National Atmospheric Deposition Program Joint Subcommittee Meeting

Brown Hotel, Louisville, Kentucky

Tuesday April 25, 2017

08:03 - Welcome and Introductions, Greg Wetherbee, USGS: Approximately 50 in attendance

08:15 - Approval of Fall 2016 Joint Minutes (Santa Fe, NM) – Greg Wetherbee

Motion: Mark Rhodes, Second: Pam Padgett, Approved unanimously

8:20 - State of the NADP – David Gay

NTN has 270 sites. Since the last meeting, NTN lost four sites in Fl, AL, and GA that were sponsored by Southern Company; gained 5 in Colorado: CO6, CO11, CO85, CO86, CO87. New Colorado site - CO84 is expected to come online soon. NTN is in good shape.

AIRMON: no changes in sites. Ariel Stein has stepped in as the new NOAA representative to the EC and technical lead on AIRMON with the retirement of Rick Artz.

MDN continues to be turbulent with 105 sites. MDN lost seven sites: five in the southeastern U.S. (also previously sponsored by Southern Company) and two in Canada. One site restarted in Alaska, AK02, in January. Other new MDN sites are expected in Cleveland, OH (summer) and Alaska: Nome/Kotzebue, Toolik Field Station, Kodiak Island (pending permit). A large spatial gap in MDN in the west remains, resulting in an incomplete national picture of annual mercury wet deposition. The gaps in the western portion of the mercury concentration and deposition maps is due to the recent loss of three sites in ID, two in NV, two in NM, one in AZ, and two in OR.

AMON: 105 sites currently operating. Two sites were added in Canada (SK27, SK28). Three sites were lost: two in Ontario, Canada, one in Georgia. AMoN remains stable.

AMNet: 23 sites in the network. One site added since the last meeting. Because of the shutdown of the ARA/Southern Company sites, at least three Tekran systems became available and were acquired by the PO. These donated systems are now available for interested groups to establish AMNet sites. PO has received equipment request from the Leach Lake Band of Ojibwa in MN with a plan to start a new site in June. Boston University/MIT are considering establishing an urban mercury site and are potentially interested in borrowing the mercury equipment. Tekran 2537 is at Bondville, with speciation (1130, 1135) to be added in the future.

Litterfall Initiative: USGS initiated litterfall mercury monitoring at 19 sites in 2012 as part of a 5-year pilot program. This year marks the end of the 5-year data collection period, leaving the EC

at a decision point regarding the future of this effort. Three options: 1) cease data collection as a NADP initiative; 2) continue data collection in a pilot network mode; 3) formally add litterfall to NADP as a new subnetwork. Chris Rogers, chair of the ad hoc review committee, will discuss these options later in the Joint Meeting after the litterfall update from Marty Risch.

Trouble Ticket System – Tom Bergerhouse and Roger Claybrooke completed a trouble ticket system which is now operating at the PO. The online system tracks all reported issues received from phone, email, and others.

Talks and Travel - AMNet Interest Meeting, Japan -Nov 28-Dec 2, 2016; Exploring the potential to help establish a Tekran-based AMNet network in Asia; Measurement Model Fusion Workshop February, 2017 (WMO-Geneva) - TDEP-like effort on larger scales and different continents; WAIM/WADE-IN Workshop, March 8, Reston VA; U.S. EPA Region 4 Air Monitoring Workshop with booth, Athens, GA, Mar 21-23, 2017; Tribal Mercury Workshop, EPA Region 5 - One day workshop on tribal efforts on mercury; Upcoming National Tribal Forum Tucson, AZ May 1-4. Primary objective will be to raise awareness and support to address MDN gaps in the west.

40th anniversary of NADP – For the upcoming milestone, the PO would like to create a celebratory poster and is seeking input on three versions. Others are also welcome to submit their own ideas for how to acknowledge NADP's accomplishments over the past four decades.

Robert Watts has been running KY22 NTN site for 29.5 years. He is a stellar site operator and was also nominated for the NWS Thomas Jefferson Award - the highest and most prestigious award for cooperative weather observers.

08:45 CAL Report – Chris Lehmann

A detailed CAL report is available online at http://go.illinois.edu/NADPcalreport. 425,917 NTN samples analyzed. 31,783 AIRMON samples. 13,210 AMoN samples analyzed. In 2016, the CAL had the highest sample count in its history – 17,204.

