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INSTRUCTION MANUAL

NADP/NTN SITE SELECTION AND INSTALLATION

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM

A Cooperative Research Support Program of the
State Agricultural Experiment Stations (NRSP-3)
Federal and State Agencies
and Private Research Organizations

INSTRUCTION MANUAL

NADP/NTN SITE SELECTION AND INSTALLATION

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The NADP is National Research Support Project - 3: A Long-Term Monitoring Program in Support of Research on the Effects of Atmospheric Chemical Deposition. More than 220 sponsors support the NADP, including private companies and other nongovernmental organizations, universities, local and state government agencies, State Agricultural Experiment Stations, national laboratories, Native American organizations, Canadian government agencies, the National Oceanic and Atmospheric Administration, the Park Service, the U.S. Fish & Wildlife Service, the Bureau of Land Management, the U.S. Department of Agriculture - Forest Service, and the U.S. Department of Agriculture - Cooperative State Research, education and Extension Service (under agreement no. 98-COOP-1-5925). Any findings or conclusions in this publication do not necessarily reflect the view of the U.S. Department of Agriculture or other sponsors.

1 Introduction

1.1 The NADP and NTN Atmospheric Deposition Monitoring Programs: A Background

The amount of substances dispersed in the atmosphere and deposited by precipitation, aerosols, and gases is expected to continue to increase throughout North America. Thus, there is an increasing need for careful measurement of the amounts, nature, and effects of these substances in agricultural, forest, and aquatic ecosystems of the United States. In addition, these measurements are crucial to the validation of transport models and the evaluation of National and North American emission control strategies.

The National Atmospheric Deposition Program (NADP) was created by the Association of State Agricultural Experiment Stations (North Central Regional Project NC•141 now Interregional Project IR-7) to conduct research on atmospheric deposition and its effects on surface waters and agricultural and forest lands in cooperation with federal, state, and private research agencies. The National Trends Network (NTN) was designed under the direction of the Task Group on Deposition Monitoring, Interagency Task Force on Acid Precipitation, in accord with the 1982 National Acid Precipitation Assessment Plan, to gain a better understanding of the spatial and temporal variability of acidic atmospheric deposition in the United States. Through the continued development and maintenance of these atmospheric chemical deposition monitoring networks, and through research on the effects of chemical changes in atmospheric deposition, scientists are discovering and characterizing biologically important spatial and temporal trends in the chemical climate of North America.

1.2 Sampling Strategy

In addition to a strict set of siting criteria, which this manual presents, other essential ingredients of a successful network design and operation include; uniformity of sampling protocol, uniformity in analytical techniques and procedures, and a long-term monitoring commitment. The NADP/NTN accomplishes this by (1) designating specific precipitation collection equipment to be used throughout the network which allows precipitation to be recorded, collected and verified; (2) requiring this equipment to be maintained in good working order at the original location specified on the SITE INFORMATION WORKSHEET; (3) specifying a strict weekly sampling protocol and a clear definition of sample types; (4) requiring every sample to be analyzed at a single laboratory, the Central Analytical Laboratory (CAL) operated by the Illinois State Water Survey, Champaign, Illinois, and (5) expecting each site to operate continuously for a 5-10 year period. The NTN network further utilizes a finite number of regionally distributed sites as a part of its design.

Because the success of the network depends upon each site's continuing commitment to strictly follow this protocol, the acceptance of a site into the NADP/NTN networks is based in part on the site's ability to implement the program outlined here and presented in more detail in the *National Trends Network Site Operation Manual* (http://nadp.sws.uiuc.edu/lib/manuals/opman.pdf).

2 Site Selection

2.1 General Considerations

Monitoring sites for the networks are selected to represent major physiographic, agricultural, aquatic and forested areas within each cooperating state, region or ecoregion. Wherever possible, collection sites include locations where watershed, marine, freshwater, or other hydrological research is already underway, or where research is being conducted on nutrient cycling, air pollution, or atmospheric chemistry. Additional consideration is given on the basis of available knowledge of emission sources, prevalent forms of deposition, frequency of precipitation events and other meteorological and atmospheric processes that influence the deposition of substances in each area. This background information permits meaningful interpretations of spatial, seasonal and temporal variations in the chemistry of wet and dry deposition both regionally and nationally.

2.2 Co-location with Other Programs

The co-location of monitoring equipment with other programs is encouraged. Some precautions, however, need to be observed when co-locating sampling or monitoring equipment.

Sampling sites can be overused to the point where one program becomes compromised by the addition of extra equipment. Besides violating the siting criteria outlined in Section 2.3, increased visitation to a site increases the chance of contamination to the sampling receptacles. Disturbances in air movement about the site by other than natural phenomena can reach a point where what is sampled is no longer representative of the region but only represents the local congested environment.

2.3 COLLECTOR and RAINGAGE Siting Criteria

2.3.1 Regional Requirements

The RAINGAGE and COLLECTOR should be located in an area that typifies a region and minimizes the impact of local point or area sources. However, if a region is characterized by a certain type of agricultural land use or industrialization, the COLLECTOR should be located to provide representation of such extensive deposition sources.

Specific sources of concern include industrial operations and suburban/urban area related sources. Industrial operations such as power plants, chemical plants and manufacturing facilities should be at least 10 kilometers (km) away from the collector. If the emission sources are located in the general upwind direction (i.e., the mean annual west-east flow in most cases) from the COLLECTOR, then this distance should be increased to 20 km. This same criteria also applies to suburban/urban areas whose population approximates 10,000 people. For larger population centers (i.e., greater than

75,000) the COLLECTOR should be no closer than 20 km. This distance is doubled, to 40 km, if the population is upwind from the COLLECTOR. Beyond 50 km both industrial and urban sources are generally assumed to blend in with the typical characteristics of the region.

2.3.2 Local Requirements

Transportation related sources, agricultural operations and surface storage of certain types of products are typically the most troublesome sources to identify and quantify once regional requirements for industrial sources have been met (Section 2.3.1). No moving sources of pollution, such as air, ground, or water traffic or the medium on which they traverse (e.g., runway, taxiway, road, tracks, or navigable river) should be within 100 meters (m) of the COLLECTOR. The local road net around the site is of particular concern. Traffic volume and type will largely determine the impact of these types of sources on the site. Feedlots, dairy barns, etc. , in which large concentrations of animals are housed should be no closer than 500 m from the COLLECTOR. Grazing animals, and pasture should be no closer than 20 m from the COLLECTOR. Surface storage of agricultural products, fuels, vehicles, or other source materials should be kept at least 100 m from the COLLECTOR. Parking lots and maintenance yards also need to be kept at least 100 m from the collector. Local sources, whether point, line or area sources, will greatly influence the suitability of a site to serve as a long-term regionally representative station. Land development in future years may further compromise the site's usefulness as a station. For these reasons consideration should be given to alternate sites in the event that the original site is no longer representative of the region.

2.3.3 On-Site Requirements

The site should be accessible in both summer and winter and be a low risk to vandalism. Further, the COLLECTOR and RAINGAGE should be sited to conform as nearly as possible with the following:

1. The COLLECTOR should be installed over undisturbed land on its standard 1 m high aluminum base. Naturally vegetated, level areas are preferred, but grassed areas and slopes up to ±15% will be tolerated. Sudden changes in slope within 30 m of the collector should also be avoided.

   Ground cover should surround the collector for a distance of approximately 30 m. In farm areas a vegetated buffer strip must surround the collector for at least 30 meters.

