

# **Mercury Deposition Network Site Operations Manual**



For information about the National Atmospheric Deposition Program (NADP) contact:

NADP Program Office  
Illinois State Water Survey  
University of Illinois at Urbana-Champaign  
2204 Griffith Drive  
Champaign, Illinois 61820-7495

URL: <http://nadp.isws.illinois.edu>

e-mail: [nadp@isws.illinois.edu](mailto:nadp@isws.illinois.edu)

phone: 217-333-7871

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## Document Change History

Version	Description	Effective Date
2.3	Updated Tables 1, 3, 6, and 7. Updated Training information. Updated protocol for lid seal replacement. Updated FAQ to include statement about Thies sensor with ACM collector, special studies, and SC115 flash drive.	01/2017
2.2	Major revision from 2003 document.	03/2015

## Abbreviations

AIRMoN	Atmospheric Integrated Research Monitoring Network
AMNet	Atmospheric Mercury Network
AMoN	Ammonia Monitoring Network
CAL	Central Analytical Laboratory
FGS	Frontier Global Sciences
FOF	Field Observer Form
FORF	Field Observer Report Form
HAL	Mercury (Hg) Analytical Laboratory
MDN	Mercury Deposition Network
MOF	Mercury Observer Form
NADP	National Atmospheric Deposition Program
NED	Network Equipment Depot
NOS	Network Operations Subcommittee
NTN	National Trends Network
PDA	Personal Digital Assistant
PO	Program Office
QA	Quality Assurance
QC	Quality Control
SAES	State Agricultural Experiment Stations
SOP	Standard Operating Procedures
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

## **Introduction**

The Mercury Deposition Network (MDN) is the only long-term network for monitoring mercury in precipitation across the United States and Canada. The network began operation in 1994.

Each site in the network is configured with an automated precipitation collector and a raingage. Weekly composite samples are collected every Tuesday morning. Site operators follow standard operating procedures to ensure data comparability and representativeness throughout the network. All samples are shipped to the Mercury (Hg) Analytical Laboratory (HAL) at Eurofins/Frontier Global Sciences in Bothell, Washington for analysis. Total mercury is reported for all samples. Some samples are analyzed for methyl mercury as well. This work is done under a separate contract with the National Atmospheric Deposition Program's Program Office (NADP PO).

Following review of the data for completeness and accuracy, data are made available on the NADP website. Data are flagged for equipment failure, sample mishandling, and contamination. A map indicating active and inactive MDN sites is available on the NADP website, as is the complete data record for each site in the network.

Quality Assurance/Quality Control (QA/QC) activities ensure integrity throughout the network. The U.S. Environmental Protection Agency (EPA) and U.S. Geological Survey (USGS) administer external QA programs as further checks of the network and its operation.

## **Site Selection and Site Re-location**

Sites in the NADP networks are selected to quantify wet deposition in major physiographic, agricultural, aquatic, and forested areas within states, regions, and ecoregions. Sites are located away from urban areas and point sources of pollution, e.g., coal-fired power plants and mercury emitting sources. Siting criteria are presented in detail in the *NADP Site Selection and Installation Manual*. That document is available on the NADP website (<http://nadp.isws.illinois.edu>).

Should a site need to be re-located, the site sponsor should contact the Site Liaison to ensure that the new location meets NADP siting criteria. Additional information regarding site re-location is available in the *NADP Site Selection and Installation Manual*.

## **Approved Equipment**

Table 1 lists the equipment that has been approved by the NADP for use in the MDN network. Periodically, equipment is tested and evaluated for inclusion in the network. Additional information on the procedures for evaluating and approving new equipment is available on the NADP website. The NADP website should be consulted for the most current list of approved equipment. Questions regarding the list of approved equipment may be directed to the Site Liaison for the network. Contact information for each of the active manufacturers, and for the site liaisons is included in the Contact List section of this document.