Lab Operations: Automated pH measurement instrument was commissioned in January 2017.

New Total N instrument: CAL received a new FIA automated colorimeter (Hach Lachat QuickChem 8500 Series 2) for analysis of total dissolved N in precipitation samples. It is equipped with an in-line sample prep module for digestion of total N and total P.

The CAL is now analyzing total phosphorous via manual digestion. Samples digested in an autoclave (converts phosphates to orthophosphorous by sulfuric acid hydrolysis, organic phosphorous converted to orthophosphate by persulfate digestion) EPA Method 365.1/Lachat Method 10-115-01-1B

Bottle Leaks: The frequency of bottle leaks increases with the number of uses whether old NTN bottles or new flexible bottles are used. Bottles are discarded after 10 uses.

AMoN detection and uncertainty: Approved algorithms were used to calculate AMoN lab detection limits and uncertainty. Values are summarized in the 2017 CAL report. AMoN detection limit went down. Network uncertainty for ambient measurements is calculated annually from valid replicate values for each quartile of data based on the prior three years of ambient concentration data. Table is included in the 2017 CAL report.

AMoN Travel blanks – Travel blanks have been a historic concern for AMoN. The plots showing all travel blanks concentrations for 2016 show that nearly all travel blank concentrations are below detection, which continues to be a significant improvement since changing the protocol used for preparing the passive sampler in 2015.

The AMoN lab blank results for 2016 are concerning. The Clean Air Bench QC blank is showing elevated concentrations and need further investigation. The blank check indicates the effectiveness of the clean air bench in removing ambient ammonia and indicate when the activated carbon filters require replacement. Ammonium concentrations increased above the AMoN reporting limit after replacing the carbon bed in the clean air bench.

Archive sample requests: Since May 2016, 4,271 NTN precipitation samples and ~100 filters were sent out to 14 different research groups. No call for AIRMON data. Contact Sybil Anderson for archived samples.

Instrument Detection Limits (IDL) and Method Detection Limits (MDL): The 2016 and 2017 MDL/IDL values were reported for the AIRMON and NTN analytes. The 2017 MDLs are used by the CAL for data reported to the PO in 2016. The NTN MDL decreased for Ca, Na, K, CL, and NH4 from 2016. NTN orthophosphate and sulfur increased from 2015.

The 2017 QA Plan is in revision. The 2014 QA Plan is available on the NADP website. The 2016 QA Report is in preparation. The 2015 QA Report is complete and available online at http://nadp.isws.illinois.edu/lib/qa/cal_qar_2015.pdf

Fifty-three published CAL SOPs are being revised and reviewed on a staggered time schedule. A current list of active SOPs with scope, applicability, and revision dates is maintained at http://go.illinois.edu/NADPCALSOP Copies of CAL SOPs are available upon request.

Time it takes to validate data is improving, allowing for better data turnaround.

CAL-CAPMoN Collaboration. Lee Green and Chris Lehmann at CAL visited the laboratory facilities of the Canadian Air and Precipitation Monitoring Network (CAPMoN) in Toronto, Ontario on April 4 – 5. The purpose of this visit was to meet with key CAPMoN staff and review methods and instrumentation for comparisons with the CAL. As part of the action items from the meeting, a document will be created comparing CAL and CAPMoN methods to those recommended by the WMO; CAPMoN is calculating temperature-compensated AMoN concentrations; ECCC is preparing a satellite-derived interpolation of AMoN data; CAL will share preliminary data from NO_2 & SO_2 passive sampler study at Bondville.

The CAL is coordinating several air quality monitoring studies at the Bondville Field station. Greg Beachley (EPA) installed a MARGA in March 2017. A Tekran analyzer for ambient elemental mercury was installed by NADP staff also in March. Mercury speciation to be added in Summer 2017.

The CAL is participating in a proof-of-concept study with the University of Maine to track pollen using NTN sample filter. The expected costs to the CAL are negligible as the filters would otherwise be disposed. This work is part of an initiative to form a national aeroallergen monitoring network coordinated through the NADP's Aeroallergen Monitoring Science Committee (AMSC) which was formed in October 2016. This work is being done in cooperating with the Council of State and Territorial Epidemiologists (CSTE) with initial funding from the Centers for Disease Control and Prevention (CDC). Further information on the NADP's AMSC is available at http://nadp.isws.illinois.edu/committees/amsc/.

