NADP 2000 Technical Committee Meeting - Saratoga Springs, New York - Joint Session - October 17, 2000 - 0945 to 1100 EDT

1. Welcome by Jim Lynch - Technical Committee Chair - and introduction of attendees

2. Introduction of NADP Subcommittee Chairs

   Bob Brunette - Data Management and Analysis Subcommittee (DMAS)
   John Sherwell - Environmental Effects Subcommittee (EES)
   Jane Rothert - Network Operations Subcommittee (NOS)
   Each Chair summarized a list of topics to be discussed in their individual subcommittee meetings scheduled for later in the day

3. Approval of joint session minutes from meeting conducted in San Antonio, Texas in April 2000

   A motion to approve the minutes as summarized on the NADP Web Site - Motion was seconded, called to vote and passed unanimously

4. CAL Report - Karen Harlin - this particular report is included as attachment 1

5. ~~HAL Report - Bob Brunette - this particular report is included as attachment 2~~

6. Raingauge Updates - Don Schaefer - USGS - this particular report is included as attachment 3

NADP 2000 Technical Committee Meeting - Saratoga Springs, New York - Network Operations Subcommittee (NOS) Meeting - October 17, 2000 - 1115 to 1500 EDT

1. Attendance roster - this is included as an attachment 4

2. HAL Audit Review - Clyde Sweet and Eric Prestbo

   A hard copy of the report entitled "Audit of the Analytical, Data Management, and Quality Assurance Procedures of the NADP/MDN Mercury (Hg) Analytical Laboratory (HAL), Located at Frontier Geosciences Inc., Seattle, Washington - June 28-30, 2000" was distributed. The report was briefly reviewed. Per Eric Prestbo, Bob Brunette has penned draft responses to the audit report - the draft responses were not available for this meeting.

MOTION NO. 1
By John Gordon - Seconded by Susan Johnson and Lee Maull
NOS Secretary notify NOS via email that PDF version of this report is available upon request - Motion was called to vote and passed unanimously.

Per Dave MacTavish - Clyde to send letters to Site Sponsors notifying them that this report is available.

3. CAL Audit Final Report to NOS - John Gordon - this particular report is included as attachment 5

MOTION NO. 2
By Susan Johnson - Seconded by several NOS members
Establish an external review team to review the CAL QA Plan and forward the team's comments to Jane Rothert - Review Team to consist of Scott Dossett, Dave MacTavish and Gary Stensland - Motion was called to vote and passed unanimously.

4. Precipitation Collector Update - Mark Nilles - this particular report is included as attachment 6

MOTION NO. 3
By Scott Dossett - Seconded by Dennis Lamb
Establish a team to track progress of the new precipitation sampler development - Team to consist of Scott Dossett (Chair), Dennis Lamb, Mark Nilles and Rick Artz.

Per Susan Johnson - the performance of any new sampler in cold weather needs to be evaluated during Phase II testing.

Motion was called to vote and passed unanimously.

5. Siting Exemptions and Site Categorization: Ad hoc Committee Selection - Jane Rothert

Jane proposed that an ad hoc committee be established to address these issues. Several NOS members suggested that the committee address site categorization issues only (exclude siting exemption issues for now).

MOTION NO. 4
By Susan Johnson - Seconded by Karen Harlin

Establish an ad hoc committee to prepare a 5-page (maximum) “straw” paper that addresses site characterization issues (e.g., urban vs. rural vs. coastal) - Paper to be presented at the Spring 2001 Meeting - Committee to use data already developed by Luther Smith et al. - Committee members include Jane Rothert, Luther Smith, Scott Dossett, Bob Larson, Tamara Saltman and either Clyde Sweet or Bob Brunette - Motion was called to vote and passed unanimously.

6. <u>CAPMoN Update - Dave MacTavish</u>

Showed map of existing sites, expect to add 5 new sites
CAN4 (Sutton) - Expect to move site ~12 Km to the northwest in Fall 2000 - Site will receive a new network ID upon completion of the move

7. <u>Network Equipment Depot (NED) Report - Scott Dossett</u>

Follow-up on email discussion regarding the potential changes of the location of the ACM sensor heater-control thermistor - Repair cost is ~$150 per component

MOTION NO. 5
By Scott Dossett - Seconded by Mark Nilles
The Program Office be approved to proceed with the design change - implement on an as-needed basis.

FRIENDLY AMENDMENT TO MOTION NO. 5
By Rick Artz - Scott to report on progress to date to the NOS in subsequent meetings

Motion was called to vote and passed unanimously.

Scott presented results of testing conducted with an ACM collector and a collocated LODA collector (ACM clone) at the Program Office - this particular report is included as attachment 7.

MOTION NO. 6
By Mark Nilles - Seconded by Mark Mesarch
The LODA equipment is an acceptable alternative to the ACM equipment - Motion was called to vote and passed unanimously.

8. <u>MDN Update - Clyde Sweet</u>

A hard copy of the document entitled “MDN Procedure for Daily Sampling” was distributed.

MOTION NO. 7
By Clyde Sweet - Seconded by Scott Dossett
The procedures summarized in the document are approved by the NOS.

FRIENDLY AMENDMENT TO MOTION NO. 7
By Mark Nilles – NOS presumes that data collected using the daily sampling procedures will be combined to generate weekly averages of concentration and deposition. NOS is not certain that the data generated by combining the daily samples would be "equivalent" to the data generated from samples collected using the standard weekly sampling procedures (editor's note: "equivalent" was not defined in this motion). As such, NOS will attempt to determine the "equivalence" of weekly data generated by combining the daily samples prior to publishing this data.

Motion was called to vote and passed unanimously.

"Chimney" caps on the MDN sampler orifice - Plastic supports for the collection funnel are being manufactured.

9. <u>ATS Update - John Shimshock</u>

Showed map of sites audited in 2000 - Working closely with the Program Office to collect pertinent data - Noted that site auditors are still encountering rain gauges that fail calibration checks - Suggested that ATS record the number of NTN mailers that each site stores.

10. <u>USGS Update - John Gordon</u>

External QA Project consists of (a) Blind Audit Program, (b) Interlaboratory Comparison Program, (c) Field Blank and Reference Sample Program, (d) Collocated Sampler Program and (e) Intersite Comparison Program.

11. <u>New AIRMoN FOF - Jane Rothert</u>

A copy of the new form was displayed on the overhead projector

MOTION NO. 8
By Rick Artz - Seconded by Joel Frisch
NOS to approve new AIRMoN FOF

Per Dave MacTavish - suggest that listed email address be changed from <mailto:rothert@uiuc.edu> to AIRMoN general email address
Motion was called to vote and passed unanimously.

12. <u>Selection of New NOS Secretary for 2001 - coordinated by Jane Rothert</u>

MOTION NO. 9
Joel Frisch nominated Kristi Morris - seconded by Scott Dossett - No other nominations. Motion was called to vote and passed unanimously.

13. <u>Adjourn</u>

NADP 2000 Technical Committee Annual Business Meeting - Saratoga Springs, New York - Network Operations Subcommittee (NOS) Meeting - October 17, 2000 - 1515 to 1730 EDT

1. <u>Executive Committee Report</u>

Jim Lynch presented the Site Operator Service Awards (listed in the NADP Proceedings 2000-01 - NADP 2000 - Ten Years after the Clean Air Act Amendments: Adirondacks in the Balance)

The NADP Program Advisors presented brief status reports -
NRSP-3 / SAES - Wayne Banwart
CSREES - Dan Jones
NTN - Mark Nilles
AIRMoN - Rick Artz
CASTNeT - Gary Lear
Mike Uhart (NAPAP) was not present at the meeting.

2. <u>NTN Report - Van Bowersox</u>

8 new NTN sites, 1 closed site (NM09, Cuba, NM), 1 site moved (MT13, renamed MT96), 1 site (MS19) to be moved

3. <u>AIRMoN Report - Rick Artz</u>

1 closed site (OH09), 1 new site in West Virginia established, documented various uses of AIRMoN data

4. <u>MDN Report - Clyde Sweet</u>

Map of current and proposed sites was displayed on the overhead projector

5. Subcommittee Resolutions

A. NOS Report - Jane Rothert

Nine motions as summarized above were presented to this session. A motion was made, seconded, and called to vote to accept the NOS report (passed unanimously).

B. DMAS Report - Bob Brunette

Two motions were summarized and presented to this session.

Motion #1 - Consider a field sample with an exposure duration of less than 6 days valid if all other validity criteria are satisfied

Motion #2 - Considering low-volume samples for data completeness - allowed 2 additional sample types to be considered valid samples

A motion was made, seconded, and called to vote to accept the DMAS report (passed unanimously).

C. EES Report - John Sherwell

Discussed examining non-organic HAPs (metals), organic compounds (HCHO), total nitrogen

Discussed the need for a mercury brochure - short-term need vs. a "nitrogen-like" brochure

A motion was made, seconded, and called to vote to accept the EES report (passed unanimously).

6. New Business

NADP Technical Committee Secretary for 2001 is Rich Grant

Location of 2001 Technical Committee Meeting - Washington, DC?

7. Adjourn

Karen Harlin, CAL Director
217-244-6413
k-harlin@uiuc.edu

NADP (NRSP-3)
Fall Technical Meeting
Oct. 17--20, 2000
Saratoga Springs, New York

Central Analytical Laboratory (CAL) Report

National Atmospheric Deposition Program
Illinois State Water Survey
2204 Griffith Dr., Champaign, IL 61820

Updated from 10/99

Highlights

Special Events

- ?? NTN: 200,000th sample received June 2000 (from WA99, off 5/23/00)
- ?? AIRMoN: 10,000th sample received March 2000 (from TN00, off 3/4/00)

Site Related Events

- ?? FIRE! FIRE! In spite of numerous forest fires this summer only one site was affected
  - o MT97; a 4-week sample was retrieved for the 8/8/00 to 9/5/00 sampling period
- ?? NTN 226 active sites (219 sites last Oct.)
  - o 5 NPS sites have been added
  - o 2 USF&W sites have been
- ?? 31st Site Operators Course scheduled at CAL on **May 1-3, 2001**
- ?? 2001 CALendar available

Lab Related Events

- ?? Sampling bucket inventory up to ~ 1 weeks supply
- ?? New lower calibration ranges for many CAL analytes and additional QC checks added such as a Faux Rain 10th percentile check

Data Related Events

- ?? **Data to Program Office is on schedule**!
  - o NTN data through **June 00** to Program Office
  - o AIRMoN data through **July 00** to Program Office
- ?? AIRMoN preliminary data results have been sent to sites electronically since July 2000

Heads Up Items

Bucket Lids

- ?? Search in progress for supplier for current lid style

What's Changed?

Field Observer Report Forms (FORFs) and Field Observer Forms (FOFs)

- ?? NEW AIRMoN FOF with hourly precipitation, new formatting, and barcode added
- ?? Updated NTN FORF with barcode and minor format changes added

Database and barcode system for parts and site supplies

- ?? February 2000, expansion of the Network Equipment Depot (NED) barcode system to include NTN tracking site supplies, mailer rotation, and to include MDN parts sent and received by the CAL
- ?? Provides immediate feedback from Site Liaison contacts to shipping staff
- ?? July 2000, 2nd system added for AIRMoN use and to serve as backup for NTN
- ?? Tailored reports will soon be available for # mailers in rotation, supplies and parts to site, response time for supply/parts request, use for inventory control, etc.