2. Annual vegetation within the site should be maintained at less than 2 feet in height.

3. No object or structure shall project onto the COLLECTOR or RAINGAGE with an angle greater than 45° from the horizontal (30° is considered optimal, but 45° is the

highest angle acceptable). Therefore the distance from the sampler to the object must be at least equal to the height of the object (preferably twice the height of the object). Residential dwellings must be kept twice their height from the collector (30°). Pay particular attention to anemometer towers and overhead wires (Fig. 2.1).

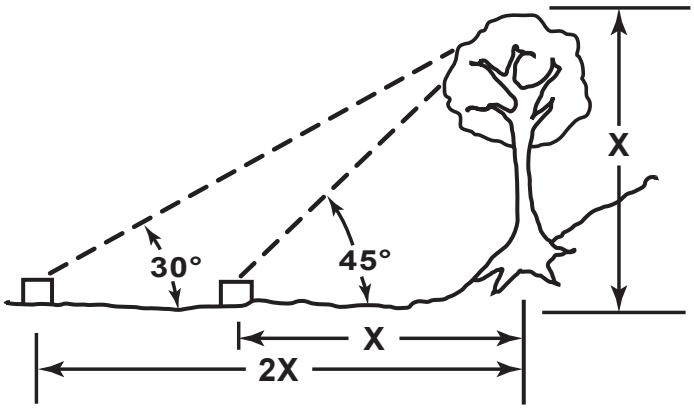


Fig. 2.1

4. Residential structures within 30 m of the COLLECTOR should not be within the 30° cone of the mean wind direction (Fig. 2.2).

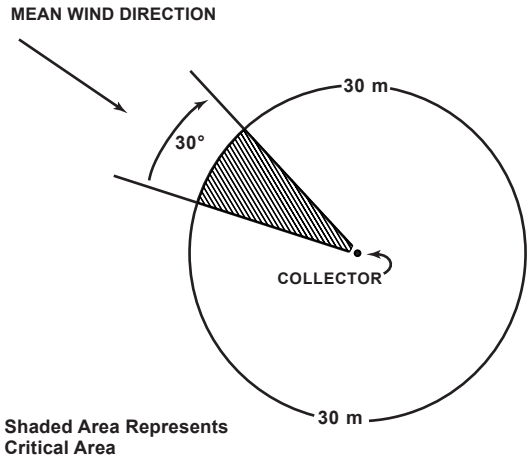


Fig. 2.2

5. The base of the COLLECTOR should not be enclosed. Further, any object over 1 m high with sufficient mass to deflect wind should not be located within 5 meters of the COLLECTOR. Alter wind shields and open fences are excluded from this requirement.

6. The RAINGAGE should be within 30 m of the COLLECTOR but no closer than 5 m. Its orifice should be located within one foot of the same plane as the orifice of the COLLECTOR. In snow accumulation areas this may require a separate platform for the raingage.

7. In areas where more than 20% of annual precipitation is snow, raingages must be equipped with an alter wind shield. This shield should be installed such that the pivot axis of the shield is at the same level as the top of the raingage.

8. In areas having an accumulation of over 0.5 m of snow per year, the COLLECTOR and RAINGAGE may be raised off the ground on a platform. The platform should be no higher than the maximum anticipated snow pack. In general, platforms are discouraged. Note: The 5 m separation between the raingage and collector must be maintained (item 6).

9. COLLECTORS located in areas which normally receive snow should have a properly counterweighted snow roof installed on the moving lid of the COLLECTOR only if problems with the opening and closing are encountered. If installed, the roof will be left on year round. (See counterweighting, Section 4.2.1).

10. Changes or modifications to established or approved sites or to its equipment must be submitted to the Program Coordinator's Office prior to implementation. This includes moving the site, siting other equipment in close proximity to the existing collectors (30 m), installation of snow roofs, etc. In the event additional equipment is added to the site or a change in location becomes necessary, the following information is needed:

    a) A brief letter to the Program Coordinator's Office requesting the change and documenting its need.

    b) Sites moving within the 30 m surrounding the original location of the collector will be required to file a new site sketch with pictures and negatives, along with a letter stating when and why the site was moved.

c) Sites moving greater than 30 m but less than 10 km will be required to file a new Site Information Worksheet;, site sketch map, and pictures with negatives. A new topographical map will be required only if the site moves off the old quad.

d) Sites moving further than 10 km or into a different type of topography, ecoregion, or land use must reapply for admission to the network as a new site. Such a move requires submission of a complete set of siting documents to the coordinator's office for approval. A new site name, CAL code, and station number will be assigned to the new site.

11. All COLLECTOR location changes (orientation, moves on or off platforms, elevation, short moves, long moves, etc.) will be documented so that data users have the ability to determine if a change in data correlates with some physical change at the site.

2.4 Classification of Network Sites: Operational Status

Once a site has been identified, sites will be classified into one of three levels:

Provisional

Each site will be initially classified Provisional based upon the information provided with the Site Information Worksheet;, if the questionnaire has been properly completed. Pictures showing the COLLECTOR in place, topographical map and a site drawing are required to obtain Provisional status.

Interim

Interim status will be given to those sites which after visitation by a network site reviewer are verified as having met all of the siting criteria outlined in Section 2.3 of this manual and as having all of the required sampling equipment including the Aerochem Metrics or equivalent WET/DRY precipitation COLLECTOR; the weighing, recording RAINGAGE equipped with an EVENT RECORDER; the pH and conductivity meters and a 20 kg capacity balance. If a representative of the Coordinator's Office installs the site, then Interim status may be granted at the time of installation.

Certified

Final certification will be made after several years of routine operation of each site.

A site will become Certified when data analysis determines that the site is operating according to established protocol and that the site is a regionally representative site not significantly biased by local sources.

3 Site Information Worksheet

3.1 Introduction

This section contains information and instructions for completing the National Atmospheric Deposition Program (NADP)/National Trends Network Site (NTN) Information Worksheet in Appendix A. Complete a worksheet for each proposed site. Send completed worksheets to:

NADP Program Office
Illinois State Water Survey
2204 Griffith Drive
Champaign, IL 61820-7495

Update the worksheet when changes occur in any of the items under Site Instrumentation, Related Scientific Activities, or Potential Sampling Obstructions and Pollution Sources. Inform the Site Liaison (1-800/952-7353) prior to making any changes in these items. Send updates to the Program Office. Also notify the Liaison of changes in Site Personnel or Laboratory Facilities. **Consult the Site Liaison before moving or changing the precipitation collector or recording raingage. A new worksheet must be completed before a site is moved.**

On the worksheet, record distances and elevations in metric units (e.g., meters as m, centimeters as cm, and kilometers as km) and directions from magnetic north. Except as noted, report distances from the planned or current collector location. Where space is inadequate for your remarks, attach additional pages, and label the remarks for the worksheet item being described.

3.2 Site Identification

The SITE NAME should be descriptive and unique to the site. Together with the COUNTY and STATE, the SITE NAME should allow easy identification of the site by sponsoring and operating agencies, site supervisors and operators, and researchers (for example, the Bondville site, operated by the NADP Central Analytical Laboratory or CAL, is several miles from the central Illinois village of Bondville). The Program Office assigns the SITE ID after receipt of the completed worksheet. The SITE ID is a unique identifier based on the COUNTY, STATE, and other network information (for example, the Bondville site is in Champaign County, Illinois, and has a SITE ID of IL11).