**Table 1.** NADP Approved Equipment for use in the MDN.

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model Number</b>
Precipitation collector	Aerochem Metrics, Inc.	301 (modified*)
Precipitation collector	Loda Electronics Company	2001 (modified*)
Precipitation collector	N-CON Systems	MDN sampler
Raingage	ETI Instrument Systems, Inc.	NOAH IV
Raingage	OTT Hydromet	OTT NADP Pluvio/Remote Monitoring Module
Raingage	OTT Hydromet	OTT Pluvio <sup>2</sup> /Remote Monitoring Module
Raingage	OTT Hydromet	OTT Pluvio <sup>2</sup> – L/Remote Monitoring Module
Raingage	Belfort	B5-780**
Wind screen	NovaLynx	260-952 (Alter-Type), or equivalent

\* modified collector; wet-side bucket replaced with two 128 cm chimneys to support the sampling train, and enclosing the collector base

\*\* equipment to be retired by 31 December 2011 in the NADP networks

## Site Operation

Four entities have direct responsibility for the operation of a monitoring site: the Site Sponsor, the Funding Agency, the Site Operator, and the Site Supervisor. The individuals in these roles are responsible for the operation of the site in accordance with standard MDN procedures and criteria.

The Site Sponsor may provide in-kind services for the operation of the monitoring site. This may include: site location, site facilities, and/or a site operator. The Funding Agency provides funds for the operation of a site. This may include: equipment, personnel, chemistry, utilities, shipping, and other expenses related to operation of the site. In some cases the Site Sponsor and the Funding Agency are the same.

Tables 2 and 3 indicate the responsibilities of the Site Supervisor and the Site Operator, respectively, and the frequency of those activities.

It is recommended that each site identify a Backup Operator. The Backup Operator performs Site Operator duties when the Primary Operator is not available.

Excluding travel to and from the site, weekly activities associated with operation of the site may take approximately two hours to complete.

In order to maintain uniformity throughout the network, the wet deposition sample should be processed every Tuesday morning as close to 9:00am as possible. Inclement weather and the availability of personnel during holidays may prohibit the sample from being processed on this schedule. To account for such instances, samples may be processed either early or late. The MDN bottle contains a pre-charge which preserves the mercury in the wet-deposition sample.

As such, MDN samples are not invalidated based on the length of time the sample train was deployed.

**Table 2.** Responsibilities of the Site Supervisor.

<b>Activity</b>	<b>Frequency</b>
Ensure conformance with MDN procedures	As needed
Ensure conformance with MDN siting criteria	As needed
Review site data	Monthly
Review data reports and summaries	Annually
Arrange for resources to correct problems	As needed

**Table 3.** Responsibilities of the Site Operator.

<b>Activity</b>	<b>Frequency</b>
Inspect site and equipment	Weekly*
Verify sensor operation	Weekly*
Collect and process sample	Weekly*
Collect and process raingage data	Weekly*
Complete MOF	Weekly*
Ship sample and MOF to the HAL	Weekly*
Change dry side bucket bag	Weekly*, if dry-side bucket is present
Replace dry side bucket	As needed, if present
Clean collector surfaces	Weekly*
Clean and inspect collector lid seal	Weekly*
Replace collector lid seal	As needed
Maintain/stir anti-freeze solution in raingage	Weekly*, when winterized
Verify equipment is secure and level	Monthly
Troubleshoot equipment	As needed
Repair and maintain equipment	As needed
Replace/upgrade equipment	As needed
Winterize/Summerize equipment	Annually (location dependent)
Participate in Field QA Programs	Once every year
Participate in External Site Performance and Systems Survey	Once every 3-4 years

\* Every Tuesday morning.

This document does not address safety issues that may result from the operation and maintenance of a monitoring site. It is the responsibility of the site operator and the site supervisor to determine regulatory requirements, and establish appropriate safety protocols.




## Weekly Activities

As indicated in Table 3, some activities associated with the operation of an MDN site must be performed on a weekly basis. Completion of the weekly tasks on a regular schedule is essential. Detailed instructions for many of the weekly activities are included in separate Standard Operating Procedure (SOP) documents and can be accessed from the NADP website. On-line video instruction materials detailing these same activities are in production.