Data operations

- ?? New final data validation staff member, Nov. 1999
    - o NTN and AIRMoN data validation and verification review
- ?? Daily precipitation amount & type, field comments, and lab comments are now in the CAL NTN database
    - o Winterizing and summarizing dates added for all sites with automated check of precipitation type
- ?? New data validation and review streamlining programs
- ?? January 2000, three decimal places added to CAL database for all chemical analyses
    - o nitrate, sulfate, chloride, ammonium, and calcium changed from 2 to 3 decimal places
    - o NOTE: The PO data base is not affected by this change
- ?? January 2000, values below the MDL are now in the CAL NTN database
    - o NOTE: The PO data base is not affected by this change
- ?? July 2000, per NOS request at spring meeting, the date of analysis has been added to the NTN database for the three analytical procedures (AAS, FIA, and IC)
- ?? July 2000, field added to NTN database to record note when subsample taken at site for additional research (Y, N, or M)

Lab operations

- ?? Addition of weekly plastic bag blanks
- ?? January 2000, color coding implemented for supplies inventory rotation

Continuing Programs and CAL products

Site Operator Training Course

- ?? 30th Site Operators course, May 16-18, 2000
    - o 30 new operators trained this year
- ?? 31st Site Operators course scheduled for **May 1-3, 2001**

NTN Site Operator Training Manual

- ?? Available on NADP Internet Site
- ?? Fully revised Appendices B, C, and D
    - o 12/31/00 expected date of completion

1998 CAL Quality Assurance Report

- ?? NADP QA Report 2000-01 by Jane Rothert,
    - o Paper copies available on request
    - o Internet access available soon

2001 CALendar

- ?? Now available
- ?? AIRMoN site map included
- ?? Will be shipped to all NTN and AIRMoN site operators and supervisors, and technical committee in November mailing

Special Projects

- ?? New electrodes under evaluation
  - o Sentron Ion Sensitive Field Effect Transistor sensor (ISFET)
    - ?? AL2O3 used for sensitivity to hydrogen ions
    - ?? www.sentron.nl
    - ?? See poster by Bachman, Patten, Bergerhouse
  - o Others soon to be evaluated

Misc. QA/QC

- ?? ALL CAL Standard Operating Procedures reviewed and updated 9/00. Final internal review in progress
- ?? CAL Quality Assurance Plan, DRAFT prepared and internal review in progress
- ?? Interlaboratory Comparison Samples
  - o USGS
    - ?? Field Blank Samples (~100/year)
    - ?? Blind Audit Samples (~100/year)
    - ?? Interlaboratory Comparison Samples (26/year)
  - o World Meteorological Organization (WMO)/Global Atmospheric Watch (GAW)
  - o National Water Research Institute, Burlington, Ontario (NWRI), Ecosystem Interlaboratory QA Program
    - ?? two per year
  - o Norwegian Institute for Air Research (NILU)
    - ?? no samples received in 1999, 1 sample set (4) received in July 2000
  - o North Central Research Station, MN
    - ?? 2 samples received April 2000 and October 2000

CAL Audit/Review Follow-up

- ?? CAL final response report to the Coordinator July 2000 (Coordinator, NOS Chair, John Gordon; on-site coordinator John Robertson
  - o Discussion at NOS Fall 2000

Goals for 2001

CAL Web site

- ?? Staff information, method summaries, Quality Assurance reports, CALendar, Site Operator Training Manual, Site Operator Training Class announcements, and other forms and CAL related materials

Computerized transfer of lab contamination codes, pH, and conductivity to database

- ?? Investigating new technology (such as touch sensitive monitors)

Further updates to NTN preliminary printout to sites

- ?? CAL newsletter replacing the footer information
- ?? Combine two reports (Field and Preliminary) into one report

Finalize CAL QAP

Complete records inventory and update records retention policy

Continue to refine and update data validation/verification procedures

Frontier Geosciences
Mercury Deposition Network
Mercury Analytical Lab Organization Chart

May 26, 2000

MDN HAL Director: Bob Brunette

MDN Science Advisor: Eric Prestbo

Analytical Laboratory Sample Analysis
- **Lucas Hawkins** — Sr. Analyst, Total & MMHg
- **Amber Steward** — Analyst, Total & MMHg
- **Dustin Leen** — Analyst, Total & MMHg
- **Sarah DuBord** — Analyst, MMHg

HAL Tech Support
- **Paul Laskowski** — MDN Tech, Sample Prep, Ship/Rec
- **Phil Swartzendruber** — MDN Tech, Sample Prep, Ship/Rec
- **Jacob Meyer** — MMHg Distillations
- **Melinda Cowen** — MMHg Distillations

HAL Bottle Washing
- **Malaika Lafferty** — Sr. Sample Custodian, Lab Assistant
- **Jennifer Koss** — Lab Assistant
- **Citron Choice** — Lab Assistant
- **M.B. Miller** — Lab Assistant
- **Xoria Rordame** — Lab Assistant (student labor)

Data Management

HAL Data Review and Data Entry
- **Gabe Choy** — Sr. Technical Data Specialist
- **Dan Leeman** — Technical Data Specialist

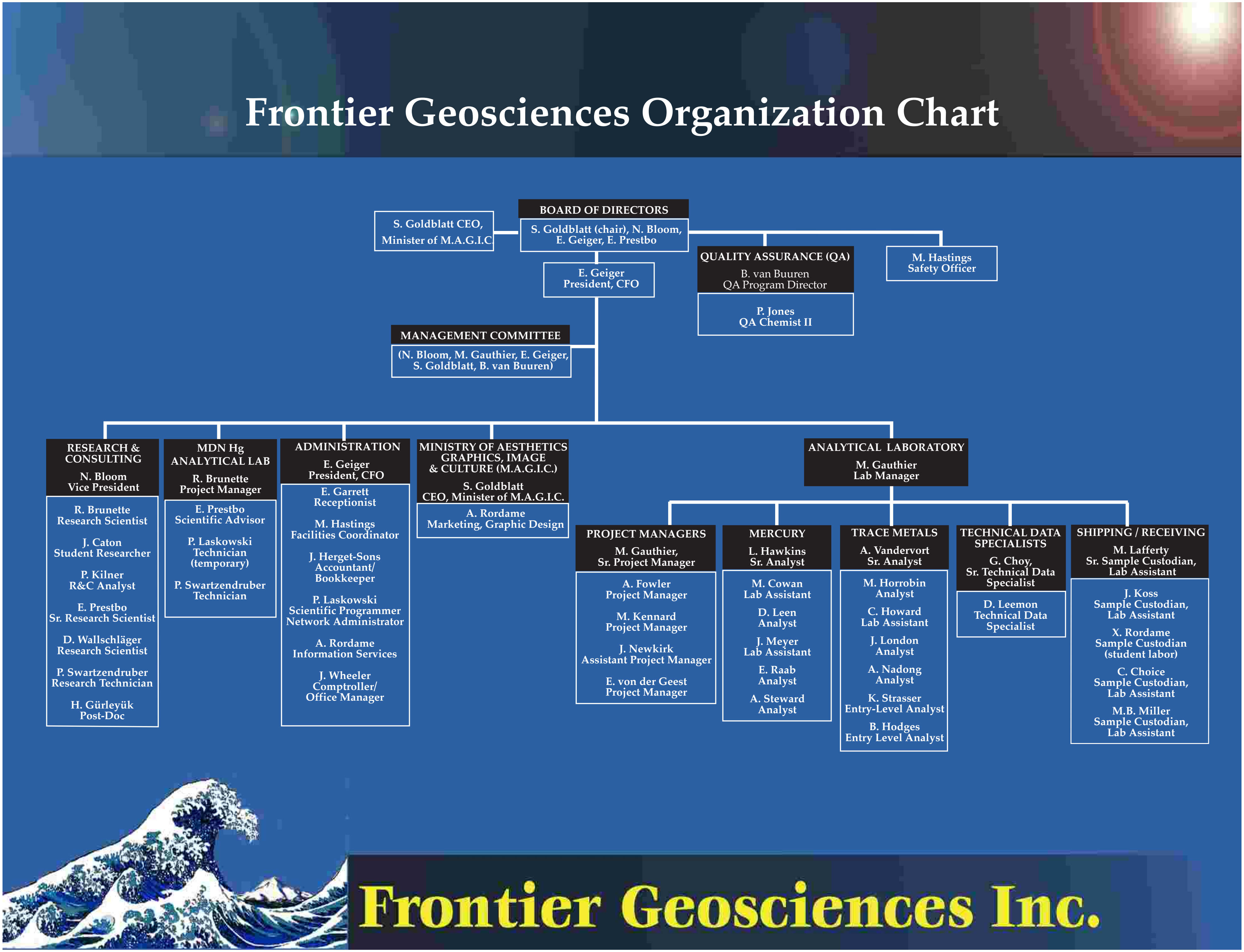
Data Management and Computer Support
- **Paul Laskowski** — Data & Applications Programmer
- **Bob Brunette** — Database Specialist

HAL MDN Site Support
- **Bob Brunette** — Site Liaison
- **Phil Swartzendruber** — Site Liaison (in training)

HAL Site Operator
- **Paul Laskowski** — Primary Site Operator
- **Phil Swartzendruber** — Secondary Site Operator
- **Bob Brunette** — Back-up Site Operator

Frontier Geosciences Inc.

Attachment 2



HAL Staff Update

Leaving Frontier

Heather Fergusen - HAL Teflon & Glass Trace Cleaning Tech
B.S. Zoology, graduated form the University of Washington and has been working at the HAL for the last 5 months.

Replacing Heather Fergusen

Citron Choice, HAL Teflon & Glass Trace Cleaning Tech
Studied Environmental Biology at San Diego Community College in San Diego and has been working at the HAL for the last 5 months.

Internal HAL Position Changes

Moving to Full Time Computer Management Specialist

Paul Laskowski - HAL MDN Technician II
B.S. Chemistry, experience includes 3.5 years as a Hg analyst at the HAL and also 1.5 year as MDN Data Base Management Specialist.

Replacing Paul Laskowski:

Dan Leeman, HAL Electronic Data Deliverable/Data Entry
B.S. Watershed Management & Land Use Planning, graduated from University of Wisconsin. In current position for 4 months.

Currently Hiring For HAL Technical Data Specialist Position

Frontier Geosciences Inc.

HAL Capacity Expansion

- HAL has analyzed 6,759 Total Hg Samples to date
- HAL Receives 200 Samples/Month
- Current Analysis Capacity is 150 Samples/day or ~ 3000/month
- HAL MDN Office and Sample Processing Room moved to larger facility – Completed November 1999
- Re-organizing of HAL staff completed (see HAL Organization Chart)
- New Full Time MDN Employee – Site Liaison Assistant
- Purchased additional HAL supplies for 15 new MDN sites
- Two Additional Total Hg Analyzers for MDN use only

HAL MDN Data Status

1999 Final MDN Data:

- HAL 1999 MDN Data Base transmitted to the PO Apr/2000.
- PO Released Final 1999 Data to NADP Web Site July/2000.

2000 1st and 2nd Quarter MDN Data:

- Final 1st & 2nd Quarter MDN Data Transmitted to PO Sept, 2000

2000 3rd Quarter MDN HAL Data Turn-Around-Time:

1. October 31, 2000 - 3rd Qtr HAL Preliminary Quarterly Report Transmit To Sponsors
2. Oct 31– Nov 30, 2000 Data Review Period by Site Sponsors
3. December 6th, 2000 HAL incorporates sponsor corrections and sends Final 3rd Qtr Database to the Program Office.

HAL Web Server Data Deliverables:

- 1st and 2nd Qtr Preliminary Reports Delivered via new system
- HAL Sponsor Web Server Accounts and Passwords
- Allows Sponsor Access to E-Copies of Data Whenever Needed

HAL Quality Assurance

1999 MDN HAL QA Report:

- Completed June 2000 - copies available.