Definitions and responsibilities of the SPONSORING AGENCY and OPERATING AGENCY are described in Section 2.4 of the *National Trends Network Site Operation Manual* (http://nadp.sws.uiuc.edu/lib/manuals/opman.pdf). In general, the Sponsoring Agency provides the funds that pay for NTN participation, which includes the services provided by the CAL and

Program Office. The OPERATING AGENCY provides the SITE OPERATOR, who is responsible for the monitoring equipment, site maintenance, and sample collection (measurement, documentation, and submission). SITE OWNER refers to the owner of the land where the site is located

An exact site location is established when the LATITUDE, LONGITUDE, and ELEVATION of the collector are reported. MAP NAMES refer to the U.S. Geological Survey topographic map series.

3.3 Site Personnel

List site personnel names, addresses, and other contact information in this section. Each site has a SITE OPERATOR and SITE SUPERVISOR. In rare cases one person may perform both roles. Section 2.5 of the *National Trends Network Site Operation Manual* (http://nadp.sws.uiuc.edu/lib/manuals/opman.pdf) describes the responsibilities of all site personnel.

The SITE OPERATOR's ADDRESS must be an appropriate location for United Parcel Service (UPS) delivery of supplies from the CAL, which includes field buckets and sample bottles packed in (2-foot × 2-foot × 2-foot) mailers. Data reports, correspondence, summaries, and publications issued by the CAL and Program Office are also mailed to this address.

The SITE SUPERVISOR receives data reports, correspondence, and other summaries and publications from the CAL and Program Office. The SITE SUPERVISOR can sometimes help resolve data or site operational problems or arrange for resources to help resolve or correct these problems. Additionally, this person often can evaluate the preliminary data and help determine whether the data are reasonable and reflect local conditions.

3.4 Site Instrumentation

Circle the PRIMARY POWER source for your site. If it is alternating current (AC), record the VOLTAGE (110 or 220) and SERVICE AMPERAGE (e.g., 20 amperes). If it is direct current (DC), record the BATTERY CAPACITY in ampere-hours. If your DC system is equipped for solar recharge, record the SOLAR PANEL OUTPUT as well. Information on electrical service and instrumentation helps determine the potential to operate in all types of weather and to solve operational "down time" problems.

The NADP requires every site to use an approved PRECIPITATION COLLECTOR and RECORDING RAINGAGE equipped with an EVENT RECORDER. Approved equipment is listed in Appendix A of the *National Trends Network Site Operation Manual* (http://nadp.sws.uiuc.edu/lib/manuals/opman.pdf). Record the MAKE and MODEL of the collector and gage. For the gage, indicate TYPE (e.g., weighing or tipping bucket), DIAMETER

OF OPENING, WIND SHIELD TYPE (e.g., None, Alter, or Wyoming), and whether the gage is equipped with an EVENT RECORDER. Also report the DISTANCE AND DIRECTION FROM COLLECTOR. The collector and gage must be no closer than 5 meters (m) nor farther than 30 m from one another. Record any information you may have on average ANNUAL PRECIPITATION amounts and the YEARS OF RECORD from which these averages were computed.

Information on a NEAREST ALTERNATE GAGE will help Program Office staff decide whether precipitation data from this gage may be substituted for the regular NADP precipitation data on those rare occasions when both the NADP recording raingage and precipitation collector fail. In addition, information on the NEAREST CLIMATE NORMAL GAGE provides a historical record against which to evaluate the NADP site record. A 'climate normal' gage is an official National Weather Service station with a 30-year (or more) precipitation record. In some cases, the NEAREST ALTERNATE GAGE also may be the NEAREST CLIMATE NORMAL GAGE.

Information on WIND INSTRUMENTS at the site will help researchers evaluate and interpret the local site climatology.

3.5 Related Scientific Activities

The NADP compiles this information to characterize RELATED SCIENTIFIC ACTIVITIES at sites. This information is useful in preparing scientific proposals and in establishing linkages with related programs. Of particular interest are related regional and national programs, such as the Clean Air Status and Trends Network (CASTNet), and state measurement programs. Describe measurements taken up to 0.5 kilometers (km) from the collector. Please distinguish between on-site (within 30 m of the collector) and off-site measurements. Simply indicate NONE if there are no RELATED SCIENTIFIC ACTIVITIES within 0.5 km.

3.6 Potential Sampling Obstructions and Pollution Sources

This section is designed to identify objects and vegetation that may interfere with sample collection and objects and activities that may contribute to the chemical deposition measured at the site. Posts, towers, trees, and other objects disturb the free flow of the wind, which, in turn, may affect rain and snow catch. These objects also may increase the potential for sample contamination from splash. Roads, cities, and power plants are sources of airborne particles and gases that may affect the sample chemistry.

Distance of the object or activity from the precipitation collector and recording raingage, as well as the object type and size or activity type, determines its potential impact. This section is organized by distance categories, including on-site (less than 30 m), local area (less than 500 m), and regional (less

than 40 km). Distances up to 5 meters from the collector and gage are considered the instrumental footprints. Ideally, there are no objects taller than a meter in these footprints. The 30-meter circle centered on the collector is called the site. Beyond 30 m, the sources become part of the local and regional influences on wet deposition chemistry at the site. As distance from the site increases, local influences tend to become indistinguishable from regional influences on the chemical climate at the site.

A topographic map and a state or regional map are invaluable in completing this section. The categories are designed to identify both stationary and mobile sources. Do not neglect sources such as quarry operations, coal stockpiles, and farm wastes, which may be intermittent or seasonal. Careful evaluation of potential sampling obstructions and pollution sources is important in determining site quality and in evaluating data anomalies.

3.7 Laboratory Facilities

The NTN is committed to accurate measurements of field pH and conductivity. For this reason, sites are required to have the capability for taking these measurements in close proximity to the sampling site. A "good" laboratory facility is clean and temperature-controlled with a specific area set aside for the pH and conductivity meters, balance, and related supplies. The area should be free of clutter and away from traffic areas.

3.8 Other

A topographic map, scale drawing, and photographs **are required** before a site is accepted into the NTN.

The U.S. Geological Survey can provide 1:24,000 and 1:250,000 scale topographic maps, which include your site location. These maps are used to assess proximity to line, point, or area sources and to establish further physiographic information about the site. Use a circled X to show clearly the site location on the map. If the site is at or near the map border, include the adjoining map(s). Digital images of similar resolutions can be substituted for the U.S. Geological Survey topographic maps.

Prepare a site sketch using the template provided on the last page of Appendix A. NADP sites are defined by a circular area of 30-meter radius centered on the NADP collector. Use the symbols on the template to show ground cover and locate objects, such as a fence, or instruments, such as a NWS stick gage. Where an NADP collector is installed, place it at the center of the sketch. Place the circle of the NADP collector symbol in the center and point the arrow in the direction **from the dry-side bucket to the wet-side bucket**. Magnetic north is at the top of the sketch. Place the Belfort raingage on the sketch, marking it at the shortest distance between the NADP collector and gage. Draw the locations of all other instruments, towers, buildings, shelters, fences, posts, etc., within the 30-meter area. Label items in the sketch, as needed to prevent any confusion, and include the height of objects

taller than 0.6 m. Finally, show land cover (trees, shrubs, weeds, mown grass, bare ground, etc.) in the 30-meter area.