## MDN Observer Form

When processing the weekly precipitation sample a MDN Observer Form (MOF) must be completed. Figure 1 illustrates that form. The Site Operator, i.e., the person processing the sample, should complete Blocks 1-11 on the form. Incomplete forms require additional resources to process, and require a phone call to the Site Operator to gather the missing information. It is recommended that the Site Operator verify that the form is complete and that the information is legible before sending the MOF, and the sample, to the HAL.



**NATIONAL ATMOSPHERIC DEPOSITION PROGRAM**  
A Cooperative Research Program of the  
State Agriculture Experiment Stations (NRES-3)  
Federal and State Agencies  
and Private Research Organizations

### MDN OBSERVER FORM

Send Completed Form With Each Shipping Cooler  
Problems? Call the HAL toll free at 1-877-622-6960

Courier/Tracking # \_\_\_\_\_  
 LAB ID \_\_\_\_\_

<b>1. STATION</b> Name <u>Program Office Site 01</u> ID <u>P 0 0 1</u>	<b>2. OBSERVER</b> Print name <u>N.S. Liaison</u> Initials <u>N S L</u>	<b>HAL/NADP Use Only</b> <b>Sample Receipt</b> Name (print): _____ Date: MO DAY YR _____ Cooler # _____ Time Hour Minute _____ Bag Open? Yes No Leak? Yes No _____ Full Wt. _____ Empty Wt. _____ Net Wt. _____ Leak Wt. _____ Total Wt. _____																																																																						
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<b>7. PRECIPITATION RECORD</b> R - Rain Only (includes Hail) S - Snow Only M - Mixture U - Unknown <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th>Type</th><th>MON</th><th>TUES</th><th>WED</th><th>THURS</th><th>FRI</th><th>SAT</th><th>SUN</th><th>MON</th><th>TUES</th><th>WED</th> </tr> <tr> <td>Circle one</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td><td>R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U</td> </tr> <tr> <td>Inches</td><td></td><td></td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td></td><td></td> </tr> <tr> <td>or Circle one</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td><td>Z T MM</td> </tr> <tr> <td></td><td colspan="10">Z - Zero T - Trace MM - Missing</td> </tr> <tr> <td></td><td colspan="10">Total Precipitation <u>0 . 0 3</u></td> </tr> </table>				Type	MON	TUES	WED	THURS	FRI	SAT	SUN	MON	TUES	WED	Circle one	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	R S M U R S M U R S M U R S M U R S M U R S M U R S M U R S M U	Inches			0	0	0	0	0				or Circle one	Z T MM	Z T MM	Z T MM	Z T MM	Z T MM	Z T MM	Z T MM	Z T MM	Z T MM	Z T MM		Z - Zero T - Trace MM - Missing											Total Precipitation <u>0 . 0 3</u>										<b>8. OVERFLOW</b> YES NO (check one) <input checked="" type="checkbox"/> Overflow _____ 0 mL	
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<b>10. REMARKS</b> For example: equipment malfunction, contamination, farming, burning, logging, leakage, etc. Temperature below 20° F, sensor is not heating. Tree 25m NE of collector removed. Pile of treated lumber railroad ties 60m S of collector removed. Liquid in overflow dish, but sample bottle not full. No cracks in sample bottle or sample train.		<b>11. SUPPLIES</b> Circle if needed, unit received. Gloves _____ Field Forms _____ Rain Gauge Charts _____ Sample Bottles _____ Rain Gauge Ink _____ Dry Seal Bags _____ Lid Seal Pad _____ ACM Air Filter _____ Mill-Q Water _____		<b>HAL Use Only</b> Preservation: _____ Date _____ Initials _____ HCL _____ mL _____ BrCl _____ mL _____ Composition: _____ mL _____ Split: _____ mL _____ Split Bottle ID _____ Comp. Bottle ID _____																																																																				

WHITE - Program Office Copy
YELLOW - HAL Copy
PINK - Site Operator Copy
Rev 4/08

Figure 1. MDN Observer Form.

## Non-standard Operation

In some instances it is necessary to place the equipment in a non-standard operating mode. The Site Liaison will decide when this is necessary. Bulk sampling is one example of non-standard equipment operation. In this mode the sample train and sample bottle are exposed continuously during the sample period. The Site Liaison may request bulk sampling when the sensor or the collector motorbox fail. This should be noted in Block 10 of the MOF.

