJJ guys, he says that Tisch marks up the costs and they buy it off of him. So, I wouldn't bother talking with Tisch; but he charged $250 for a shipping case. I had sent him an AeroChem sensor and asked if he could incorporate this sensor, and he said no.

David Gay: There is another collector out there in Taiwan. It's manufactured like an MICB. But it's a company that's still making them.

Mark Olson: We did test those a long time ago, but they failed due to splash.

David Gay: There is splash, but it wouldn't be difficult to put a bucket in the bay.

Richard Tanabe: There was another one-man shop, but the delivery date kept being pushed back farther and farther – out 6 months – so they cancelled the contract.

Chris Rogers: How many units were made for CAPMON?

Jason O'Brien: Yes, they did fulfill the order for CAPMON, 30 units, but we did have some issues with the collectors. I can follow up to discuss those issues with the collectors.

Greg Wetherbee: Worried about all our eggs in this basket with NCON. Is there a patent?

David Gay: All the parts are available off the shelf.

Richard Tanabe: I've talked with Kevin Hartley – reached out about 6 months ago to talk about improvements to the NCON. Wanted to know how we can change without impacting the actual operation of the collector.

David Gay: They're younger than me, I don't think they're going away anytime soon.

Greg Wetherbee: We want a second company to build these, but these have always been built by a Mom and Pop. I think as long as NCON doesn't change the sensor, that's 95% of the game. If they built a motor that opened the lid faster, you might have impacts to the concentration, but unclear whether this would be a higher concentration or impacts to rain splash. We have to use collocated sampling to test the differences in the chemistry. It's all dependent on the sensor.

David Gay: We're faced with keeping these sites running with very old technology. So we've got to have some flexibility.

Greg Wetherbee: If we had AeroChems, I would want to replace the sensors with Theis sensors if I could. But doesn't work with all sites because they're not on line power, so with solar sites you're stuck. But for the rest, they should be replaced with Theis sensors.

Martin Shafer: Back to the collector, maybe the university lab could help build if they held the blueprints or patents rather than a commercial company.

David Gay: Not a bad idea to have the machine shop as a second, reasonable option.

Greg Wetherbee: I suggest if we're going to throw sensors out there, they be tested to see what kind of effect they might have on the chemistry.

David Gay: I was going to suggest earlier that NOS make a motion or kick it to Exec and make a choice for what they would like to see.

Greg Wetherbee: In our peer-reviewed USGS report in 2017, there were a number of events where the MDN 11-grid sensor opened first, bound to get first flush. Typically the 7-grid sensor closed first. Each of these sensors has its own issue with the chemistry. With the 7-grid sensor, you get a lot more cycling. And there's big differences with exposure especially with snow. Typically AeroChem concentrations are lower than NCON. Impacted calcium concentrations, but not pH. There's a shift in the data when you switch out the collector so that information should be logged.

Chris Rogers: It's our job to set out action items for what we want to accomplish before the Spring meeting. I think the test site is set up for what we needed to do, but what do we need to see and do we want to try to improve before the spring meeting? We need some kind of timeline for when we start putting this sensor in the field.

Mark Olson: I didn't present a timeline. 40% of the sites have sensor failures every year. Roughly 75% of those failures happen in the winter. It's the Program Office's obligation to keep this equipment running as best we can.

Chris Rogers: Can we use what Greg W. found in his 2017 study to say how these sensors may impact the chemistry? Then we already know the results. This makes more sense than going through the boards and trying to pick out one that's going to work.

David Gay: By Day-X, we start putting this upgraded sensor into the field. In the next two or three weeks we put one of these new ones vs the old ones at Eagle Heights. Then maybe in 3

months, we start moving these updated sensors into the field and see if there's a step function change.

Maria Jones. Not all sensors with the same number of grids act in the same way. There's significant variability within approved sensors in the field, unlikely to be able to determine difference between new vs old sensors.

Mark Olson: I agree with Maria, these sensors vary in his testing in his house. None of these sensors respond in the same way.

Maria Jones: We plot these data, but we don't distinguish between MDN and NTN, but we put these together into the annual report.

Richard Tanabe: One of the big things is that we're using 2021 components that are available that are replacing components from 1980, some of these are hard to get.

Chris Rogers: We need a motion to present to Joint tomorrow.

Mark Olson: Richard Tanabe and I will develop a motion for sharing in Joint.

Greg Wetherbee: This sounds great. It would need to have a collocated testing component that David Gay talked about and the justification for a consistent sensor. And need to look at the network; look at the sites with 7-sensor on line power and see if they can upgrade to the Theis sensor. And if it's a solar-powered sensor, then we need to go to the new sensor.

David Gay: Would propose to sites with the 7-grid sensor that they move to Theis sensor because we can't fix the other ones anymore.

Richard Tanabe: I will look up all of our sites to see what the impact would be to each agency and do a breakdown whether it's a university or it's Feds. Then see what the cost would be, aside from just the Theis sensor.

Mark Olson: Does the $600 include the arm and everything or just the sensor?

Richard Tanabe: $600 is for just the sensor.

Mark Olson: Probably another $200 into the arm.

Chat:

Eric Hebert: Richard - did you recommend changing the square shaft to a spline shaft for the lid arms?

Mark Olson: Do we want to make a better sensor or one that is the same as 1978/1996?

Richard Tanabe: Eric, I haven't met with him yet, but open to suggestions to bring to the table

Mark Olson: We can make it operate the same as before if that's what we want but why not try to improve the data?

Andrea Blakesley: Greg - didn't you also talk about regionally-specific potential correction factors in that paper? Collocation studies could give future researchers the opportunity to address data shifts if they choose to.

Maria Jones: not all of the same grid sensors work the same. They are all over the place when we audit them.

Camille Danielson: not sure the study will be conclusive in light of what maria is saying

Camille Danielson: it is a more sustainable plan -- We can't sustain the old sensors even if they are better.

Eric Hebert: Agreed, and consider adding a pot to adjust the lower temperature as well so we don't evaporate light snow.

Martin Shafer: Both options, Theis and upgraded 7-grid should be part of the solution moving forward.

John Walker: Good idea, Richard

David Gay makes a motion to adjoin.

Motion to adjoin was seconded by Chris Rogers.

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