Photographs should show the area surrounding the collector in the eight cardinal directions (N, NE, E, SE, S, SW, W, and NW). For proper perspective, 3 × 5 color photographs, taken with a 35-millimeter (mm) camera, are preferred. Include negatives. Use a wide angle lens (35 or 28 mm), if possible. Digital images are encouraged. Pictures should be taken at a distance of about 5 m from the precipitation collector or planned collector location. Show the collector position with a flag stake in the center foreground. Concentrate on the surrounding area. A few pictures taken from a greater distance (including aerial photographs) are also useful and appreciated. Label the backs of all photographs with the site, date, and direction you aimed the camera when the photo was taken.

If available, Soil Conservation Service (SCS) soil survey maps of the site are useful in characterizing the site environment. These maps can be obtained by contacting your local or state U.S. Department of Agriculture (USDA) Soil Conservation Service office or through the extension service at your state land-grant college or university. An annual "List of Published Soil Surveys" lists all current surveys by state and county.

4 Site Installation

Field installation can be completed more effectively if the wet/dry collector and weighing raingage are preassembled prior to arriving on site. Preassembly is especially useful if electric power is not available on site, event recorder installation is necessary or rain gage calibration is to be attempted.

4.1 Power Requirements

4.1.1 110v AC Operation

For sites located in rural areas where line power is frequently interrupted, trickle charged battery backup is recommended. However, only charging arrangements which cannot interrupt AC power are acceptable. See Figures 4.1 and 4.2.

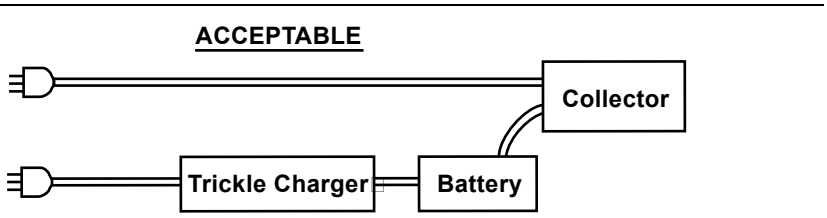


Figure 4.1

If a battery failure occurred in Figure 4.2, line power would not reach the collector and the

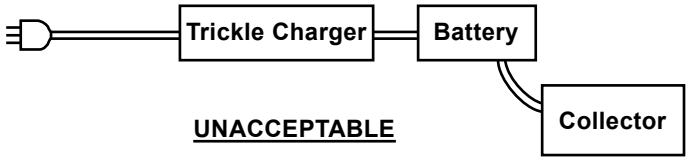


Figure 4.2

trickle charger would become the source of power for the collector. Trickle charger output is not generally sufficient to power the collector. Certain trickle chargers further have the ability to over charge batteries and ruin them. In Figure 4.1, the collector would run on one power system or the other, not one power system through the other as in Figure 4.2. In Figure 4.1, line power to the collector is independent of battery and trickle charger units. Aerochem Metrics makes an acceptable trickle charge option for its wet/dry collector. The charger is built into the motorbox. Contact Aerochem Metrics for details.

4.1.2 DC Operation

Battery power is not a recommended method of powering the Aerochem Metrics Collector, however, the use of a solar panel to continuously charge a 12 VDC source is an acceptable alternative when AC power is not available.

If battery operation is the only alternative for powering the collector then it is essential that the battery be properly sized and have a generous amount of reserve capacity.

4.1.2.1 Batteries

Only deep cycle marine rated batteries should be used to power the collector. Ordinary automotive batteries, though cheaper, are not designed to be continuously drawn down and recharged (you might get 20 cycles); deep cycle marine batteries are rated for 2000 cycles. Gel type batteries as opposed to lead-acid batteries (the most common type of battery) have the additional advantages of being 1/3 to 1/2 the weight per ampere hour, sealed (do not leak acid) and do not freeze when the temperature drops and there is less than a full charge on the battery.

When sizing panels or batteries, the following collector electrical power consumption figures should be realized. During wet status the collectors draw 0.06 watts to power the event pen, 6.6 watts for the sensor heater, and 9.0 watts while the lid cycles. During dry status the collector draws only 0.6 watts to motorbox. If the temperature drops below 4°C (40°F), the collector draws 6.6 watts continuously to power the sensor heater regardless of its wet or dry status. This creates the following power requirements:

dry status	0.05 amps continuous
cycle	0.75 amps duration of cycle
wet status	0.60 amps continuous
cold status	0.55 amps continuous

Battery requirements would then be calculated as per Table 4.1.

The required capacity (from Table 4.1) divided by the battery rating determines the number of batteries or battery changes needed per week.

4.1.2.2 Solar Power/Trickle Charging

Solar panels and trickle chargers are rated to deliver a certain number of amps per hour at a given voltage. A trickle charger delivers this current as long as it is powered by an AC source. A solar panel delivers this rated current only during peak daylight hours. For this reason it is extremely

important to estimate the number of effective solar hours per week at your site before determining the size or number of panels required to operate the site. Typically effective solar hours vary from 4 hours day in the east to 6 hours day in the southwest. These estimates do not take into account local solar easements such as trees or building shadowing a solar site.

Table 4.1 An Example Site: Worst Case - Winter

Collector Activity	*Hrs/wk*		*Amps*	*Total*
Temperature less than 4°C	168	x	0.55	92.4
Precipitation occurs and temperature is greater than 4°C	0	x	0.60	0
No. of precipitation events (6 sec cycle × 2* × 0.75)	7	x	0.02	0.14
Remainder of hours in a week (168 hrs.)	0	x	.05	0
Amps/hrs per week				92.5
Cold weather battery efficiency (80°F-65%, 0°F-40%)				46.3
50% is used for this example				18.5
Required capacity amp-hrs/wk				157.3

*Open and close cycle

If we had used a 90 amps/hour marine battery in the above battery example, 67.3 amps-hr of extra capacity would still be needed to meet our winter site requirements. If we used a trickle charger for all 168 hours of the week, then the charger would have to have an output capacity of 0.4 amps/hour (67.3/168) to meet our extra capacity demand. Note, however, that in order to operate the site week after week under the example conditions, the full 157.3 amps must be replaced every week! The charger then would have to deliver 0.94 amps/hour to keep up with our weekly demand. A solar panel rated to deliver 2.0 amps/hour and operating at peak capacity 12 hrs/day 7 days of the week would barely meet our example sites needs.

Using the 4 hours/day estimate of effective solar hours, we would need 3 solar panels to keep our battery fully charged week after week. The Coordinator's Office has experience in sizing panels and is available for advice.

4.2 Wet/Dry Collector[1]

If available, please refer to the manufacturer's instructions.

4.2.1 Assembly

1. Open the shipping carton on the side marked "Open This Side." The collector chassis is placed in the box with the bottom side facing up and with loose items packed in the bottom opening. Remove the packing material from the bottom opening. You will find the precipitation sensor, fuses, legs, mounting kit, bolts, and a bucket cover. While the unit is still in the box, cut the box at the corners for a distance of about 12 inches and fold the sides of the box down. Fasten legs in place with 1/4-20 bolts and nuts. It may be necessary to ream some holes with a 1/4-in drill or rat tail file. Next, bolt the two sections of aluminum angle that are approximately 36 inches (91 cm) long to the outside of the pairs of legs across the narrow dimension of the collector so that one face of the angle rests on the floor with its edge oriented away from the collector.