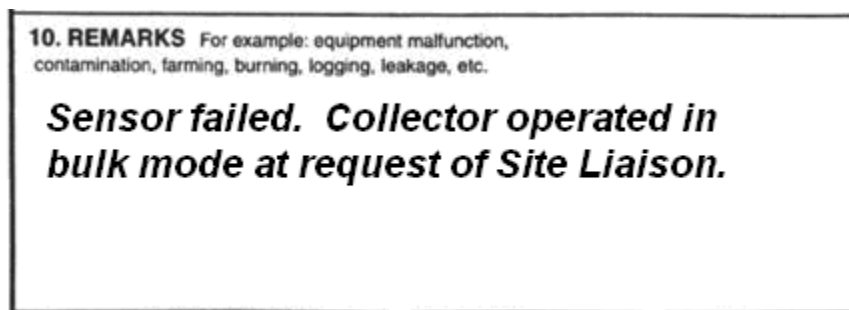


Figure 2. MOF Block 10 indicating bulk sampling.

An undefined sample results when the sample train and sample bottle are exposed during dry weather for more than 6 hours. This may occur when the sensor fails to heat, or when the collector motorbox malfunctions or fails. Both bulk mode samples and undefined samples will be flagged as invalid during data review. It is likely that the chemistry of these samples was impacted by dry deposition.

## Field Chemistry

Field chemistry is not part of the protocol for operation of an MDN site.

## Other Activities

Some activities associated with the operation of an MDN site are performed less frequently than the weekly activities that were discussed earlier in this document. Instructions for completing these activities (e.g., lid seal replacement, sensor replacement, motorbox replacement) are documented in SOPs and are available from the NADP website (<http://nadp.isws.illinois.edu>). It is recommended that the Site Operator verify that the equipment is secure and level on the first Tuesday of each month.

Prior to the onset of winter, those sites which typically experience temperatures below freezing should be winterized. Refer to equipment specific SOPs for winterizing the site. The HAL will send a reminder with instructions for winterizing the site with the weekly cooler containing the replacement sample train and bottle. Winterization includes adding anti-freeze (e.g., ethylene glycol or propylene glycol) to the precipitation gage, replacing the filter in the frame of the collector with insulation block, and adjusting the thermostat to maintain a proper temperature range inside the collector. Additional equipment specific activities are noted in Table 4.

Samples that include snow (S), mixed (M), or unknown (U) precipitation types will be invalidated if the site has not been winterized.

**Table 4.** Equipment-specific winterization activities.

<b>Equipment</b>	<b>Activity</b>	<b>Frequency</b>
Collector	Adjust thermostat	Weekly when winterized
Collector	Plug in and test the heater	When site is first winterized
Collector	Replace filter with insulation block	When site is first winterized
Raingage	Empty weighing chamber and add 2 quarts of antifreeze	When site is first winterized
Raingage	Maintain/stir anti-freeze mixture	Weekly when winterized
NWS stick gage (if used as backup raingage)	Remove and store 2” tube and funnel	When site is first winterized
Belfort raingage*	Remove and store funnel from top cap	When site is first winterized
Belfort raingage* clock (electric)	Replace battery	When site is first winterized
Battery (DC powered sites)	Service battery fluid	When site is first winterized
Battery (DC powered sites)	Load test	When site is first winterized

\* equipment to be retired by 31 December 2011 in the NADP networks

When the anti-freeze mixture becomes dilute, it will lose its effectiveness and the mixture may freeze in the weighing chamber. This may cause the weighing chamber to crack. To prevent this from occurring, the weighing chamber should be emptied and fresh anti-freeze added to it. A transfer pump (available from the NED) should be used to empty the weighing chamber. The raingage should be inspected weekly to ensure this does not become a problem. Anti-freeze is toxic to wildlife and should be disposed of properly. RV/camper anti-freeze (propylene glycol) is more environmentally friendly and may be a better option for use.