2000 Quarterly QA Reports:

- Now sent with Each Quarterly Report to Sponsor

HAL Interlaboratory Comparison Studies:

- HAL 2000 Lab Intercomparison QC Study – December 2000
- Frontier Referee Lab For US EPA Method 1631 (Hg Method)
- Frontier Referee Lab For US EPA 1600 Series Metals Methods
- Frontier, US EPA sponsored, MDL Improvement of 200.8 Drinking Water Metals Methods

Frontier/HAL Laboratory Audits 2000:

- US Army Core of Engineers – June 2000
- NADP HAL Audit – June 2000 (Draft HAL Response Available)
- Natl. Env. Lab Accreditation Program – July 2000
- State of New York Dept. of Env. Conservation – Aug 2000
- US EPA – Office Of Water – Sept 2000

New Frontier/HAL State Certifications:

- New York
- New Jersey
- Wisconsin
- California
- Louisiana (Pending 2000)

Frontier Geosciences Inc.

HAL Field QA

HAL Field QA Studies:

- ME98 with UMAQL – continuing through end of 2000
- HAL Co-located ACM Study at WA18 – ended Feb 2000
- MDN Co-located ACM Study to continue at IL11 by PO
- HAL Co-located MDN ACM and MICB Collector –Dec 2000
- New System Blank Procedure Implemented (40% Return)

MDN Site Audit Program:

Initial Site Visit/Start and Operator Training by HAL in 2000:

AB08, AL03, BC06, GA40, MS22, NB02, NF09, NSO1, ON07

- **7 Site Start-Ups with 2 Existing MDN Sites Visited**
- **Total of 16 Site Operators and Back-Up Operators Trained**

Advantages of HAL Installation and Training:

- **Ensured Site Operators were following clean techniques**
- **Siting Criteria and Equipment Installed Correctly**
- **Sponsors confident to start site and generate data**

Program Drastically Reduces Site Liaison Activities with New Sites and Clearly Shows Sites Generating Good Data From Start.

ATS Field QA Program:

- **10 MDN Sites Visited Since September 1999**

HAL New Initiatives

- HAL has been doing work with individual sponsors and non MDN sponsors doing Trace Metals in rainwater in addition
- HAL has redesigned the ACM in order to utilize the second chimney for Trace Metals collections
- HAL has designed a trace metals sample train to fit in the second MDN ACM chimney.
- HAL has been collecting analyzing trace metals in addition to Hg at WA18 and other sites for over 2 years.
- HAL will be releasing a trace metals informational sheet explaining the cost, metals we recommend to analyze in addition to Hg, and the procedures needed to support this effort at each MDN site.

HAL SRM Change

HAL Trace Mercury SRM NIST DORM-2 (Dogfish Muscle)

- US EPA Method 1631 Validated with the use of DORM-2
- HAL US EPA Referee Lab for 1631 utilized DORM-2 10 years
- Not A Water (Matrix) Specific SRM

HAL Change to NIST 1641d "Hg in Water"

- First Ever Water Specific Trace Hg SRM - Feb 2000
- HAL Incorporated Use Of 1641d in May 2000

HAL MINI NED Re-Org

- NADP Network Equipment Depot Re-organized
- New System Now Tracks Parts via Bar Coding System
- MDN "Mini NED" now included in Tracking System
- MDN "Mini NED" under new system as of Sept 2000

Phase III Testing of The OTT-Pluvio Rain Gage

Network Operations Subcommittee

October 17, 2000

USGS
science for a changing world

Introduction

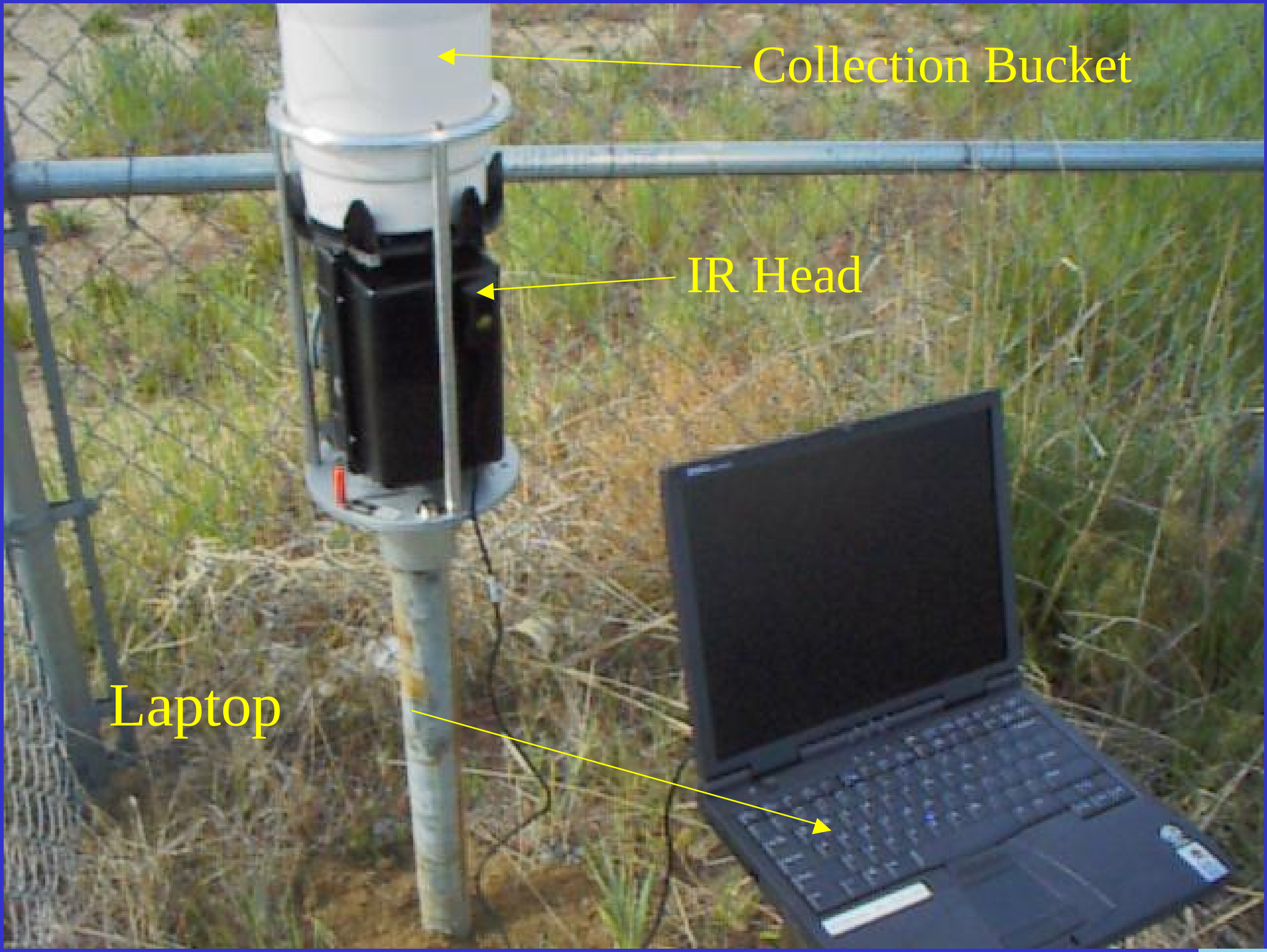
- National Atmospheric Deposition Program/National Trends Network (NADP/NTN) collects rainfall rate and chemistry data at over 200 sites throughout the United States
- Design of current Belfort rain gage is 50 years old
- Belfort gage is prone to mechanical breakdown and data loss
- Rainfall data is used to calculated depositional loads from network

USGS
science for a changing world

OTT-Pluvio Rain Gage

USGS
science for a changing world


Load Cell
Data Logger


Collection Bucket
IR Head
Laptop

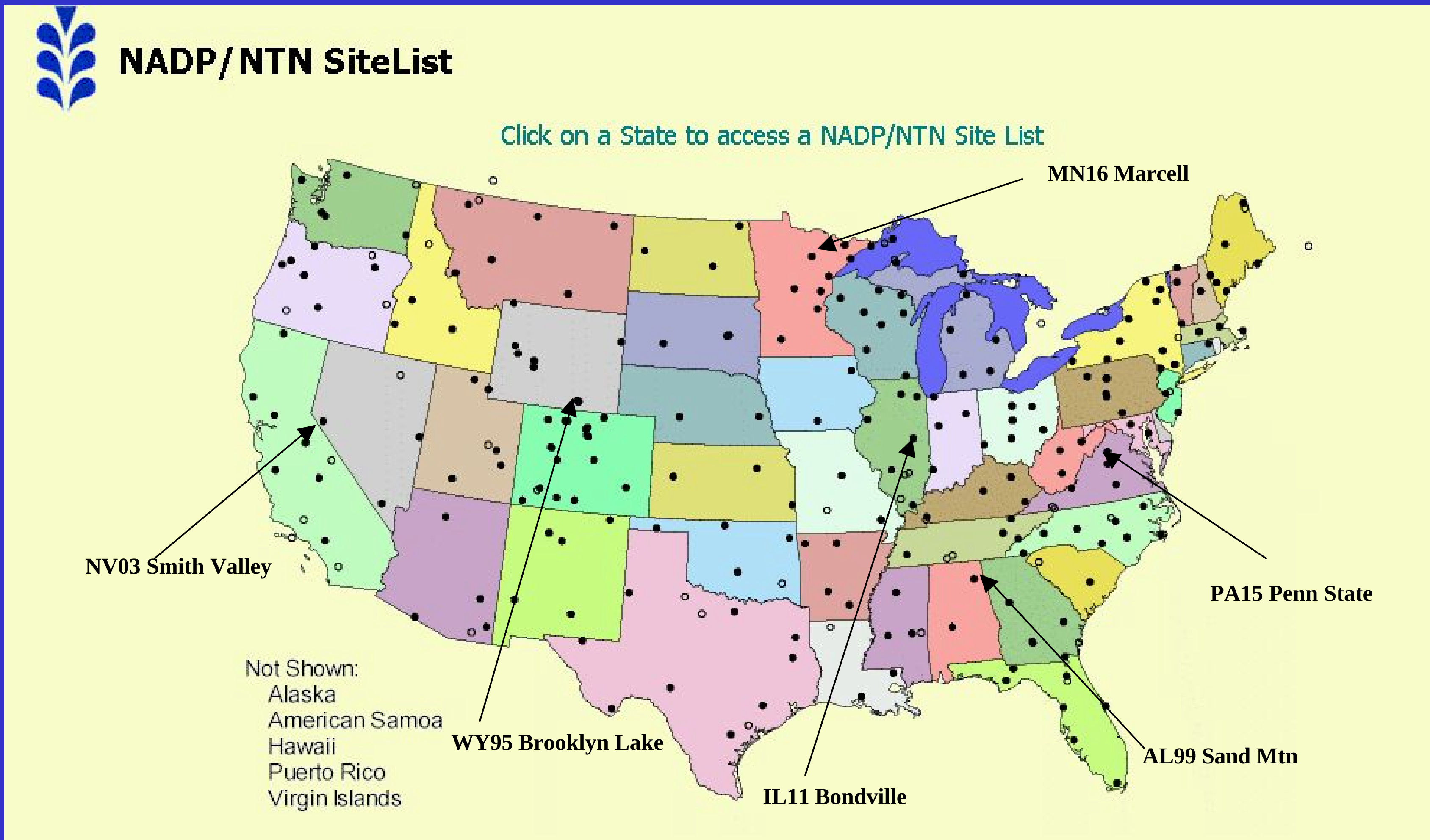
Objectives

- Determine comparability of existing Belfort rain gage and OTT-Pluvio gage
- Compile Standard Operating Procedures for installation, data collection, and maintenance
- Analyze quality of data collected from the OP gage and suitability as a replacement for existing gage

USGS
science for a changing world

Approach

- Seven OTT gages installed at six NTN sites throughout the country
- Illinois Water Survey has two OTT gages at IL11
- Gages collocated with Belforts will be tested for eighteen months


NADP/NTN SiteList
Click on a State to access a NADP/NTN Site List
MN16 Marcell
NV03 Smith Valley
PA15 Penn State
WY95 Brooklyn Lake
IL11 Bondville
AL99 Sand Mtn
Not Shown:
Alaska
American Samoa
Hawaii
Puerto Rico
Virgin Islands