2. Install the counterweight and rod between the ends of the long arms. If your collector was supplied with a peaked snow roof, the counterweight will be in two parts.

   Note: We recommend that the snow roof and corresponding counterweight (the smaller of the two) not be installed on the collector until a clear need for this accessory has been demonstrated. In addition to serving as a snow roof, the peaked roof also acts somewhat as a wind "sail". This "sail" causes the lid to lift off of the wet side bucket during high winds) thereby allowing dry deposition to intrude into the wet-side bucket.

   Check that the counterweight is centered on the 3/8-inch rod and that the Waldes rings are positioned so that they are pressed firmly against the ends of the counterweight. If your collector does not have a commercially manufactured matched snow roof counterweight or if modifications have been added to the collector roof, proper counterweighting must be achieved as follows:

   a) Turn the box and enclosed unit right side up and lift off the shipping carton. Cut the two black bands holding the roof and buckets in place.

[1]From Aerochem Metrics "Assembly and Operation Instructions Automatic Sensing Wet/Dry Precipitation Collector".

b) From underneath the base, remove the single bolt that holds the drive arm mechanism to the clutch arm on the motor box. (The end of the drive arm mechanism is cut down to provide clearance as it cycles with the clutch arm). With the lid in mid-travel and the drive arm mechanism supported with your hand up to the level of the clutch, add weight to the rod or existing counterweight until the lid remains in mid-position unassisted. A very close approximation of the proper amount of counterweighting is achieved if you add twice as much counterweight as lid weight. A muffler clamp attached to the existing counter weight and/or washers can be used to increase the counterweight to the necessary weight.

3. To mount the precipitation sensor, remove the four screws located around the hole in the corner of the chassis at the "dry" collector end. Insert the cannon plug through the hole and fasten the sensor in place with the sensor oriented so that it faces away from the dry collector. Connect the cannon plug to the motor box.

4. If connected to a 110 AC 50-60 Hz source, the unit is now ready to operate. For 12 VDC operation, disconnect from the AC source and remove the 1/2 amp fuse from the AC fuse holder (Also see Section 4.1, Power Requirements). Connect a source of 12 VDC to the spade lugs located on the side of the motor box. Observe the polarity markings on the box. Place a 2-amp fuse in the fuse holder above the spade lugs. The unit should now operate. During the first cycle the roof should move to cover the "wet" bucket which is located at the end away from the rain sensor. Remove the cardboard inserts placed between the roof and the bucket. Short the rain sensor grid to the base plate with a coin, a drop of water or a moistened finger; the roof will move to cover the "dry" bucket and thus expose the "wet" bucket.

4.2.2 Mounting the Collector

All techniques require the collector be mounted level with the wet-side bucket to the west and the sensor facing north.

Because of its large cross-section and relatively low weight, the precipitation collector is susceptible to being blown over in high winds. Therefore, it is essential that the unit be firmly anchored when placed in the field. THE INSTRUMENT WARRANTY DOES NOT APPLY TO DAMAGE INCURRED DUE TO IMPROPER MOUNTING. Numerous anchoring techniques are available including stakes, rocks, sandbags or cement blocks placed across the protruding ends of the cross members. Alternatively, 7 inches of each of the protruding ends can be cut off and then bolted to the remaining portions of the cross members so that the short sections project downward. Four small holes

are dug to accommodate the downward-protruding sections. The collector is then mounted in place, carefully leveled, and concrete poured into the holes. (In order to obtain a better set in the concrete, you may wish to first drill several holes in the aluminum angle.)

4.3 Event Recorder

For those sites not having raingages with event recorders, the event recorder is installed as follows:

1. Remove housing of the weighing raingage by removing top, bucket, and screw from center of bucket holder. Remove the bucket holder. Remove the five screws from around the base, then remove the outside housing.

2. Referring to Figure 4.3, remove the screws and nuts holding the event recorder pen in the aluminum protector. Place the pen assembly in position on the frame, with the cutout surrounding the upper bail pivot bracket. Hold the event recorder assembly tightly and drill a No. 28 hole through the upper hole of the pen assembly. Put one of the 6-32 screws through the upper hole just drilled and secure with a nut. Drill through the bottom hole and secure with the remaining 6-32 screw and nut.

3. Remove the remaining screw from the shipping protector and slip the lower end of the pen assembly behind the pen arm pivot, line up the holes, and secure the assembly to the frame with the two 6-32 screws and nuts.

4. Feed a two conductor wire of sufficient length to reach the Aerochem collector through one of the yellow-capped holes in the base. Connect the wire to the two terminals of the event recorder. Install such that strain relief prevents tension being placed on the wire at the terminals.

5. Connect the other end of the wire to the screw terminals under the middle fuse of the precipitation collector. Note: Early models of the collector did not have the third fuse and the two screw terminals. If your collector does not have the three fuses on the face of the motor box and the connector with the two screw terminals, we suggest that you remove motor box and return it to the manufacturer for modification.

6. Adjust the position of the pen tip by loosening the screw and block holding the pen arm pivot. This provides adjustment of the pen in all directions. Adjust the pen scribe approximately between the 5 1/2 and 6 1/2 rainfall line of the chart and 4 hours to the left of the position of the raingage pen. This permits the rain gage pen to pass up and under the event marker pen in case of rainfall in excess of 5 1/2 inches.