09:05 HAL Report - Bob Brunette

Minamata Convention – 128 signatories; 50 countries needed to ratify for the Convention to enter into force; intended to address mercury emissions and releases on a global scale.

Bob Brunette showed a series of MDN mercury wet deposition maps 1996-2016. David Gay noted a huge gap in the network coverage in the western U.S. Over 95,000 samples have been analyzed to date. In 2016, MDN lost 10 sites; three sites are in jeopardy of shutting down; one site in AK was added.

Site-liaison activities: Belforts are nearly gone with 6 left in MDN. The HAL had a number of requests for tech support. Bob Brunette presented 2015 data: ~250 Journal Tracking Entries < Estimated 210 Total For 2015) ~289 Email Related to Site Liaison < Estimated ~100 Total For 2015> ~107 Toll Free Phone Calls < Estimated 112 total for 2015.

HAL 2015 Review – 63% of 19 findings closed out with 7 open.

HAL still working to convert the HAL access database to SQL; plan to use HAL existing LIMS (Promium - Element) to import all data into a new HAL SQL DB.

HAL 2015 QA Report shows that matrix duplicates are typically within 5% RPD for total mercury.

HAL 2016 QAP is available at http://nadp.sws.uiuc.edu/lib/qaPlans.aspx

No changes in HAL staff.

HAL reaching out to industry groups and states for site support.

Bob Brunette discussed the MDN bottle/sample train study with PETG bottles. Comparison of PETG bottles and glass in dual-chimney NCON is completed. One year of data for WA18. Very promising; may eliminate the need for bottle blank correction in total Hg analysis; bottles don't

break, leak, or require cleaning. Investigating PETG at two additional sites – IL11 and a site in WI.

IJC report recommends support for 21 MDN and AMnet sites in the Great Lakes states.

09:45 QA Report - Mark Rhodes

CAL review planned for August 2017. The team consists of Greg Beachley - US EPA, Eric Hebert - EEMS, Ted Struzeski - USGS, and Richard Tanabe - ECCC – Review Team Leader.

2018 HAL review being planned. Chris Rodgers (AMEC FW)

2016 QA Reports: Field Surveys – ready to post; CAL, HAL, AMNet – in progress; 2017 CAL QAP is being revised.

QA document updates: Operations manuals for AIRMON, AMNET, MDN, NTN; AMON annual checklist; site operators training plan; site operator reference sheets (1 page reminders such as sample change out for MDN and NTN, sampler change-out for AMON, and sample processing for NTN); QR codes produced for these reference sheets.

Mark Rhodes provided a preview of the QA topics that will be discussed in NOS: Testing of the OTT Pluvio^2-S, collector test, ongoing sensor study (with new Thies sensor), PETG bottle study for MDN, Tekran 2537X, AMoN travel blanks and site surveys.

10:00 DMAG Report – Bob Larson

Bob provided an update on data available on the web.

Network	Status
NTN	Dec 2016
AIRMoN	Feb 2017
MDN	Nov 2016
AMoN	Feb 2017

NADP-TDEP map differences (also discussed in TDEP):

- Interpolation -- NADP is using IDW with a power of 2 and radius of 500km. In the TDEP approach, Gary Lear is recommending IDW with a power of 3 and a radius of 400km.
- Precipitation – Precip. is different. Merger of NADP precipitation amounts with PRISM model; Are differences driven by data or coding? The data differences are being resolved and tested. Assume any remaining differences are due to code; the scripting languages are different and can account for these (AML vs Python).
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AMON data offered 2 ways: individual replicates, with blanks; and average of triplicates. In 2016, Bob stopped reporting triplicate averages. The triplicate values are replaced with a single value first valid replicate. This algorithm used is consistent with the annual report.

Sites database: Is used to track site properties, people, agencies, etc. The old interface was in MS Access; Tom Bergerhouse has created a new interface in VB.net. More work is needed to make it available to HAL and EEMS.