Site Equipment

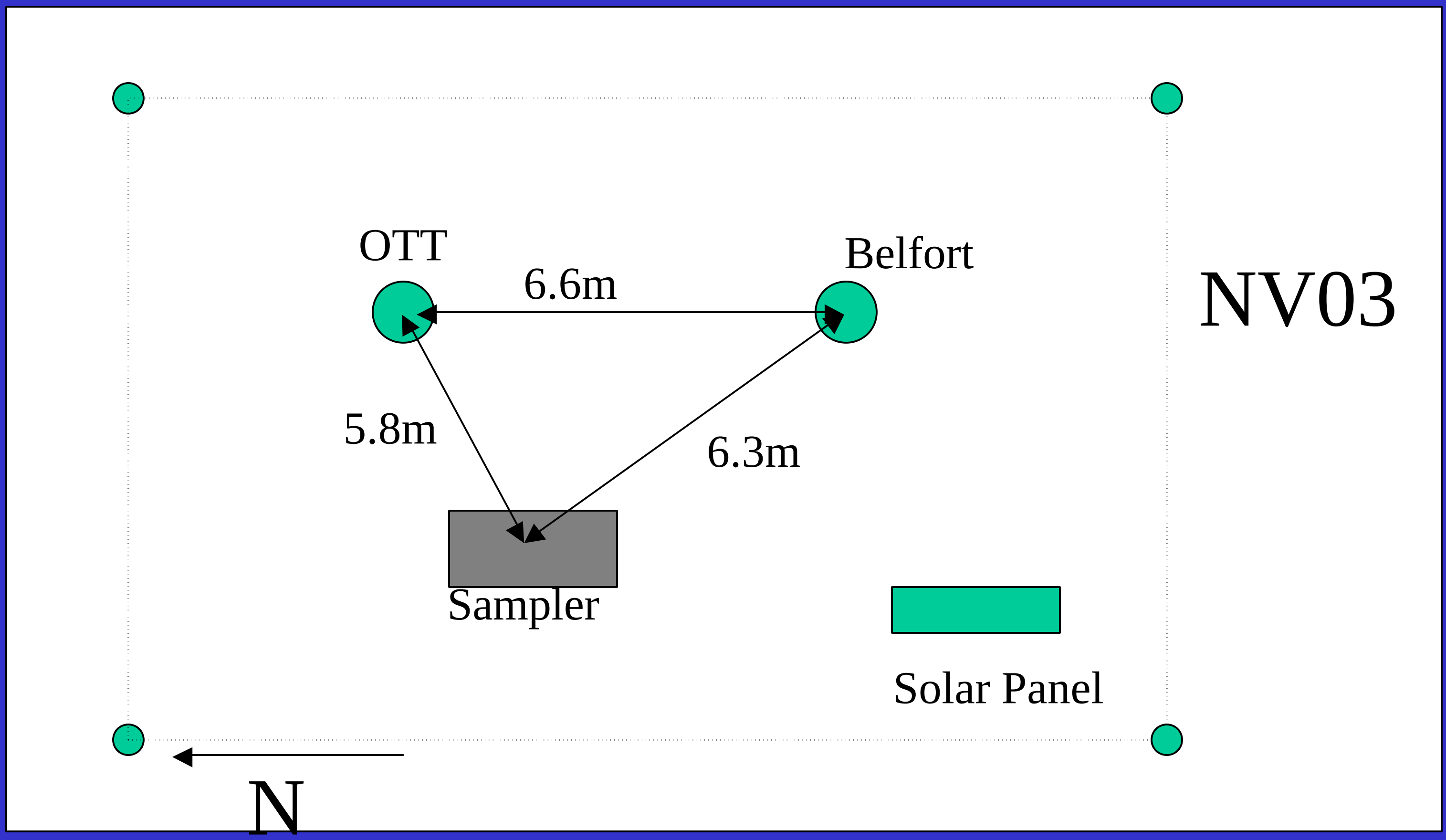
Site	OTT	Belfort	Stick	Power
AL99	1	1	0	AC
IL11	2	3	1	AC
MN16	1	2	0	AC
NV03	1	1	0	DC
PA15	1	2	2	AC
WY95	1	1	0	DC

Installation

- Set on 2” pipe
- Gage installed >5m from sampler and Belfort
- Obey 45° rule
- Gage orifice at same height as Belfort
- Alter shield for OTT if Belfort has one

Installation

Installation



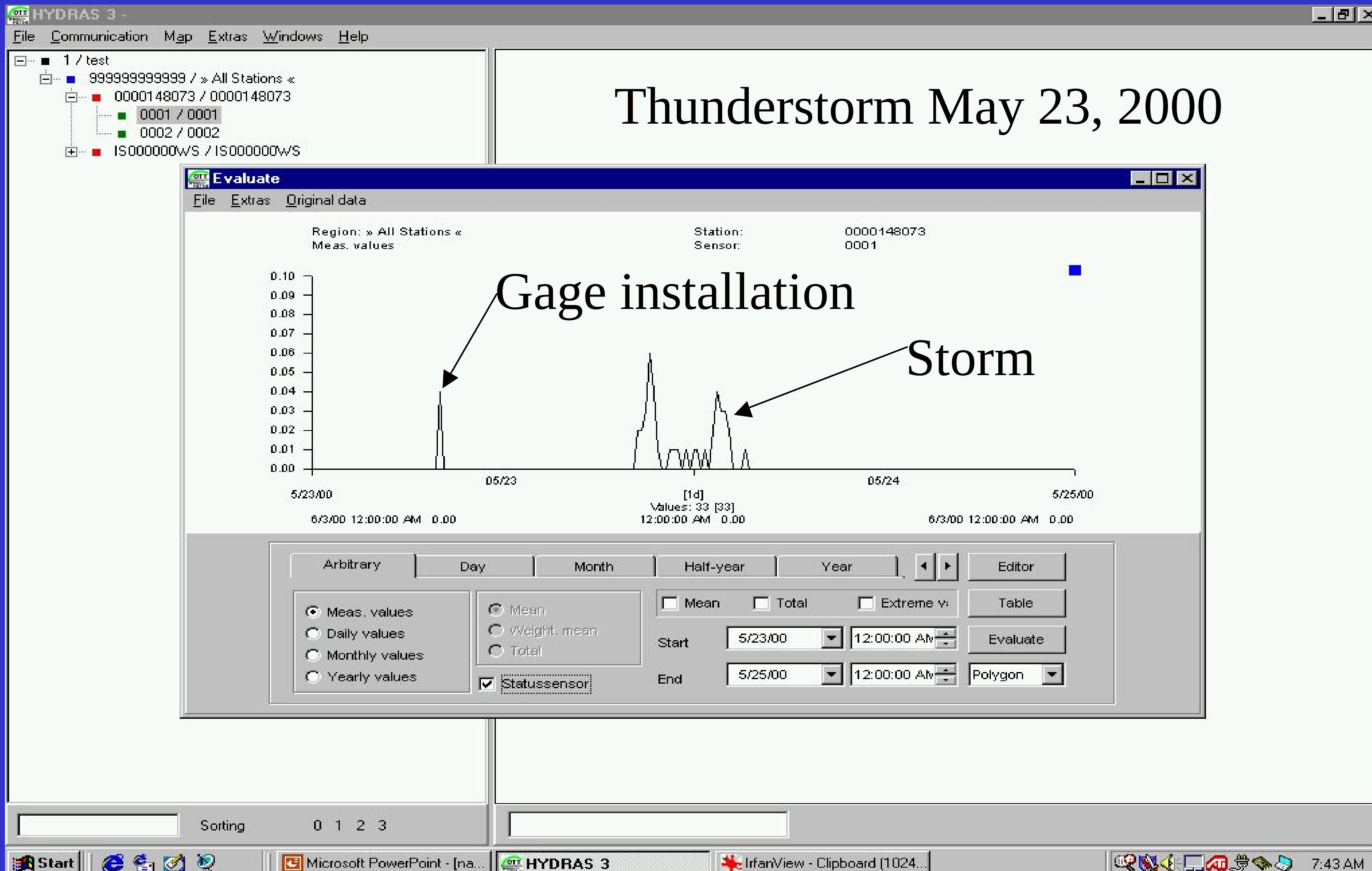
Installation

USGS
science for a changing world

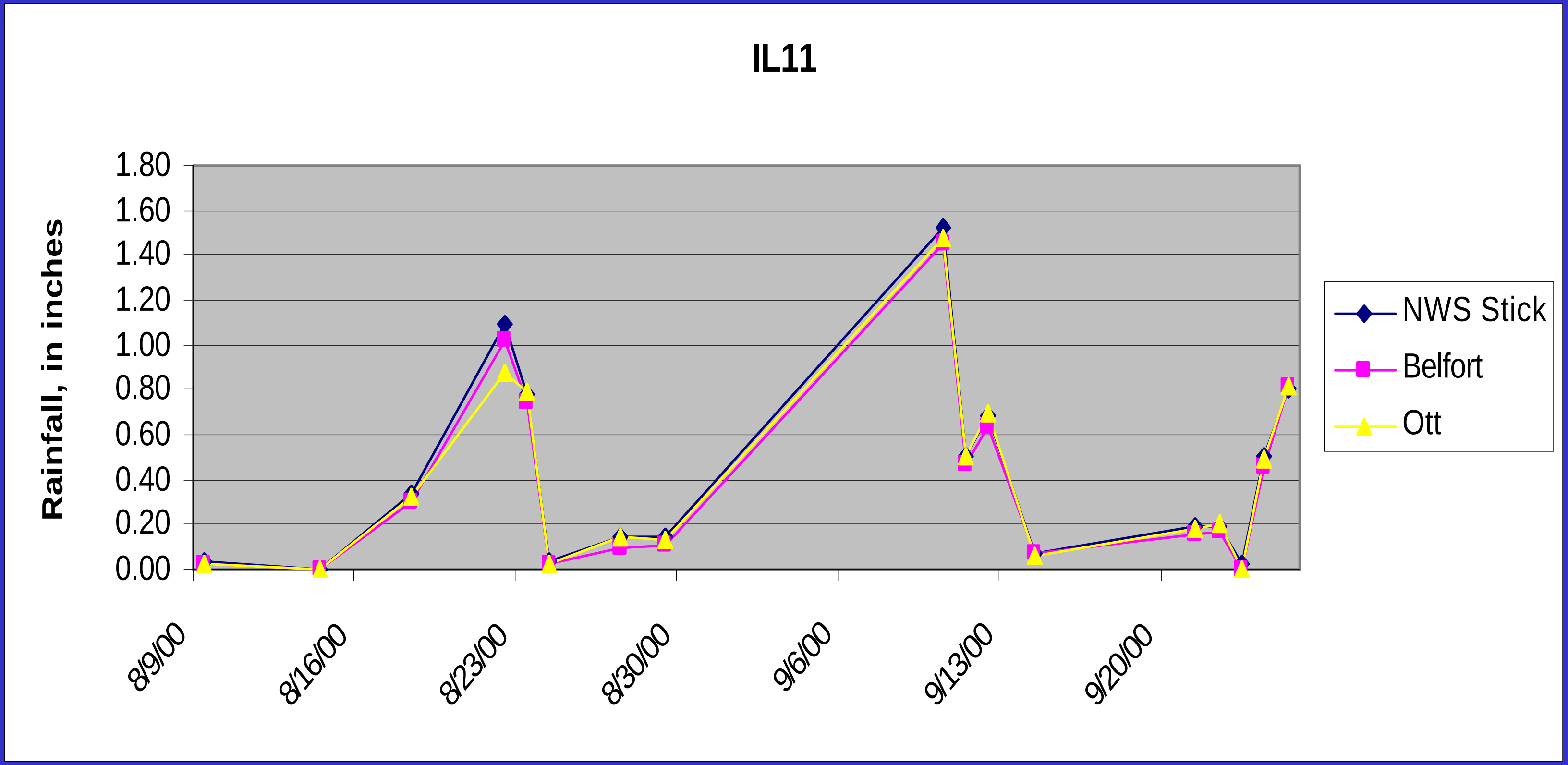
Data Collection

- OTT visited every Tuesday
- Download previous week of data
- Visually inspected in field
- Sent as attachment via email
- FORF and Belfort chart for each site sent by NADP program office