When the temperature at a site will remain above 40°F consistently, those sites that have been “winterized” should be “summerized.” Refer to equipment specific SOPs for summerizing the site. The HAL will send a reminder with instructions for summerizing the site with the weekly cooler containing the replacement sample train and bottle. Activities associated with “summerization” are listed in Table 5.

**Table 5.** Equipment-specific summerization activities

<b>Equipment</b>	<b>Activity</b>	<b>Frequency</b>
Collector	Adjust thermostat	When site is first summerized
Collector	Unplug heater	When site is first summerized
Collector	Replace insulation block with filter	When site is first summerized
Raingage	Dispose of anti-freeze mixture according to proper disposal guidelines	When site is first summerized
NWS stick gage (backup raingage)	Replace 2" tube and funnel	When site is first summerized
Belfort raingage*	Replace funnel in top cap	When site is first summerized
Battery (DC powered sites)	Service battery fluid	When site is first summerized
Battery (DC powered sites)	Load test	When site is first summerized

\* equipment to be retired by 31 December 2011 in the NADP networks

## **Training**

In addition to this manual, it is recommended that those responsible for the operation of a site read the document *NADP Site Selection and Installation Manual*. That document describes the NADP siting criteria and is available from the NADP website. On-line training videos for the MDN are in production. These materials will be available on the NADP website.

## **Troubleshooting**

SOPs are available from the NADP website (<http://nadp.isws.illinois.edu>) to help troubleshoot problems associated with the operation of the wet-deposition monitoring equipment. Documents are available for the three approved collectors, and for the raingages.

## **Field Quality Assurance Program**

The USGS sponsors an external QA program for sites in the MDN. The purpose of this program is to measure the effects of field exposure and sample handling on sample chemistry. Participating sites are asked to process and submit one QA sample during the course of a year. The field QA sample is processed during a dry week, and is submitted to the HAL. Results from the program are available at <http://bqs.usgs.gov/>. Contact information for this program is available in the Contact List section of this document.

The collocated equipment program is another QA program sponsored by the USGS. This program allows a site to operate pairs of collectors and/or pairs of raingages. The equipment pairs may be the same make and model, different models from the same manufacturer, or different models from different manufacturers. This program is used to assess the overall error in MDN measurements, and for testing equipment that is proposed for network use. Site Operators may be asked to participate in a collocated equipment program for a period of a year or more.

## Site Performance and Systems Survey

The U.S. EPA sponsors an external, independent survey of sites in the NADP networks. Each site in the MDN is surveyed once every 3-4 years by an independent survey team. The survey team will contact the site approximately one month prior to their visit to schedule the survey.

Weather permitting, the survey team will:

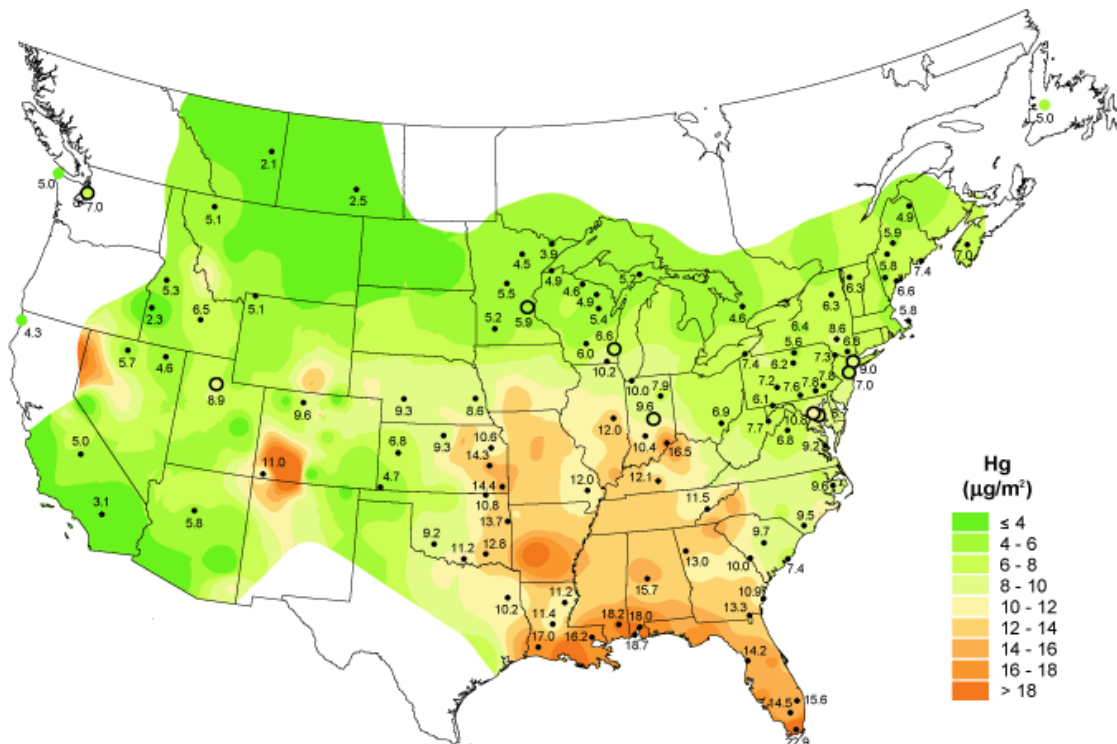
- verify the operation and calibration of field equipment
- document site information
- document compliance with siting criteria
- photograph the site
- verify conformance with NADP procedures
- answer operator questions
- assist with minor repairs and maintenance