Bob has prepared a transition strategy to help his successor on data management activities. The strategy includes a data management guide, SOPS, and cleaning-up the existing DB. The data management guide includes a general description of technologies used, development environments, and source code locations; databases; programs; data flow; and the website. To date, Bob has produced SOPs for 56 activities organized by different topics (e.g., data processing, data maintenance, incoming data/telemetry, web, meetings).

10:20 Litterfall Network Report – Marty Risch

Marty Risch reviewed the status of the litterfall initiative. Multiple sponsors have participated in the initiative during the 5-year transition and 3-year pilot. The number of sites in the network has varied from 13 – 27 sites. Written SOPs and QA program for litterfall Hg monitoring have been drafted. USGS Wisconsin Lab has provided support consistent in both cost and quality. All litterfall Hg data are available in a USGS public data base with a persistent URL and explanatory metadata. Two journal articles: approved journal article interpreting data for atmospheric Hg deposition to forests in 16 states, 2007-2014, and a journal article interpreting 6-year Hg dry deposition at AMNet sites, aligning litterfall Hg and Hg^0 deposition.

10:40 Future of Litterfall Network Open Discussion – Chris Rogers

Chris Rogers presented a proposal on behalf of the litterfall advocates (Marty Risch, Mark Olson, Mark Rhodes, and Chuck Sams) to approve the initiative as a NADP network. There were some questions about the cost to the PO to administer this network. There was also discussion about the science and whether long-term sampling was a valid way to address dry deposition. Greg Wetherbee moved to approve “Leafnet” as a new NADP network, with the exception that the Executive Committee look at cost recovery. Motion seconded by Pam Padgett. There was group consensus that although the science is evolving, it should not preclude this initiative from moving forward in an approved network mode. MOTION CARRIES.

Note: In an unprecedented intervention during the Executive Committee meeting, the PRI interim director blocked this decision, prohibiting Leaftnet from becoming a new NADP network.

10:55 Louisville Metro Air Quality Control Program – Billy DeWitt

Billy DeWitt from the Louisville, KY Air Pollution Control District (APCD) provided an overview of ambient air monitoring in the metro Louisville area. APCD monitors concentrations of EPA NAAQS pollutants: ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, nitric oxide, inhalable particulates, fine particulates and lead. APCD also supports operation of meteorological equipment, and special purpose and research monitors; APCD monitors to provide support to SIPs, national air quality assessments, and policy decisions; to judge compliance with and/or progress made towards ambient air quality standards; and to activate emergency control procedures that prevent or alleviate air pollution episodes, as well as develop long term control strategies. Some suggestions were offered to examine the ambient air quality data in conjunction with NADP base cations.

11:15 Science Committee Reports

Total Deposition – Kristi Morris (refer to TDEP minutes)

No motions. Update on a variety of topics:

2016 TDEP maps expected August 2017.

David Gay and Donna Schwede attended a WMO workshop on measurement-model fusion for global total atmospheric deposition, February 2017 in Geneva, Switzerland.

Greg Beachley and John Walker working on TDEP research needs white paper; Leming Zhang is using AMNet data and deposition velocities to estimate mercury dry deposition fluxes at select locations.

Gary Lear is working on uncertainties associated with the TDEP approach.

Bret Schichtel/Donna Schwede/Jeff Collett are focusing on the contributions of organic and inorganic oxidized and reduced N compounds to total N dep.

Chris Rogers nominated John Walker as incoming co-chair to replace Kristi Morris; The group approved John Walker as the new co-chair.

Aeroallergen Monitoring – Norm Anderson (refer to Aeroallergen monitoring minutes)

AMSC was established to explore the creation of a national “aeroallergen” (e.g. pollens and mold spores) monitoring network. At present, a National Allergy Bureau (NAB) network of about 80 aeroallergen monitoring sites, as well as other individually operated and supported sites run throughout the country; however, their efforts are not highly coordinated. The Council of State & Territorial Epidemiologists (CSTE) Asthma & Allergy work group, in collaboration with the national Center for Disease Control, support the need for a coordinated network. Four key areas of focus: Sample Collection, Analysis & Network Design; Data Handling & Dissemination; Quality & Standards; and Forecasting & Analysis. One of the AMSC’s near-term goals is to seek a full 4-year approval as a science committee at the 2017 fall meeting in San Diego, CA.