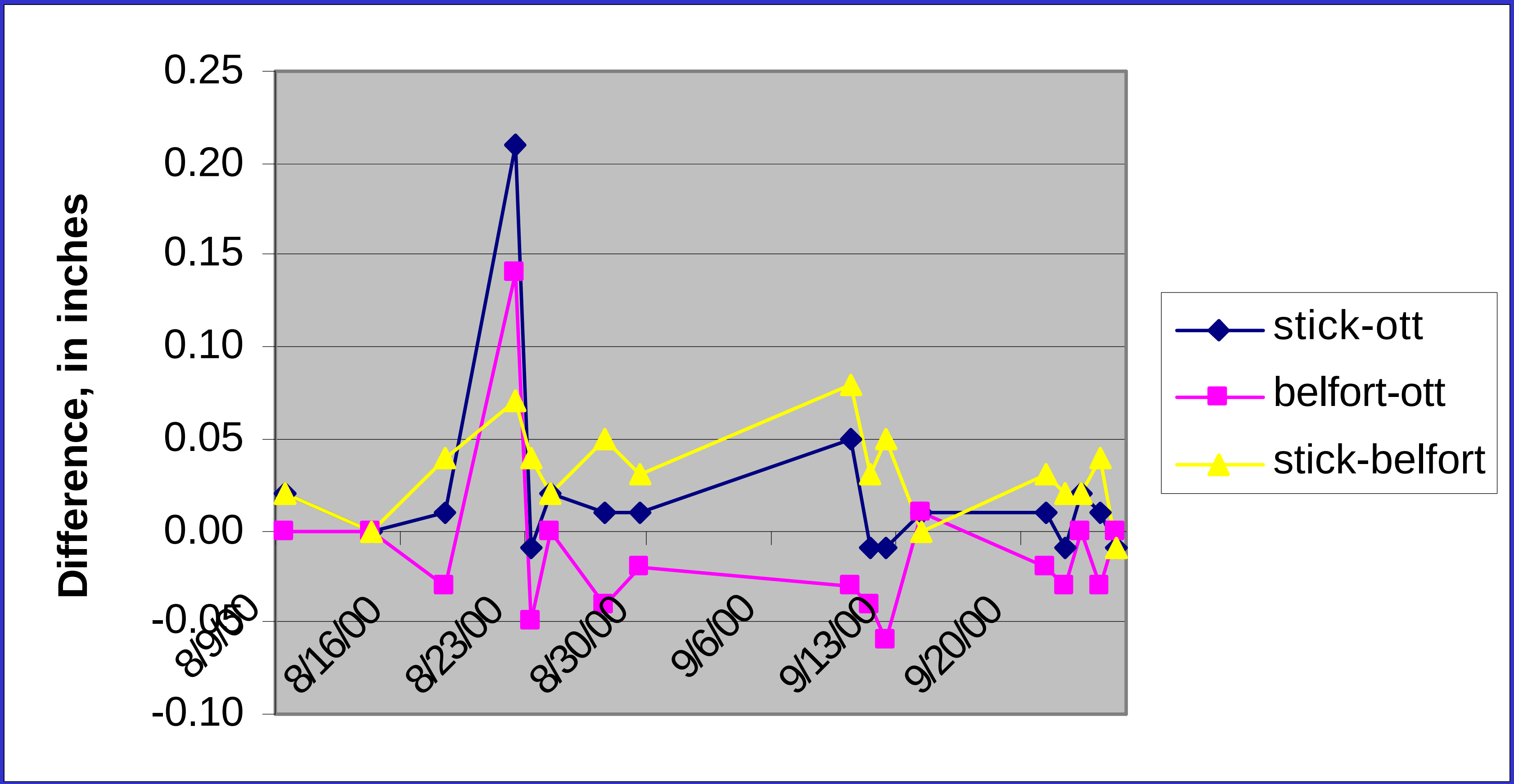
Preliminary Results



Preliminary Results



Preliminary Results



Statistical Analysis

- Data from seven OTT gages, ten Belforts, two stick gages
- Compared on a daily basis for each site, for each pair of gages
- Null hypothesis for analysis is difference between measurements equals 0
- If differences have normal distribution, a paired t-test is used
- If differences are symmetric, but not normally distributed, a signed rank test is used
- Every three months a station will be picked at random to run hourly comparisons

USGS
science for a changing world

Current Progress and Scheduling

- All seven gages are installed and functioning
- SOP completed and distributed to observers
- Receiving data from observers
- Data collection scheduled to run through 1/02
- Statistical analysis will be ongoing during data collection period
- Analysis complete by 4/02
- Report complete by 9/02 – web based report

Plans for upcoming year

- Continue with data collection and analysis
- Install small weather station at NV03 with wind speed/direction, temperature, and barometric pressure
- Install DCP at NV03 – send data to web site

Problems and Concerns

- Laptops may not be ideal for data collection
- Downloading of data from gage is cumbersome
- Software is not user-friendly
- Transmittal of data is complicated – four files for each download

USGS
science for a changing world

NADP FALL 2000 MEETING - SARATOGA SPRINGS, NEW YORK - ATTENDANCE ROSTER

Last Name	First Name	Affiliation	Attendance at NOS Session 17-Oct-00
Archer	Scott	USDI- Bureau of Land Management	X
Artz	Rick	NOAA - ARL	X
Bachman	Sue	Illinois State Water Survey	X
Beach	Martha	N-Con Systems	X
Demir	Brigita	Illinois State Water Survey	X
Dossett	Scott	Illinois State Water Survey	X
Dunn	Allen	Clemson University	X
Frisch	Joel	U.S. Geological Survey	X
Furiness	Cari	North Carolina State University	X
Gordon	John	U.S. Geological Survey	X
Harlin	Karen	Illinois State Water Survey	X
Johnson	Susan	Minnesota Pollution Control Agency	X
Kobe	Rich	Michigan State University	X
Lamb	Dennis	Penn State University	X
Latysh	Natalie	U.S. Geological Survey	X
MacTavish	Dave	CAPMoN / Environment Canada	X
Maull	Lee A.	Dynamac Corporation	X
Mesarch	Mark	University of Nebraska-Lincoln - SNRS	X
Moore	L. Grady	U.S. Geological Survey - NY	X
Morris	Kristi	USFWS	X
Nilles	Mark	U.S. Geological Survey	X
Robertson	John	JR Consulting	X
Rothert	Jane	Illinois State Water Survey	X
Schaefer	Don	U.S. Geological Survey	X
Shimshock	John	Advanced Technology Systems	X
Sweet	Clyde	Illinois State Water Survey	X
Wolfe	Rosemary	U.S. Environmental Protection Agency	X

CAL Audit

FINAL REPORT TO NOS

October 17, 2000

Saratoga Springs, New York

Background

- An audit of the CAL was completed in September 1999

- Reports regarding the recommendations by the audit team and CAL's responses have been presented at the past two NOS meetings

- This will be the final report to NOS regarding the September, 1999 audit

Overall Performance

- Everything that can be done in response to the audit is being done

- Auditors' Comments:
  - "...Karen and the folks in CAL are doing a super job, and have done well in considering the audit recommendations."
  - "...pleased to see that many of the recommendations were implemented and all suggestions were taken very seriously."
  - "I feel that Karen's response is considered and reasonable."

ACTION ITEM: Safety issues

STATUS (October 2000)

- CAL management has reviewed existing policies with all staff
- ISWS safety manual is being revised
- Review team's recommendations were forwarded to Chair Mark Peden for consideration
- a CAL analyst has been appointed to the safety committee

Action Item: Revised CAL QAP needed

Status

- a CAL QAP draft for the laboratory has been prepared and is being internally reviewed
- the Data Validation/Verification portion is being written

a final version including both sections will be available by the Spring meeting

Action Item: Annual update of SOPs needed

Status

- All staff have reviewed and revised SOPs

- SOPs are currently being reviewed by the CAL Director and CAL QA Specialist

ACTION ITEM: the supervisory analyst needs some relief from analytical duties in order to perform her supervisory functions

STATUS

- this recommendation is being implemented

- supervisors have more time for supervisory functions now that the CAL is fully staffed

ACTION ITEM: CAL needs its own workspace-sharing space with another tenant is leading to problems

- **the cotenant's fume hood is filled with heavy metal waste and aging reagents.**

- **a potential exists for lax safety practices of the cotenant to compromise the safety and analytical work of the CAL.**

STATUS

- Moving the cotenant is being discussed with University management.

CAL is working with them to coordinate work schedules to enhance the situation. For example, the digestion and the flow injection work is being be coordinated and is no longer run simultaneously.

- Housecleaning and safety issues regarding the cotenant have improved.

ACTION ITEM: If CAL sample load expands, as projected, then thought needs to be given to computerized scheduling and tracking of sample blocks in the laboratory and data management system, instead of the casual system, in place, which has worked well over the years.

STATUS

- **The data management system continues to be updated and refined. The new sample and parts management system as well are refinements to the analytical data processing procedures contribute to this process. CAL management will continue to pursue additional developments to allow for efficient monitoring of the processes involved in sample tracking.**

ACTION ITEM: CAL should explore the use of using more standards closer to the present method detection limit. It was noted that the lowest standard for Calcium was 0.100 ppm with claimed MDL of 0.009 ppm. Calibration standard curves were limited to five points with a blank. Current software allows an unlimited number of standards for I.C. and F.I.A. methods..

STATUS

- **CAL has reevaluated and selected new ranges based on the NTN 5th and 95th percentiles. This resulted in a general lowering of the concentration of the lowest calibration standard**

- **Change was implemented in January, 2000**

Additional action items and their current status are described in the full report, including:

MSDS record keeping

Instrument maintenance record system

Analyst training record system

Expense forecasting for instruments

Updated 10/12/00

Infrastructure needs for the National Atmospheric Deposition Program: Timeline, Progress, functional specifications and rationale for new sampling equipment

A. Partial Timeline

Tasks affecting precipitation gage and sampler

~~**April 1999** NOS equipment ad-hoc committee completes a draft needs assessment.~~
~~**May 1999** NOS sub-committee endorses needs assessment, phase III precipitation gage testing, and the concept of new sampler development.~~
~~**July 1999**, Budget Advisory and Executive Committee endorse phase III precipitation gage testing and new sampler development.~~
~~**July 1999,** Budget Advisory Committee tasked with developing 1) a short term plan for funding phase III rain gage testing and new sampler design and prototype development. NADP Budget Advisory and Executive Committees approve a funding plan for Phase III precipitation gage testing and new sampler design and prototyping~~
November 2000 NADP Executive Committee implements a process to develop a funding strategy for production and deployment of new equipment on a network wide basis.

Tasks affecting precipitation gage

~~**November 1999** Phase II precipitation gage testing results are presented to NOS.~~
~~**November 1999** NOS approves required functional specifications for precipitation gage.~~
~~**December 1999**, Phase III precipitation gage test sites are identified, equipment is ordered for phase III precipitation gage testing.~~
~~**July 2000**, Phase III precipitation gage testing commences at NADP sites.~~
April 2001, preliminary Phase III precipitation gage results presented to NOS for review.
July 2001, Executive committee reviews results of Phase III precipitation gage tests.
December 2001, Phase III rain gage testing completed.
April 2002, Final report of Phase III precipitation gage tests delivered to NOS. NOS recommends deployment for Technical and Executive Committee review and consideration.
2003, New precipitation gage procured and deployed network-wide.