As part of the site survey, the site operator will be asked to perform a sample change. This will impact the sample duration of both the current sample and the subsequent sample. As discussed in the *Site Operations* section of this document, MDN samples are not invalidated based on the length of time the sample train was deployed.

A report will be sent to the Site Operator and the Site Supervisor following completion of the survey. The report will provide findings from the survey including: a list of supplies to be ordered, items to be repaired, and conditions of the site relative to the approved siting criteria. Contact information for this program is available in the Contact List section of this document.

## NADP Website

The NADP website can be accessed at <http://nadp.isws.illinois.edu>. The website contains the complete data archive for each site in the network, documents relating to the operation of the network, documentation from the site surveys, and a range of data products. Figure 3 illustrates one of the data products, a deposition isopleth map. Site Operators and Site Supervisors are encouraged to use the website.



**Figure 3.** Mercury wet deposition isopleth map for 2009.

## Frequently Asked Questions

We would like to start a new site in the network. What do we need to do?

*The “NADP Site Selection and Installation Manual” and the “Site Installation Worksheet” are two documents that will help with this process. Both documents are available from the NADP website. Once complete, the “Site Installation Worksheet,” with a sketch and photos of the proposed site, should be submitted to the NADP Program Office for possible acceptance in the network. Contact the Site Liaison for additional information.*

We would like to conduct a special study at our NADP site. The study might use NADP equipment. What should we do?

*Please contact the Site Liaison before proceeding. All special studies at NADP sites require network approval. This is particularly true if NADP equipment (e.g., the dry-side bucket) will be used in the study.*

A new operator will start next month and will assume primary responsibility for the site. What should we do?

*First, we extend our thanks to the current site operator for all of their efforts operating and maintaining the site.*

*Next, contact the Site Liaison. The Site Liaison will need contact information for the new operator. If possible, provide overlap training for the new Site Operator. Provide a copy of this manual (the “Mercury Deposition Network Site Operations Manual”), and the*

*“NADP Site Selection and Installation Manual.” Both documents are available on the NADP website. On-line training videos for the MDN are in production. These materials will be available on the NADP website.*

I need to re-locate my site. What do I need to do?

*The “NADP Site Selection and Installation Manual” includes guidance for site re-location. This document is available on the NADP website. The Site Liaison can provide guidance as well. The “move” date for the site must be documented. The funding agency should be notified at the outset, and should be kept apprised as work progresses.*

My site will be closing. What do I need to do?

*Contact the Site Liaison. The final “Date Off” for samples will need to be documented. The Site Liaison will discuss the fate of equipment and supplies. Site closure must be done in collaboration with the funding agency.*

I received the wrong glass sample train for use with my site. What should I do?