11:35 Water-Air Integrated Monitoring Meeting – Rich Pouyat

Update on the March 8, 2017 workshop hosted by USGS on the integration of atmospheric deposition and water quality monitoring for nutrients. Meeting goals were three-fold: become better informed on the state of monitoring for atmospheric deposition and water; provide examples of where integrated monitoring helps our understanding and/or management of nutrients; and identify gaps and priorities for large-scale integrated monitoring.

At the Louisville meeting, participants continued ongoing discussion about policy-relevant gaps and priorities related to integrated deposition and water monitoring, discussed the vision for integrated monitoring, and determined next steps.

WAIM collaborators include representatives from federal agencies, non-governmental organizations, and universities: USGS, EPA, FS, USDA, NOAA, NPS, NADP, CUAHSI, CWP, ACT, Boston University, University of Pittsburgh, SUNY, Purdue University.

Planning to draft a journal article and continue discussions on integrated monitoring at the 2017 Fall meeting.

11:50 Overview of Agendas for Subcommittees CLAD, EROS, NOS

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Wednesday April 26, 2017

14:00 Subcommittee Reports

NOS – Greg Wetherbee (See NOS minutes)

Motion 1: Grant approval to the Tekran 2537x for use at AMNet sites –Moved: Mark Rhodes, Second: Mark Olson. Motion carried.

Motion 2: Authorize the PO to purchase a second, used 2537x to complete the QA testing - Moved: Greg Wetherbee, Second: Eric Hebert. Motion carried.

Motion 3: Move to accept the AMNet Report and take the findings of the review to the Executive Committee - Moved: Chris Lehmann, Second: Eric Prestbo. Motion carried.

Motion 4: Authorize the PO to purchase an ECCC D400 model collector – Moved: Chris Rogers, Second: Eric Hebert. Motion carried.

EROS – Pam Padgett (See EROS minutes)

CLAD – Jason Lynch (See CLAD minutes)

14:20 New NADP Video Series – Molly Woloszyn

The NADP homepage has a link to the NADP video library. The library is a repository of videos covering a variety of topics of interest to the NADP community. These include historical information about NADP and the importance of the program from federal, state, and tribal perspectives; education about important science topics, such as ammonia deposition; instructional videos on sample change-outs and sampler maintenance, and keynote speeches from past symposia. The video library will continue to grow as new content is added.

14:40 New Trouble Ticket System Demo – Tom Bergerhouse, Roger Claybrooke

Trouble ticket system is operational.

15:00 ISWS/PRI - Kevin O'Brien

Presentation on PRI and Illinois-focused research and service. Some emphasis on managing the water supply chain within Illinois.

15:20 Precipitation Weighted Concentrations – Bret Schichtel

Nitrogen wet deposition values for Rocky Mountain National Park (RMNP) show a big increase in 2013. However, 43% of precipitation data were missing in 2013. Every year about 30% or more data are missing which is not unusual. How are missing data handled in annual deposition flux estimates? Missing ion concentrations are replaced with precipitation weighted annual average of available data. This assumes ion concentrations and precipitation rate are independent and no seasonality in concentrations or missing data; are these assumptions reasonable?

Ion concentrations versus precipitation rate: strong non-linear dependence of ion concentrations and precipitation, log regression produces the best fit when plotting analyte concentrations versus precipitation

Seasonal ion concentration versus precipitation rate: across the network and decades there is some seasonality; spring concentrations are approximately 50% higher than winter concentrations; spring precipitation rates are approximately 25% higher than winter; some sites, such as the Loch Vale site (CO89), are highly seasonal.

Can invalid data be used? A comparison of valid and invalid concentrations to annual averages was conducted for all NADP sites from 2000-2016; contaminated samples and many bulk samples were clearly biased; extended and undefined samples had similar statistics as valid samples.

Inclusion of extended and undefined samples in annual averages: The addition of the extended and undefined samples to the annual averages did not, on average, change the annual means, but can significantly change a given site-year's wet deposition rate.

Should some valid data be invalid? Are ion concentrations dependent on the fraction of the precipitation sample collected?