Tasks affecting new sampler

~~**August 1999**, SBIR grant application for sampler design is submitted via NOAA SBIR program.~~
~~**November 1999**, NOS approves functional specifications for new sampler.~~
~~**February 2000,** NOAA provides update on SBIR progress.~~
October 2000, New sampler prototype delivered to the NADP program.
November 2000, Phase 1 new sampler testing commences, Bench testing
March 2001, Phase II new sampler testing commences (initial field testing).
November 2001, Initial results from Phase I and II new sampler testing presented to NADP NOS and Technical committee. Committees endorse or rescind Phase III testing. If endorsed, site selection for phase III testing is made.
January 2001, Phase III samplers are procured.
April 2001, Phase III testing commences
October 2002, Phase III sampler testing completed.

B. Progress to date

Precipitation gage

Phase I (environmental chamber testing) and initial field-testing (Phase II) of a number of modern precipitation gages has been completed. Following Phase II data interpretation, the most likely candidate for further consideration was selected and field tests (Phase III) commenced in July 2000 at 6 NADP sites in various regions of the country, reflecting differences in precipitation types and patterns. Following approximately 18 months of Phase III field-testing, the NADP Network Operations Subcommittee will examine test results and will make a recommendation to the NADP Technical Committee regarding approval of a replacement rain gage. Identification of funds for procurement and testing through Phase III has been identified, and funding mechanisms for network-wide procurement/deployment are being developed.

Deposition sampler

A preliminary concept and a basic set of operational specifications have been developed for a new deposition sampler. NOAA has added a design and prototype development effort to its' SBIR program for FY00 while a parallel-track design prototype development effort has been initiated by a private vendor utilizing private funding. Thus it is anticipated that two competing designs will emerge from the SBIR and private development efforts. It is anticipated that the current program and SBIR funding mechanisms will be adequate for design, prototype development and field testing, however funding mechanisms for mass production, procurement and net-work-wide deployment is in the development phase.

C. Performance requirements for a replacement NADP precipitation gage

Range	? 25 cm liquid water equivalent, unattended (without user intervention)
Resolution	Reporting resolution 0.02 cm. Sensitivity to precipitation onset: 0.02 cm.
Accuracy	Laboratory accuracy: 0.05 cm linear response over entire measurement range and at rates of addition up to 2.5 cm in 5 minutes. Field Accuracy: The greater of +/- 5% or +/- 0.05 cm when compared to the NWS standard stick gage. Comparisons will be made on event, daily and weekly accumulations.
Real Time Reporting	Gage shall report precipitation amounts in real time, current to within 5 minutes of polled data requests, and shall include all precipitation that enters the measurement volume with no delays due to freezing or precipitation sticking to the gage orifice.
Anti-icing properties	The surfaces of the instrument shall be designed so as to eliminate the build-up of snow, ice or rime from interfering in proper operation of the gage.
False reporting	Gage shall not report any change in accumulation, to the reporting resolution of the instrument, in the absence of any form of precipitation.

Low temperature operational limit	-45 C full accuracy
High temperature operational limit	+50 C full accuracy
Low temperature withstanding limit	-55 C
High Temperature withstanding limit	+55 C
Operational wind limits	15 m/s steady, 25 m/s gust (5 second), fully operational
Withstanding wind limits	35 m/s steady, 60m/s gust (5 second)
Reliability, maintainability, availability	Periodic maintenance interval ≥ 90 days Mean time between failure >1000 days Mean time to repair or maintain ≤ 30 minutes
Data reporting and failure indication	Instrument should provide a status report to the attached datalogger indicating condition of important gage functions.
Lightning protection	Field induced and other phenomena surge shall not damage instrument
Grounds maintenance	It shall be possible to bring a lawnmower or string trimmer up to the base of the sampler. String trimmers shall not damage gage base.
Power requirements	110V AC and 12V DC capability with max consumption <5 amps @12VDC

D.2. Performance requirements for a replacement NADP wet deposition sampler

Range	Collection for four independent, representative precipitation samples of 0-25 cm liquid equivalent depth unattended (without user intervention) and with provision for proper routing of overflow
Resolution	Collection of ≥ 32ml of sample per 0.05 cm liquid equivalent depth.
Sensitivity	Instrument shall expose up to 4 independent collection arrays to precipitation within 5 seconds of the onset of precipitation of any type or rate and shall end exposure within 120 seconds of cessation of any form of precipitation.
Accuracy, sample volume in relation to rain gage	For rates of precipitation less than 2.5 cm per hour, +0/- 20% for liquid equivalent depths of 0 to 0.25 cm of precipitation. +0/- 10% for liquid equivalent depths > 0.25 cm of precipitation
Real Time Reporting	Instrument shall report initiation and ending of sample collection array exposure in real time.
False reporting	Instrument shall not expose sample collection arrays or report any exposure, in the absence of any form of precipitation.
Low temperature operational limit	-45 C fully operational

High temperature operational limit	+50 C fully operational
Low temperature withstanding limit	-55 C
High Temperature withstanding limit	+55 C
Operational wind limits	15 m/s steady, 25 m/s gust (5 second), fully operational. All aspects of sampler operation shall be unbiased with respect to wind direction.
Withstanding wind limits	35 m/s steady, 60m/s gust (5 second)
Height	Sampler height shall not exceed 5 feet
Materials	All external surfaces will be constructed of a weather resistant, non-reactive material.
Reliability, maintainability, availability	Periodic maintenance interval ≥ 90 days Mean time between failure >1000 days Mean time to repair or maintain ≤ 60 minutes
Serviceability-Modular design	Key components should be discreet units and field replaceable, ideally with a tool-less, quick-release design for all anticipated service operations.
Error recovery	Sampler shall have provision for automatic reset recovery in the event of transient equipment malfunction, (such as may occur during jamming of drive mechanism or power interruption)
Sample splash contamination	The surfaces of the instrument shall be designed to eliminate the splash of raindrops off the surfaces from affecting the chemical quality of sample collected or by affecting the sensitivity of the precipitation sensing mechanism. Rhodamine dye applied to adjacent collector surfaces shall not be found in sample containers following simulated or actual precipitation events
Synchronous operation	The precipitation sensor and drive train shall service each chemistry sample orifice equally well.
Collector orifice and container materials	The sampler shall accommodate up to four unique sample measurements. Sample orifice and container materials shall be constructed of materials appropriate for each NADP network program. Sampler shall be able to operate with one to four orifices, with each orifice constructed primarily of modular components except when measurements dictate use of alternative materials.
Sample cover seal	Each sample shall be isolated by an air-tight seal in the absence of precipitation

Materials contamination	Samples shall not be contaminated by any material used to channel sample between orifice and collector vessel or by residues from past events. Sample orifice cover shall not contaminate samples.
Sample collection period	Sampler shall be capable of operating without site operator assistance for one-week periods.
Anti-icing properties	The surfaces of the instrument shall be designed so as to eliminate the build-up of snow, ice or rime from interfering in proper operation of the sampler. The cover shall not seize during icing conditions.
Electrical Power	Sampler shall be powered by 110 V AC, 10 amp circuit line power or by external 12 V DC battery. Provision should be made for automatically switched back-up DC power during AC line current interruption. Overload protection via a user resettable circuit breaker will be provided.
Height above ground	Sampler orifices and precipitation sensor should be at the same height as the accompanying reference rain gauge.
Data reporting and failure indication	Instrument should provide a status report through a data port to an external data logger indicating operational sampler status. A simplified on-site status checking capability by "ready lights" or other means shall be provided.
External communications	Communications protocol should be opti-isolated RS-232
Lightning protection	Field induced and other phenomena surge shall not damage instrument
Safety	Sampler shall provide on-board Ground Fault Interruption protection and moving parts shall be shielded or employ other safety features that will preclude injury to persons operating or servicing the equipment.
Grounds maintenance	It shall be possible to bring a lawnmower or string trimmer up to the base of the sampler. String trimmers shall not damage collector base.

NADP-MDN WET DEPOSITION SAMPLER FOR MERCURY AND METALS (combined single sampler)

D.2. Performance requirements for a replacement NADP-MDN wet deposition sampler for mercury and trace metals

Range	Collect a representative precipitation samples of 0-**20** cm liquid equivalent depth unattended (without user intervention) and with provision for proper routing of overflow
Resolution	Collection of ≥ **5.8** ml of sample per 0.05 cm liquid equivalent depth.
Sensitivity	Instrument shall expose to sampling within 5 seconds of the onset of precipitation of any type or rate and shall end exposure within 120 seconds of cessation of any form of precipitation.
Accuracy, sample volume in relation to rain gage	For rates of precipitation less than 2.5 cm per hour, +0/- 20% for liquid equivalent depths of 0 to 0.25 cm of precipitation. +0/- 10% for liquid equivalent depths > 0.25 cm of precipitation
Real Time Reporting	Instrument shall report initiation and ending of sample collection array exposure in real time.
False reporting	Instrument shall not expose sample collection arrays or report any exposure, in the absence of any form of precipitation.
Sample Collection	**The funnel and sample bottle must be heated so that any type of precipitation will immediately become liquid upon contact and flow into the bottle.**
Sample Bottle Temperature	**Must be maintained between 4 to 32 C at the specified low and high operational temperature limits listed below. This will likely require a Peltier refrigeration unit**
Low temperature operational limit	-45 C fully operational
High temperature operational limit	+50 C fully operational
Low temperature withstanding limit	-55 C
High Temperature withstanding limit	+55 C
Operational wind limits	15 m/s steady, 25 m/s gust (5 second), fully operational. All aspects of sampler operation shall be unbiased with respect to wind direction.
Withstanding wind limits	35 m/s steady, 60m/s gust (5 second)
Height	Sampler height shall not exceed 5 feet
Materials	**All surfaces will be constructed of non-metallic weather resistant and non-reactive material.**
Reliability, maintainability, availability	Periodic maintenance interval ≥ 90 days Mean time between failure >1000 days Mean time to repair or maintain ≤ 60 minutes

Serviceability-Modular design	Key components should be discreet units and field replaceable, ideally with a tool-less, quick-release design for all anticipated service operations.
Error recovery	Sampler shall have provision for automatic reset recovery in the event of transient equipment malfunction, (such as may occur during jamming of drive mechanism or power interruption)
Sample splash contamination	The surfaces of the instrument shall be designed to eliminate the splash of raindrops off the surfaces from affecting the chemical quality of sample collected or by affecting the sensitivity of the precipitation sensing mechanism. Rhodamine dye applied to adjacent collector surfaces shall not be found in sample containers following simulated or actual precipitation events
Synchronous operation	The precipitation sensor and drive train shall service each chemistry sample orifice equally well.
Collector orifice and container materials	**The sampling system will consist of a funnel, tubing/connector and bottle. Likely sample train configuration: 1) funnel 129 mm O.D., 2) 2-liter bottle . Length of the sample train up to 75 cm – likely shorter. See discussion below**
Sample cover seal	Each sample shall be isolated by an air-tight seal in the absence of precipitation
Materials contamination	Samples shall not be contaminated by any material used to channel sample between orifice and collector vessel or by residues from past events. Sample orifice cover shall not contaminate samples.
Sample collection period	Sampler shall be capable of operating without site operator assistance for one-week periods.
Anti-icing properties	The surfaces of the instrument shall be designed so as to eliminate the build-up of snow, ice or rime from interfering in proper operation of the sampler. The cover shall not seize during icing conditions.
Electrical Power	**A 110 VAC circuit and enough amperage for heating and cooling of the sample train will power the sampler. Overload protection**

	via a user resettable circuit breaker will be provided. Operation of the MDN sampler by 12 VDC battery is under discussion at this time.
Height above ground	Sampler orifices and precipitation sensor should be at the same height as the accompanying reference rain gauge.
Data reporting and failure indication	Instrument should provide a status report through a data port to an external data logger indicating operational sampler status. A simplified on-site status checking capability by “ready lights” or other means shall be provided.
External communications	Communications protocol should be opti-isolated RS-232
Lightning protection	Field induced and other phenomena surge shall not damage instrument
Safety	Sampler shall provide on-board Ground Fault Interruption protection and moving parts shall be shielded or employ other safety features that will preclude injury to persons operating or servicing the equipment.
Grounds maintenance	It shall be possible to bring a lawnmower or string trimmer up to the base of the sampler. String trimmers shall not damage collector base.