*Contact the Site Liaison as soon as possible to have the correct sample train shipped to your site. A red cooler should contain glassware for use with an Aerochem Metrics MDN collector. A blue cooler should contain glassware for use with an N-CON MDN collector.*

It is Tuesday morning and it is raining (or snowing). Should I change the sample in the rain (snow)?

*It is best to change the sample after the precipitation has stopped. If this is not possible, and if it is safe to collect the sample, then the sample may be collected during the precipitation event. Use caution so as to prevent bodily harm, and possible sample contamination from clothing, an umbrella, etc. Indicate in Block 10 of the MOF that the sample was collected during a precipitation event.*

Next Tuesday is a holiday. No one will be available to collect the sample. What should I do?

*When personnel are otherwise unavailable to collect a sample on Tuesday, the network allows the sample bottle to be collected early, or late without impacting the validity of the sample. MDN samples are not invalidated based on the length of time the sample train was deployed.*

A portion of the sample spilled in the field when collecting the sample bottle from the collector. What should I do?

*Note this in Block 10 of the MOF. This will impact sample mass. It may also impact sample chemistry. Do not return the spilled sample to the sample bottle. Doing so will invalidate the sample.*

The overflow dish contains liquid, but the sample bottle is not full. What should I do?

*Inspect the sample train and sample bottle for cracks. Dispose of the liquid in the overflow dish and dry the dish. Do not add the overflow liquid to the sample bottle. Doing so will invalidate the sample. Note the presence of liquid in the overflow dish and any observations in Block 10 of the MOF.*



The sample bottle is full and the overflow dish contains liquid. What should I do?

*Using a graduated cylinder, measure the volume of the liquid in the overflow dish. Note this volume in Block 8 of the MOF. Dispose of the overflow liquid and dry the overflow dish. Do not add the overflow liquid to the sample bottle. Doing so will invalidate the sample.*

The dry-side bucket/bag contains a significant volume of water (or snow). What should I do?

*Indicate this in Block 10 of the MOF. If the precipitation gage indicates precipitation during the week it is likely that the collector malfunctioned. Verify proper operation of the sensor and the collector motorbox. If necessary, call the Site Liaison for assistance troubleshooting the problem. If equipment malfunction or failure is determined, answer NO to question 1 in Block 4 of the MOF. Call the Site Liaison to order replacement parts.*

My site has an Aerochem Metrics collector. How frequently should I change the dry-side bucket?

*As needed.*

Where do I get a new dry-side bucket?

*Contact the Site Liaison for a new dry-side bucket.*

How do I verify the operation of the grid-type sensor?

*When the ambient temperature is below 40°F, the grid sensor should heat and be warm to the touch. Place the side of one's little finger on the grid to verify whether the sensor is heating.*

*A drop of water on the sensor grid should trigger the sensor, causing the sensor to heat, and the collector to open. Blow on the sensor grid to dry it. This should cause the collector to close.*

*If any of these conditions is not met, the sensor may need to be replaced. Consult the Site Liaison for guidance.*

Which grid sensor should I use with my MDN Aerochem Metrics collector?

*The MDN requires an 11-grid sensor when a grid-type sensor is used with the collector.*

Can I use an optical sensor with my MDN Aerochem Metrics collector?

*Though a version of the Thies optical sensor can be used with an Aerochem Metrics collector, the default sensor remains the 11-grid sensor.*

Does the precipitation gage at my site need a wind shield?

*Sites that receive more than 20% of their annual precipitation as snow must install an Alter-type shield on their precipitation gage. This should be complete by 31 December 2011. Sites at an altitude of 1,000 meters or more are encouraged to install a wind shield on their precipitation gage.*



How high above the top of the precipitation gage should the Alter-type wind shield be installed?  
*The pivot axis for the leaves of the Alter-type shield should be at the same height as the orifice to the precipitation gage.*

Ice on the collector arms is a problem at my site. We replace several motorboxes on the collector each winter. What can we do?  
*Replacement bushings for the collector arms may be requested from the Site Liaison. The replacement bushings are made of Delrin, a synthetic material with a low coefficient of friction. Additionally, a snow roof can be installed on the collector lid.*