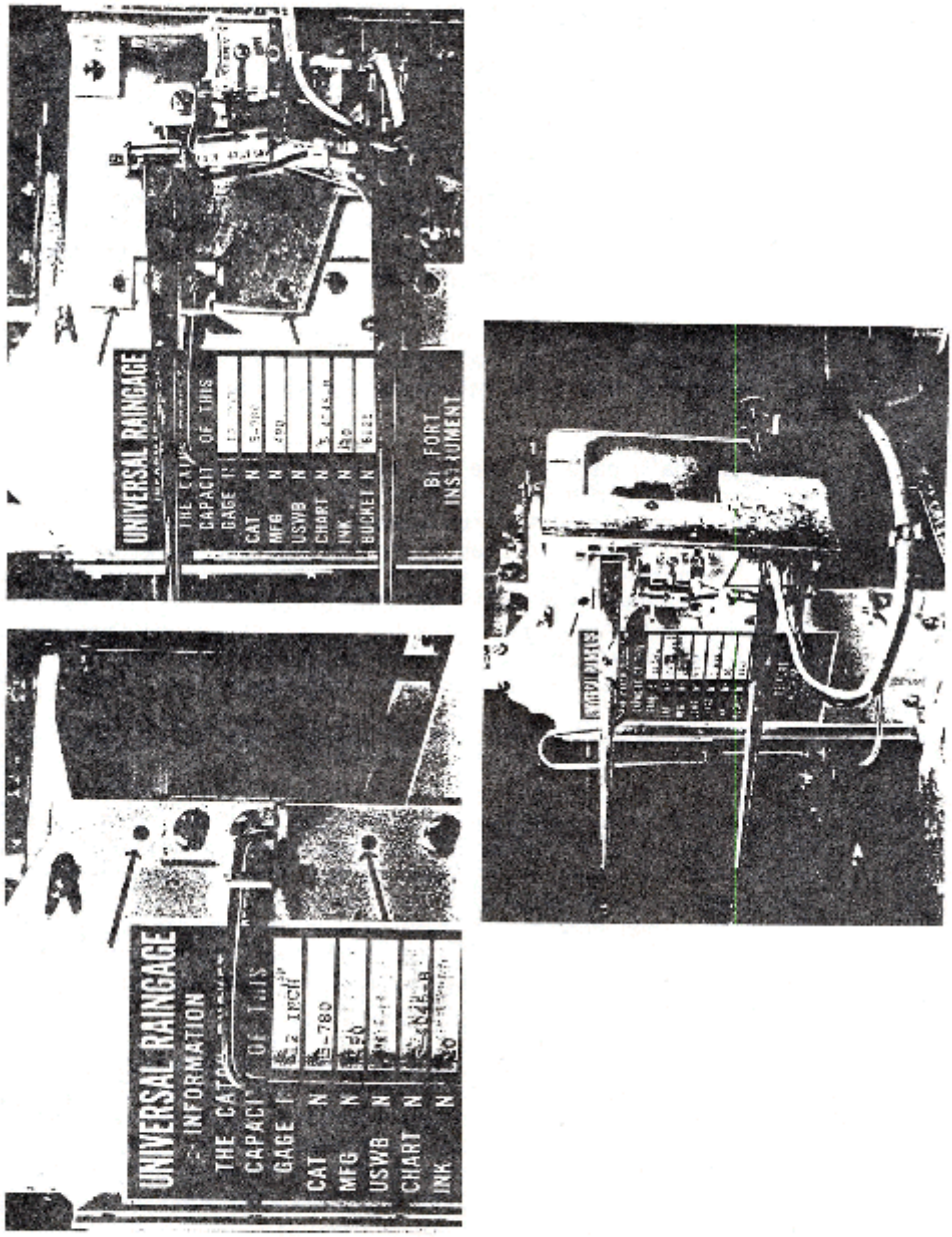

UNIVERSAL RAINGAGE
INFORMATION
CAT N
MFG N
USWB N
CHART N
INK N
UNIVERSAL RAINGAGE
CAT N
MFG N
USWB N
CHART N
INK N
BUCKET N
BI FORT INSTRUMENT

Fig. 4.3

7. Adjust the pen pressure against the chart by tilting the top of the pivot U in closer to the frame.

4.4 Raingage

The raingage should be located 5-30 m from the wet/dry collector in an area where an anchoring base can be installed. A suitable base can be made inexpensively from angle iron if a commercially available base is not available (Fig. 4.4). The installation of the gage with this base is as follows:

1. Bolt two of the stakes to the cross member of the tee base using 5/16 × 1 1/2 inch × 3/4 inch shankless bolts and nuts. Drive these stakes to within about 6 inches of the surface. When the cross member is level, drive the remaining stake to the same horizontal plane and bolt. If this leveling is done with care, the instrument will be level when it is bolted to the base. NEVER HAMMER THE BASE OR STAKES WHILE THE RAINGAGE IS BOLTED TO THE BASE, AS THIS WILL LIKELY DAMAGE THE RAINGAGE WEIGHING MECHANISM.

2. Remove the raingage top and then the weighing platform by unscrewing the center flat-head screw. Remove the outer case by unscrewing the five retaining screws about the bottom of the skirt.

3. Bolt the raingage to the tee base, using the three 3/8 × 2 1/2-inch bolts and nuts. Place the raingage such that the welded extension on the tee base extends from under the base nearest the door. The two bolts through the holes in the cross portion of the tee should extend from the raingage base through the tee base where an appropriate nut should be firmly locked reasonably tight. The bolt closest to the gage door should be passed through the tee base first up into the inside of the gage and the nut screwed firmly upon it.

4. Remove the shipping tie holding the pen arm to the pen shifter.

5. Loosen the mechanism locking screw and nut found above the pivot towards chart side of the mechanism. Back out the screw until the top lever is stopped by the limit screw. Retract the locking screw a turn or two farther; lock in position with its nut. Then remove the stop sleeve from about the movement bracket limit screw. Do not disturb the setting of the other two limit screws. Their positions are a part of the gage's calibration.