Items presented for discussion: Should some "extended" and "undefined" samples be flagged as valid? Should data with low precipitation collection efficiency (<25%) be invalidated? Should new data filling methods be explored? How to improve sample collection in challenging environments since the best method of all is to collect valid complete samples?

Comments: If we adopt Bret's method going forward what do we do with past data? All critical loads are calculated with the current method.

Motion: Chair of the Joint meeting appoint an ad hoc committee to evaluate alternate methods for calculating wet annual deposition. MOTION CARRIED, although the meeting chair was not overly supportive.

Conclusion: Criteria 1 could be relaxed slightly to 60-65% with only slightly increased error and negligible bias. Criteria 2 is appropriate as is. Use of completeness criteria does not significantly improve error in inverse distance weighting (IDW). Alternate approaches should be considered for precipitation weighting to reduce bias and errors.

16:00 TDEP Uncertainty – Gary Lear

The presentation focused on characterizing and optimizing interpolation error and additional errors generated from using non-matching CMAQ runs. Two findings: On average, TDEP estimates are relatively insensitive to IDW parameters for all variables. Recommend using power = 2 and radius of 400 km. On average, using discordant CMAQ model years adds relatively low error unless emissions are dramatically changing.

We now have 2013 and 2014 versions of CMAQ Version 5.2 is to be released June 2017.

16:45 Fall 2017 NADP Meeting and Scientific Symposium – Tamara Blett

The 2017 Scientific Symposium and Fall Meeting will be held 10/30 – 11/3 in San Diego, CA at the Bahia Hotel. The 2017 theme - "NADP data: making the world a better place; one monitor, one network, one study at a time."

16:55 One last thing for the record – Greg Wetherbee

The NADP began collecting wet-deposition data in 1978 when I was in the 8th grade. Today, I am in my 15th year as the Chief of the external quality assurance project for the NADP. I have never loved a job as much as this one, mostly because of the very special personal and professional relationships that I've enjoyed with you, my colleagues. It has been a blessing and a privilege to work with all of you, the top scientists in atmospheric deposition and associated ecological effects. I hope that our work will continue together.

We are privileged to stand on the shoulders of those who have contributed to this organization's success: Ellis Cowling, Jim Lynch, LeRoy Schroeder, Sagar Krupa, Van Bowersox, Chul Un Ro, Dave MacTavish, Karen Harlin, Scotty Dossett, Kathy Douglas, Bruce Rodger, Ellen Porter, and many others. I'm certain that they expect all of us to continue to collect high-quality data to monitor the impacts of air pollution on the land and water. In their honor, let us hold each other accountable to maintain the scientific integrity of our interpretive works. Let us also continue to maintain the NADP as a model of interagency cooperation for the advancement of scientific research.

The NADP data have demonstrated the effectiveness of environmental regulations. NADP data show that acid rain has been greatly reduced thanks to the Clean Air Act and its Amendments.

Recent decline in reactive nitrogen deposition from retrofit of electric generators is also evident in the NADP data. Meanwhile, our data show that unregulated ammonia emissions are threatening sensitive ecosystems in the Plains, Rocky Mountains, and Heartland. Our data also show that atmospheric mercury pollution continues to deposit onto the landscape where it is taken up in aquatic food chains. In 2012, the NADP demonstrated its adaptability to monitor important emission events. The NADP was one of the few fixed-station monitoring networks to monitor the effects of the Fukushima disaster on North America. Trends in the NADP data have also indicated signals of a changing climate. Today, we are developing total deposition information products from which we can evaluate critical loads of air pollutants depositing on the landscape. We're defining the tipping points for sensitive species and ecosystems. We choose to do these things because it is our duty to protect the environment.

Protecting the Earth is a noble and worthy ambition that we all share. In this uncertain time, environmental protection is viewed by many as an unnecessary government overreach. Yet, they have access to our data and interpretive products, which prove otherwise. Therefore, it is our shared responsibility to continue to be the truth tellers about our planet; humanity's changing and only island home in the Universe. Former Interior Secretary Sally Jewell encouraged us to keep working for the Earth in her farewell address. She quoted Wendell Berry (1971), who wrote: "We do not inherit the Earth from our ancestors. We borrow it from our children." In what condition shall we return the Earth to our children? They're counting on us. They're counting on the NADP.

17:00 Adjourn