*Collector arm boots may be requested from the Site Liaison. The collector arm boots are installed at the base of the collector arm, where the collector arm meets the collector frame. The boots may help prevent ice from forming at the base of the collector arm.*

How often should I submit data from the electronic raingage?  
*Data from the electronic raingage should be submitted weekly. Ideally, this should be the same day that the sample is collected from the field. In most cases this would be on a Tuesday.*

To whom should I submit data from the electronic raingage?  
*Data files for the electronic raingage should be uploaded to the following site:*  
<http://nadp.isws.illinois.edu/upload/>

*Alternatively, the data files may be emailed to:*  
[nadp-precip@isws.illinois.edu](mailto:nadp-precip@isws.illinois.edu).

Is the SC115 flash drive compatible with a MacBook?  
*Yes. Ensure “External disks” is selected under Finder Preferences if the SC115 does not appear.*

How do I download data from the electronic raingage?  
*Consult the document “Procedures for downloading raingage data.”*

I cannot connect to the electronic raingage with the PDA. What should I do?  
*Verify that Bluetooth is turned on for both the PDA and the electronic raingage. If this does not resolve the problem, power cycle the PDA by depressing the power button on the top right side of the PDA.*

My PDA is broken. What should I do?  
*Verify that the battery in the PDA is charged. If the problem persists, contact the Site Liaison.*

Can any PDA be used to collect data from the electronic raingage?  
*Though most PDAs could be used to communicate with the electronic raingage, software provided by NADP is required.*

## Contact Lists

**Table 6.** NADP contact information.

<b>NADP Personnel</b>		
<b>Contact</b>	<b>Phone Number</b>	<b>email address</b>
AIRMoN Site Liaison	800-952-7353	<a href="mailto:airmon@isws.illinois.edu">airmon@isws.illinois.edu</a>
AMNet Site Liaison	608-335-4232	<a href="mailto:amnet@isws.illinois.edu">amnet@isws.illinois.edu</a>
AMoN Site Liaison	800-952-7353	<a href="mailto:amon@isws.illinois.edu">amon@isws.illinois.edu</a>
MDN Site Liaison	877-622-6960	<a href="mailto:hal@eurofinsus.com">hal@eurofinsus.com</a>
NTN Site Liaison	800-952-7353	<a href="mailto:ntn@isws.illinois.edu">ntn@isws.illinois.edu</a>
Network Equipment Depot, wet-deposition networks	217-244-1913	<a href="mailto:tleon@illinois.edu">tleon@illinois.edu</a>
Network Equipment Depot, AMNet	608-335-4232	<a href="mailto:amnet@isws.illinois.edu">amnet@isws.illinois.edu</a>
Site Performance and Systems Survey Program	217-244-6413	<a href="mailto:rhodes1@illinois.edu">rhodes1@illinois.edu</a>
USGS External Quality Assurance Program	303-236-1837	<a href="mailto:wetherbe@usgs.gov">wetherbe@usgs.gov</a>

**Table 7.** Active manufacturer contact information for NADP MDN approved equipment.

<b>NADP Equipment Manufacturers</b>		
<b>Manufacturer</b>	<b>Phone Number</b>	<b>URL</b>
ETI Instrument Systems, Inc.	970-484-9393	<a href="http://etisensors.com">http://etisensors.com</a>
OTT Hydromet	800-949-3766	<a href="http://www.ott.com/en-us/">http://www.ott.com/en-us/</a>
N-CON Systems Company, Inc.	800-932-6266	<a href="http://www.n-con.com">http://www.n-con.com</a>
NovaLynx Corporation	530-823-7185	<a href="http://novalynx.com">http://novalynx.com</a>

## **Appendix: References**

NADP MDN Operations Manual, 2017-03  
Version 2.3

National Atmospheric Deposition Program (NADP). 2014. *NADP Site Selection and Installation Manual*. Illinois State Water Survey, Champaign, IL

National Atmospheric Deposition Program (NADP). 2016. *NADP Site Information Worksheet*. Illinois State Water Survey, Champaign, IL