Updated 10/12/00

Sampling Train Description:

The design of the wet deposition sampler for mercury and trace metals is highly dependent on the sampling train configuration and trace metal cleanliness in mind. The current sampling train consisting of a glass funnel, thistle tube and glass bottle is adequate, but not ideal. A new sampling train is being designed, however at this time the final configuration has not been exactly determined. Described below is sampling train that should be used to build a prototype wet-deposition pod for mercury and trace metals. **Using this design, a single wet-deposition sampler with a single orifice can collect rain for both trace metals and mercury.**

<u>Sampling Train Components (See sampling train illustration below)</u>

1) 1 each Nalgene 2-Liter PETG Bottle, #2019-2000 -- see website for properties and specifications http://nalgenelab.nalgenunc.com/products/catalog/productgroup.asp?pgroupId=066
2) 1 each Savillex Transfer cap assembly #0738-4-2 (Teflon lid with 2 each ¼" swaglok fittings)
3) 2 lengths of plastic tubing – ¼" O.D. x 1/8" I.D. x 30 cm
4) 1 each ¼" swaglok tube fitting to ¼ " female NPT plastic union
5) 1 each Nalgene #30255-361 - 129 mm O.D., 122 mm I.D. HDPE funnel

<u>Suggestions for Design</u>

✍✍The sampling train will be assembled in the lab so that site operator handling will be minimized in the field. The site operator should be able to simply drop the sample train assembly down through the top of the wet deposition sampler (or any other way that is simple and minimizes sample train contact). Retrieval of the sample train should be equally as simple. The current MDN aerochem retrofit design makes sample train deployment and retrieval awkward.

✍✍The interface between the funnel and the funnel support should be designed so that no water can be blown into or otherwise enter the wet-deposition sampler unit. The funnel has ribs on the outside requiring that the interface between funnel and support be designed to seal this non-continuous funnel surface.

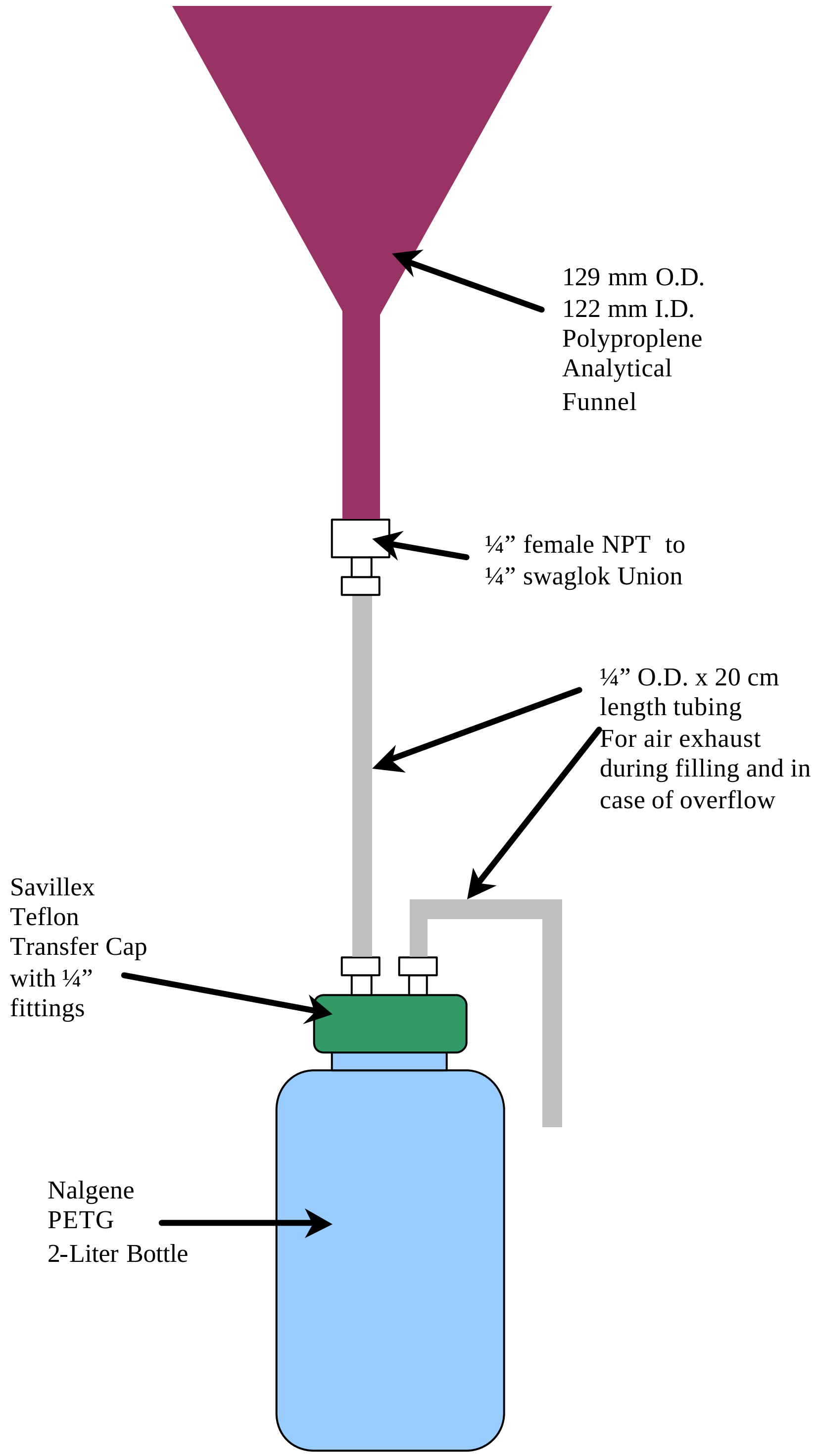
✍✍The sampling train will be connected with secure fittings, but will be lightweight. The design must secure the sampling train so that in high winds it will not be blown out of the wet-deposition sampler.

✍✍The sample train will need to be supported – the funnel alone should not carry the full weight of the sampling train. Ideally, the length of the sampling train will be held to a high tolerance. However, this tolerance is yet to be determined and it may be the case that the support of the sampling train needs to be height adjustable. We would like to <u>avoid</u> the need for height adjustment if possible.

✍✍The current design attempts to keep high temperature limit below 32 degrees C by flushing with outside air. Sample temperatures are routinely over the high limit in the Southern States and summertime conditions with this design. It is expected that a Peltier cooler (or equivalent) will be needed to keep the sample temperature below the upper limit of 32 degrees.

Updated 10/12/00

Proposed NADP-MDN mercury and trace metal sampling train (NOT TO SCALE)



E. Background; Why is this modernization necessary?

The National Atmospheric Deposition Program (NADP) monitors wet atmospheric deposition (chemicals deposited from the atmosphere via rain, sleet and snow) at nearly 265 sites throughout the United States. The program has one of the longest multi-site records of precipitation chemistry in the world and has maintained an effective quality assurance program throughout its operation. NADP networks include a 220-site National Trends Network (NADP/NTN), a 47-site NADP Mercury Deposition Network (NADP/MDN), and a 10-site research network, the Atmospheric Integrated Research Monitoring Network (NADP/AIRMoN).

Funding by 9 Federal agencies and many state and local organizations supports program management, site operation, chemical analysis, data management and dissemination, and quality assurance. In total, over 100 organizations contribute towards the environmental monitoring efforts of the NADP. Initial monitoring sites in the network were deployed in 1978 and a large portion of the network was in place by 1984.

A fundamental NADP objective is to provide scientific investigators world-wide with long-term, high-quality, atmospheric deposition data in support of research in the areas of air quality, water quality, agricultural effects, forest productivity, materials effects, ecosystem studies, watershed studies and human health. All NADP data are available free of charge via the Internet at http://nadp.sws.uiuc.edu/. In 1999 NADP provided over 17,000 data sets to research, regulatory and educational organizations.

Important data applications include gauging the effectiveness of ongoing emission control measures, determining nitrogen inputs from atmospheric sources to sensitive ecosystems and providing regional estimates of mercury deposition in the U.S. and Canada.

?? The program provides a key scientific baseline and nationwide evaluation mechanism for planned regulatory actions such as the Phase II emission reductions for sulfur dioxide and nitrogen oxides scheduled for the year 2000 under the Clean Air Act, as well as an evaluation mechanism for the Phase I reductions that began in 1995.

?? Determining nitrogen loading to sensitive ecosystems from atmospheric sources is another important and growing application of NADP data. Increased nitrogen compound mobilization and distribution via atmospheric sources can result in changes in nutrient runoff, precipitation acidity, and watershed nutrient status. NADP data is being used to estimate the contribution of nitrogen loading to the Mississippi River drainage by the interagency "Hypoxia Task Force" studying hypoxic conditions in the Gulf of Mexico.

?? The 47-site NADP mercury deposition network offers the only regional scale measurements of mercury deposition in the country. More than 40 states have advisories against the consumption of certain freshwater fish because of high mercury concentrations in fish tissues. Atmospheric deposition has been implicated as the dominant source of the mercury to aquatic ecosystems. EPA currently regulates mercury emissions from several categories of waste combustors and is developing an emissions standard for mercury emissions from other categories of combustion sources and chlor-alkali plants. Current and future MDN mercury deposition measurements will provide information for upcoming regulatory decisions as well as supporting the evaluation of the effectiveness of source controls that have been promulgated.

Problem:

Every NADP site is equipped with an automatic precipitation sampler and a recording precipitation gage. The equipment has been operating continuously in the field for an average of 15 years. This aging infrastructure has begun to adversely impact the operational readiness of the program. In 1997, approximately 185 site equipment failures were documented. A significant amount of data is lost annually due to equipment failures and the accompanying site downtime. Additionally, site support systems such as solar panel arrays, underground wiring systems, and field laboratory equipment have reaching the end of product design life cycles and need repair or replacement.

The automated precipitation sampler is a 1970's era design and utilizes many proprietary parts, no longer available from vendors. The samplers contain outdated circuitry and switches that are the primary cause of site down time for the network. In the event the sole source manufacturer and retailer of the sampler were to cease operation, NADP site operations would be compromised by a lack of key replacement parts. Sampling reliability problems and site down time are compounded with the addition of variants of this sampler at a given site for the collection of weekly, event, and mercury samples.

The model of precipitation gage currently in use by the NADP was designed approximately 50 years ago. Most of the existing gages at NADP sites have been in active use in the field for over 15 years, with some in excess of 20 years. These gages utilize a "bucket on a spring" weighing mechanism and a wind-up clock drive to convert the weight of collected rainfall into inked lines drawn on graduated paper charts. Site operators must manually interpret, sum and enter precipitation amounts from these chart traces. This process is labor intensive and subject to error. Data from the USGS collocated precision study and USEPA field audits have indicated that variance in the current raingage measurements is an increasing source of error in deposition amounts. The problem is the gage's worn and corroded mechanical linkage system. The wind-up clock drive mechanism is failure prone and is a significant contributor to the total number of part failures in the program and to data loss.

NADP precipitation data are recorded mechanically with a pen and chart and, as a result, cannot be accessed in real time. Real-time precipitation data would benefit the network operationally, as well as providing agencies such as the National Weather Service with real-time data from an additional 200+ all weather precipitation gages. System failures, now detected only when the operator makes the once-a-week site visit to collect the sample, could be detected when the failure occurs. The current loss of at least one week, and usually 2 weeks of deposition samples could be shortened to days.