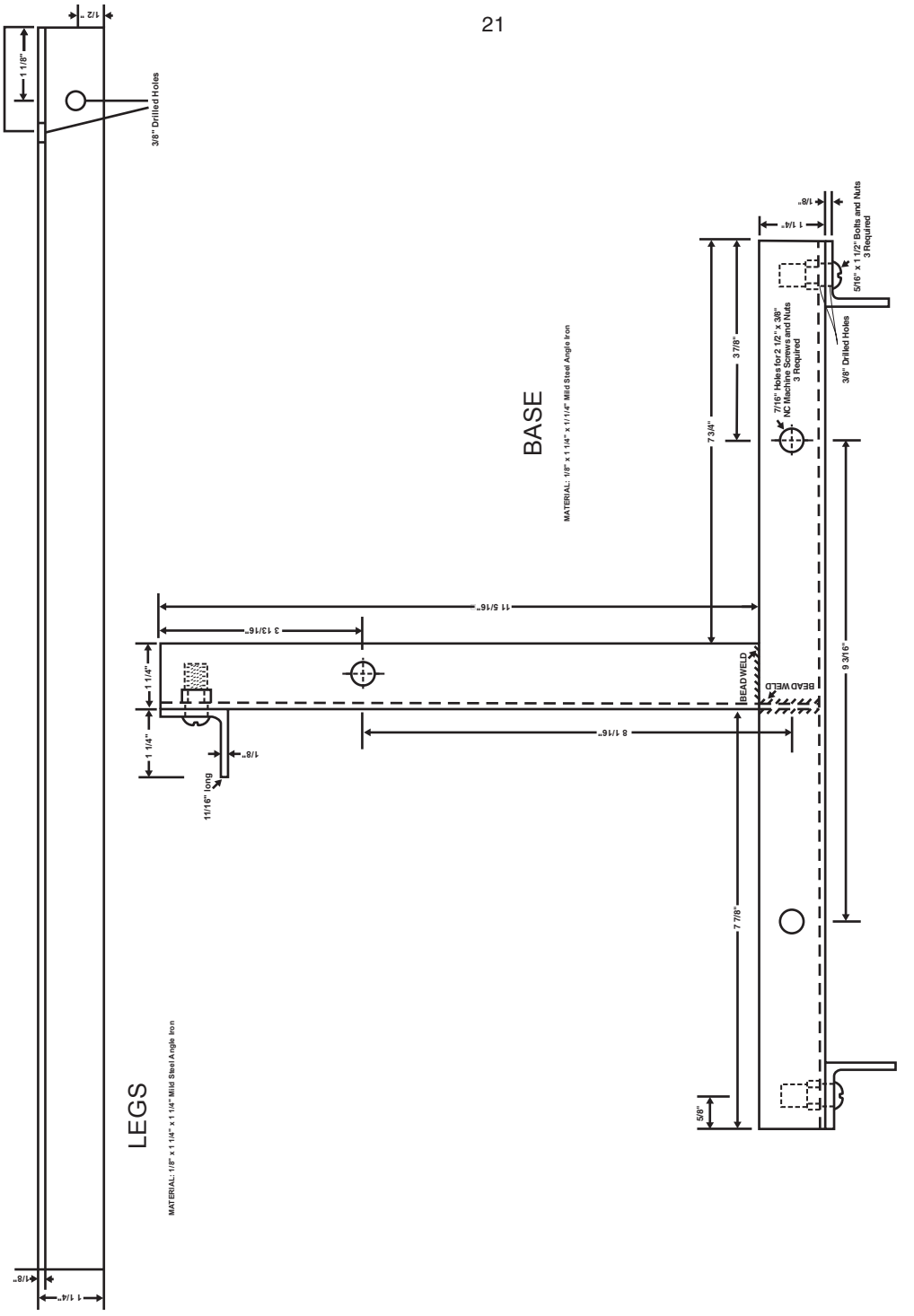

LEGS
MATERIAL: 1/8" x 1 1/4" x 1 1/4" Mild Steel Angle Iron
1/2"
1 1/8"
3/8" Drilled Holes
1/8"
1 1/4"
BASE
MATERIAL: 1/8" x 1 1/4" x 1 1/4" Mild Steel Angle Iron
11 5/16"
3 13/16"
1 1/4"
1 1/4"
1/8"
11/16" long
8 1/16"
BEAD WELD
BEAD WELD
7 3/4"
3 7/8"
1/8"
1 1/4"
5/16" x 1 1/2" Bolts and Nuts
3 Required
7/16" Holes for 2 1/2" x 3/8"
NC Machine Screws and Nuts
3 Required
3/8" Drilled Holes
9 3/16"
7 7/8"
5/8"

Fig. 4.4

6. Remove the wrapping from the chart drive mechanism, and unscrew the mechanism from the base. The dashpot is mounted to the mechanism base with two identical thumbscrews. Remove the thumbscrews and push up the dashpot cover. Pull the dashpot out from between the mechanism frame and fill the dashpot with 3 1/2 oz. of the silicone damping fluid supplied. Replace the dashpot.

7. Replace the chart drive mechanism.

8. Remove thumbnut from chart drive mechanism spindle. Mount chart cylinder (with chart clip) supplied on the spindle, making certain that the mechanism pinion and the cylinder gear are meshed. Do not replace the thumbnut.

9. Replace the gage housing, positioning it on the mechanism base so that the chart drive and pen arm are accessible from the sliding access door.

10. Fasten the housing in place with the five screws. Replace the bucket platform on the movement bracket, and fasten it in place with the washer and screw. Replace the collector on the gage housing. The gage is now ready to be put into operation.

11. If the installation is done in the winter months, the raingage should be winterized according to the instructions provided in the *National Trends Network Site Operation Manual* (http:/nadp.sws.uiuc.edu/lib/manuals/opman.pdf).

4.5 Testing the Station

Once installed, the following field checks should be made to determine if the station is operating properly. If deficiencies are noted, refer to the appropriate instrument manual or the *National Trends Network Site Operation Manual* (http:/nadp.sws.uiuc.edu/lib/manuals/opman.pdf). to troubleshoot the problem.

1. <u>Short the sensor on the collector with water or a coin.</u>
   During the cycling of the lid you should observe the following:
   a. The voltage across the event terminals on the motorbox should be between 11 and 17 VDC when the lid is in the fully open position. Voltage at any other time indicates a motor malfunction.
   b. The lid should travel at an even rate to cover the dry side bucket.

2. <u>After the cycle is complete and with the sensor wet or the coin still in place.</u>
   a. The event pen should be elevated on the raingage chart.
   b. The sensor should heat to become hot to the touch within 2-3 minutes.
   c. The lid should be centered snuggly on the dry bucket, forming an “air tight” seal.
   d. The lid should be “locked” on the dry bucket and not easily dislodged (~ 1 inch of lid travel is normal).

3. <u>Remove the coin after the cycle is completed.</u>
   a. The lid should be centered snuggly over the wet bucket forming an “air tight” seal.
   b. The lid should be “locked” on the wet bucket and not easily dislodged.
   c. The event pen should have returned to the “normal” position on the raingage chart.

4. <u>Testing of the raingage.</u>
   a. Zero the raingage.
   b. Slowly push down on the bucket of the raingage; the lower pen should return to the zero line of the raingage chart.
   c. There should be an ink tracing for both the event pen and (from 4.5.1-4.5.3) and the lower rain amount pen.

APPENDIX A - National Atmospheric Deposition Program (NADP)/National Trends Network (NTN) Site Information Worksheet

NATIONAL ATMOSPHERIC DEPOSITION PROGRAM (NADP)
SITE INFORMATION WORKSHEET

3.1 If you have any questions while filling out this form, please refer to Section 3 in the Instruction Manual, NADP Site Selection and Installation (http://nadp.sws.uiuc.edu/lib/manuals) or call 217-244-2838. Please fill the form out completely and return it to: Roger Claybrooke, NADP Program Office, Illinois State Water Survey, 2204 Griffith Drive, Champaign, IL 61820-7495.

Record distances and elevations in metric units (e.g., meters as m, centimeters as cm, millimeters as mm, megawatts as MW and kilometers as km) and directions from magnetic north. Except as noted, report distances from the planned or current collector location. Where space is inadequate for your remarks, attach additional pages, and label the remarks for the worksheet item being described.

This is a: New Site _____ Site Change _____ Date Prepared _____

3.2 SITE IDENTIFICATION

Site Name _____ County _____

State _____ Site ID (assigned by NADP Program Office) ___ ___ ___ ___

Operating Agency _____

Sponsoring Agency _____

Site Owner _____

Coordinates

Record latitude and longitude in degrees and decimal minutes (e.g. 40 degrees, 30.201 minutes)

Latitude: _____ Degrees _____ . _____ Minutes

Longitude: _____ Degrees _____ . _____ Minutes

or degrees, minutes, and seconds (e.g. 40 degrees, 30 minutes, 15 seconds).

Latitude: _____ Degrees _____ Minutes _____ Seconds

Longitude: _____ Degrees _____ Minutes _____ Seconds

Elevation _____m above sea level

USGS Map Name (1:24,000) _____ Revision Year _____

USGS Map Name (1:250,000) _____ Revision Year _____

3.3 SITE PERSONNEL

Site Operator _____ Phone (_____)_____-_____

Address_____

(Street number and name, city, state, and Zip code where UPS will deliver supplies)

_____

_____

Fax (_____)_____-_____ E-mail Address_____

Site Supervisor _____ Phone (_____)_____-_____

Address _____

Fax (_____)_____-_____ E-mail Address_____

3.4 SITE ACCESS

How will the Site Operator access the site?

Summer ☐ foot ☐ ATV ☐ auto/truck Winter ☐ foot ☐ ATV ☐ auto/truck

Road Information

Is there a site access road that allows vehicles to park within 30 m of the collector? Yes____ No ____

If Yes, Check surface material: ☐ asphalt ☐ concrete ☐ dirt ☐ gravel ☐ sand ☐ mixed

How many vehicles use this road each week? (Estimates are fine.) Summer _____ Winter_____

If No, how close is the nearest road to the collector? (Indicate m or km.) _____

If Yes, Check surface material: ☐ asphalt ☐ concrete ☐ dirt ☐ gravel ☐ sand ☐ mixed

Direction from collector _____ Is this road private or public access? _____

Parking Lot Information

Is there a site access lot that allows vehicles to park within 30 m of the collector? Yes____ No ____

If Yes, Check surface material: ☐ asphalt ☐ concrete ☐ dirt ☐ gravel ☐ sand ☐ mixed

How many vehicles use this lot each week? (Estimates are fine.) Summer _____ Winter_____

If No, how close is the nearest lot to the collector? (Indicate m or km.) _____

If Yes, Check surface material: ☐ asphalt ☐ concrete ☐ dirt ☐ gravel ☐ sand ☐ mixed

Direction from collector _____ Is this lot private or public access? _____

Logistics

How is the site secured against vandalism, grazing, etc.? _____

_____

Describe any special logistical problems. _____

_____

3.5 SITE INSTRUMENTATION

Note: NADP has specific equipment requirements. Please fill in details of planned or existing electrical supply and equipment. Please contact 217-244-2838 if you have questions.