Solution:

Overview

The solution entails a network-wide infrastructure renewal through 1) the design, testing, manufacture and network-wide deployment of a modern and versatile sampler, one capable of collecting up to 4 separate samples for analysis of a broad suite of chemical constituents and 2) the testing and deployment of a modern off-the-shelf, all weather weighing precipitation gage with telemetry capabilities. As part of this renewal, deteriorating solar or AC power system infrastructure and field laboratory equipment would also be replaced or upgraded.

Deposition sampler

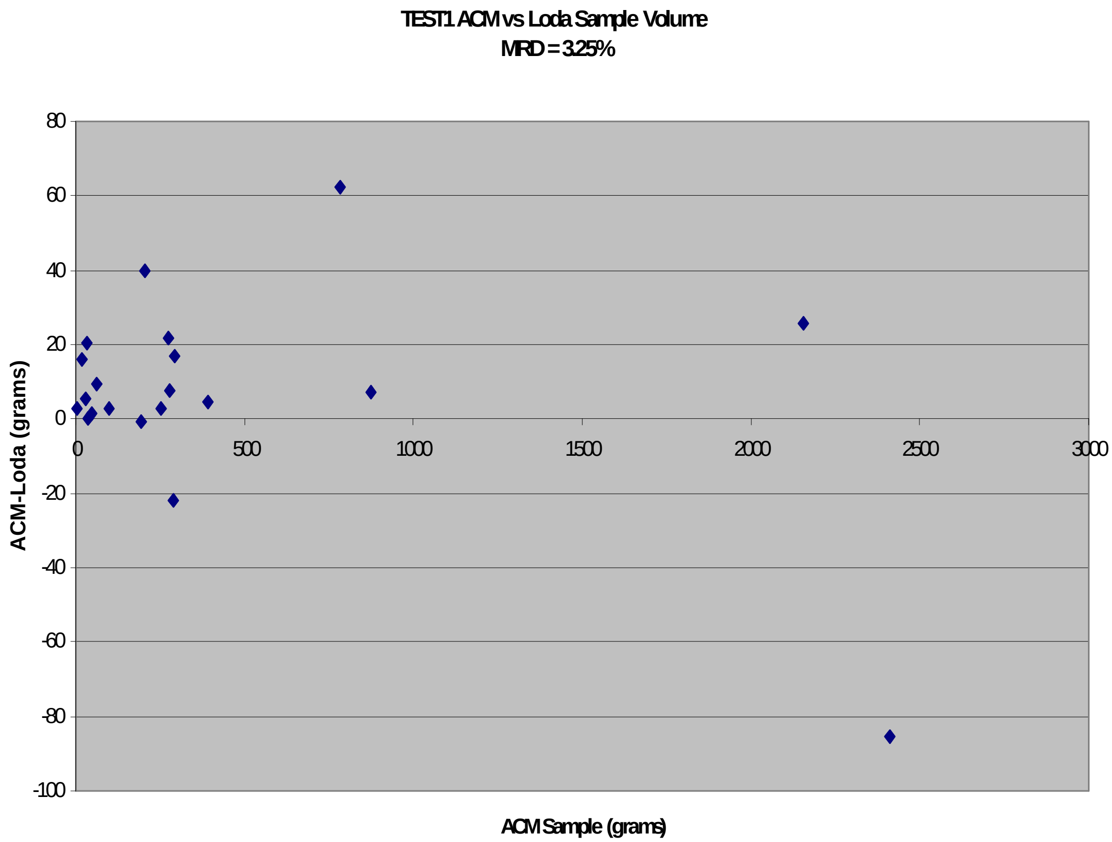
An examination of other models of deposition samplers has not identified any that would be suitable for deployment as a replacement to the current NADP sampler. Models examined from networks in Europe, Canada, Asia and Australia either share many of the same limitations as the current NADP sampler, or employ excessively costly and complex sampling methodologies. NADP requires a simple, robust sampler that exposes multiple sampling areas to precipitation, one that employs a design to protect these areas from contamination when it is not raining as well as providing effective separation between sample areas to prevent cross-contamination between sampling protocols. Collecting samples analyzed for different constituents requires specialized materials and handling procedures, depending on the constituents of interest. A single new collector needs to support four independent sample collection surfaces, one for each of the NADP network sampling protocols, as well as providing the capability to add sampling capabilities to address emerging issues (without adding collectors as is now the case). These 4 individual sampling areas in a basic sampler design would accommodate simple, low-cost sampling surfaces and methodologies, as well as accommodating more complex and specialized sampling materials and techniques. An initial conceptual design entails a central motor control and precipitation sensor module, surrounded by up to 4 sampling "pods" added as needed and arranged in a spoke-like design around the central control unit. This concept would provide single instrument reliability while providing specialization to support multiple sampling protocols. While pods could be optimized for each specific measurement, the intent would be to make most of the parts interchangeable. The design would employ a datalogger to handle bookkeeping chores such as recording lid openings and closings and would also be linked with the official NADP precipitation gage.

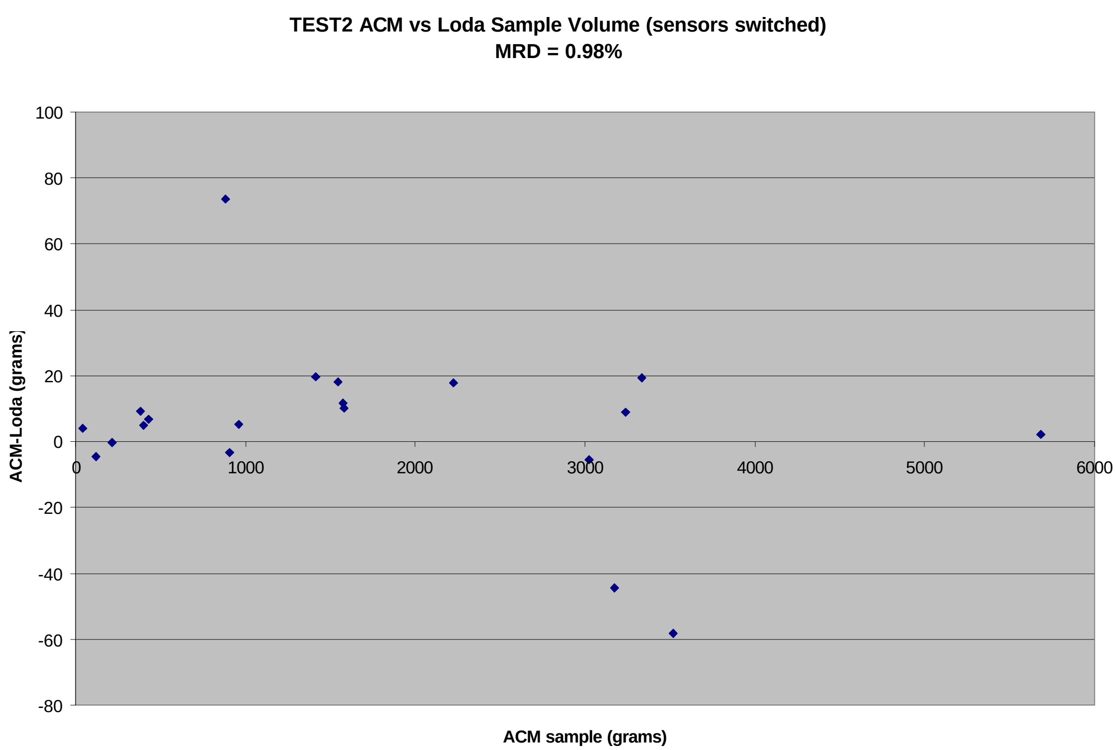
Precipitation gage

Several modern, off-the-shelf precipitation gages that employ digital output are currently being tested as potential replacements for the aging NADP precipitation gages. New gages have increased accuracy, improved reliability and the ability to digitally transfer the precipitation data from memory units in the gage to program computer files via telemetry or other means. By adding telemetry capability, site operators and other program support personnel can detect site system problems and prepare for needed site maintenance. Currently, problems at the site are not detected until the operator visits the site weekly to collect the sample. Consequently, at least one and usually 2 weeks of deposition are lost due to the need to order parts and then re-visit the site to make repairs.

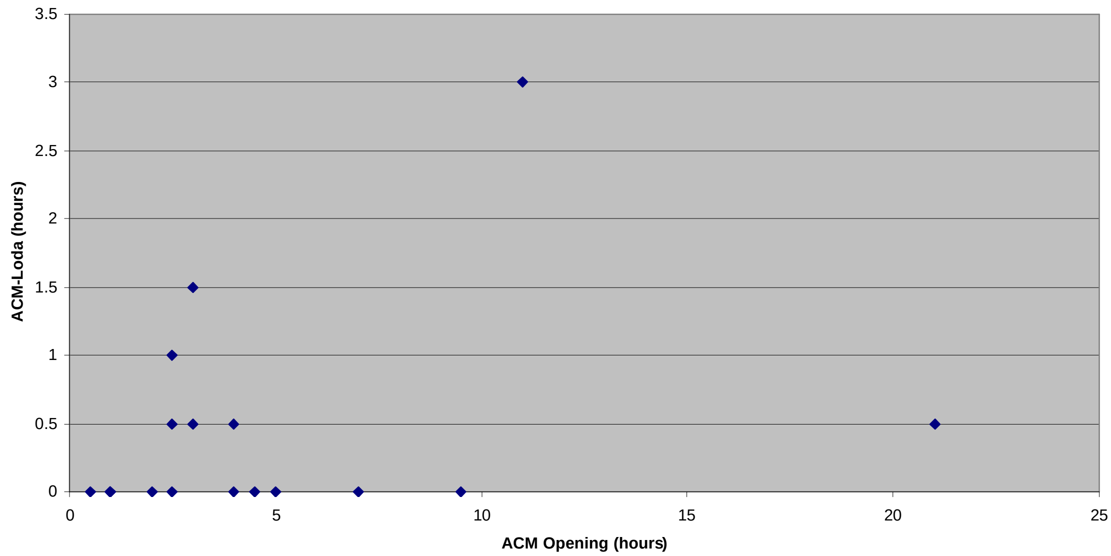
F. NADP fiscal structure

Funding by 9 federal agencies and many state and local organizations support program management, site operations, chemical analysis, data management and dissemination, and quality assurance. In total, over 100 organizations contribute towards the environmental monitoring efforts of the NADP at an estimated annual cost of ~$4.2M. No single agency contributes more than 30% of program expenditures. Most federal agency funding "dedicated" to the NADP (i.e., budgetary line items and primary initiatives) has been subsumed into other programs over the 20 years of NADP operations. Ongoing support consists primarily of small allocations from these programs, which rely on NADP data to support agency objectives, integrated research and policy assessment. While this broad decentralized funding has enhanced the fiscal robustness for NADP operations, it adds to the difficulty of identifying substantive resources for needed one-time network upgrades and improvements. Within current agency budgets there is no readily identifiable source of one-time funding for deployment of equipment that could be tapped for this modernization effort. Hence program representatives are seeking to identify a one-time single appropriation to provide funding for equipment replacement for the entire network.


TEST1 ACM vs Loda Sample Volume
MRD = 3.25%
80
60
40
20
0
-20
-40
-60
-80
-100
0
500
1000
1500
2000
2500
3000
ACM-Loda (grams)
ACM Sample (grams)


TEST2 ACM vs Loda Sample Volume (sensors switched)
MRD = 0.98%
100
80
60
40
20
0
-20
-40
-60
-80
0
1000
2000
3000
4000
5000
6000
ACM-Loda (grams)
ACM sample (grams)

TEST1 ACM vs Loda Opening Duration
MRD = 0%



TEST2 ACM vs Loda Opening Duration (sensors switched)
MRD = 0%