Power Supply

Primary power (check one) ☐ AC ☐ DC

If AC, Voltage_____ volts Service amperage_____

If DC, Battery capacity _____ ampere-hours Solar panel output _____ ampheres

Panel area _____ sq. meter

Precipitation Collector

Make _____ Model _____

Recording Raingage

(Gage must be no less than 5 m nor more than 30 m from the precipitation collector.)

Make _____ Model _____

Diameter of opening _____cm Wind shield type: ☐ Alter ☐ DFIR ☐ Fence ☐ Other

Annual Precipitation _____/_____/_____ Years of record _____

(mm) total rain snow depth

Nearest Alternate Raingage

Distance from collector (Indicate m or km.) _____ Direction from collector_____

Annual Precipitation _____/_____/_____ Years of record _____

(mm) total rain snow depth

Nearest Climate Normal Gage (National Weather Service, 30-year record)

Location _____

Distance from collector (Indicate m or km.)_____ Direction from collector_____

Annual Precipitation _____/_____/_____ Years of record _____

(mm) total rain snow depth

3.6 RELATED SCIENTIFIC ACTIVITIES

Please fill in tables with all available information regarding other research or monitoring activities within 0.5 km of the proposed site.

Aerosol and Gas Measurements

Regional, National, or State Aerosol and/or Gas Measurement Programs

Check if YES	Measurement	Distance from site (m)	Data Availability Give Reference
	CASTNet		
	IMPROVE		
	NDAMN		
	AIRMoN - Dry		
	USDA UVB		
	SURFRAD		
	LTER		
	Other (National)		
	Other (National)		
	Other (State)		
	Other (State)		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		

Meteorological Instruments

Regional, National, or State Meteorological Measurement Programs

Check if YES	Program	Distance from site (m)	Data Availability Give Reference
	NWS Coop Network		
	NOAA – Climate Reference Network		
	State Climate Network		
	Other (Naional)		
	Other (Naional)		
	Other (State)		
	Other (State)		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		
	Other		

3.7 POTENTIAL SAMPLING OBSTRUCTIONS AND POLLUTION SOURCES

Land Cover within 0.5 km of Site

Describe the land cover in a circular area of 0.5-km radius (~0.3 miles) around the site. Indicate the fraction of surface covered by forest, desert, uncultivated grassland, cultivated crops, grazed pasture, swamp or wetland, open water, residences, industries, commercial activities, farm buildings, etc.

For example cultivated crops / 80 % residences / 20 %.

Surface 1 _____/ _____ % Surface 4 _____/ _____ %

Surface 2 _____/ _____ % Surface 5 _____/ _____ %

Surface 3 _____/ _____ % Other _____% Total should be 100%.

On Site (From 0 to 5 m of Precipitation Collector)

Start at magnetic north, move clockwise, and identify all objects (vegetation, posts, instruments, etc.) that are greater than 1 m tall and their description, direction and distance from the collector position.

Object Description (Type)	Object Dimensions (m)		Direction from Collector (Start at 0 degrees)	Distance from Collector (m)
	Height	Size		
Wood Post with Power Box	1.2	.1 x .1	90°	4.9

Is there any treated lumber or galvanized metal? Yes _____ No _____

Describe _____

On Site (From 0 to 5 m of Recording Raingage)

Start at magnetic north, move clockwise, and identify all objects (vegetation, posts, instruments, etc.) that are greater than 1 m tall and their description, direction and distance from the raingage position.

Object Description (Type)	Object Dimensions (m)		Direction from Collector (Start at 0 degrees)	Distance from Collector (m)
	Height	Size		
Raingage, 8” stick	1	.5 diam.	65°	4.9

On Site (From 0 to 30 m of Precipitation Collector)

Ground Cover

Describe the ground cover within 30 m of the precipitation collector. Indicate the fraction of surface covered by bare ground, rock, mown grass, dense vegetation, shrubs, trees, water, etc.

Cover 1 _____/ _____ % Cover 3 _____/ _____ %

Cover 2 _____/ _____ % Cover 4 _____/ _____ %

Instrument shelters, buildings, sheds, residences, or other structures (start at magnetic north, move clockwise and identify all) None _____

Object Description (Type, Use)	Length (m)	Width (m)	Height (m)	Direction from Collector (Start at 0 degrees)	Distance from Collector (m)
Metal tool shed	5	4	3	75°	9.7

Overhead wires, towers, and masts (start at magnetic north, move clockwise and identify all).

None _____

Object Description (Type, Use)	Estimated Height (m)	Direction from Collector (Start at 0 degrees)	Distance from Collector (m)
Aluminum meteorological tower	10	45°	15

Animal Grazing Activity None _____

How close can animals approach the collector? _____ m Number of animals _____

Type of animal: ☐ Wild ☐ Horse ☐ Hogs ☐ Cattle ☐ Other

Is grazing: ☐ seasonal ☐ year-round?

Trees, Shrubs, and Cactuses None _____

Provide information on all trees, shrubs, and cactuses that are **taller than their distance from the collector and their description, direction and distance from the collector position.** Shorter trees, etc. may also be described.

Object Description (Type, Use)	Estimated Height (m)	Direction from Collector (Start at 0 degrees)	Distance from Collector (m)
Large Saguaro cactus	10	45°	15

Local Area (From 30 to 100 m of Precipitation Collector)

Surface Storage (Agricultural Chemicals, Products, Fuels, and Other Materials None _____

Description	Amount	Direction from Collector	Distance from Collector (m)
Farm fuel supply for tractors	~ 500 gal	Due East	98

Parking Lots or Maintenance Yards None _____

Size (meter sq) _____ Distance from collector _____ m Direction from collector _____

Check surface material: ☐ asphalt ☐ concrete ☐ dirt ☐ gravel ☐ sand ☐ mixed

How many vehicles use this lot each day? (Estimates are fine.) Summer _____ Winter_____

Air, Ground, and Water Transportation Sources Other than Roads None _____

Transport Source Description	Direction from Collector	Distance from Collector (m)
Airport Runway		
Airport Taxiway		
Train tracks		
Waterways		
Other		

Roads None _____

Include all roads, even ones previously described in the Site Access section above and their description, direction and distance from the collector.

Road Name/Use	Surface Material (Asphalt, Concrete, Dirt, Gravel, Sand, Mix)	Vehicle Use # per		Direction from Collector	Distance from Collector
		Winter	Summer		
HWY 1 Rural 2 lane	Concrete	< 100	>1000	NW or ~ 300	250

Local Area (From 100 to 500 m (~ .3 miles) of Precipitation Collector)

Identify large concentrations of animals (feedlots or dairy, poultry, or swine operations) None _____

Type	Number of Animals	Direction from Collector	Distance from Collector (m)
Poultry Building	~200	90°	350

Identify combustion sources (open or controlled coal, natural gas, oil, waste, etc.) None _____

Fuel Type	Season (Spring, Summer, Fall, Winter)	Direction from Collector	Distance from Collector (m)
Wood	Winter heating	180°	450

3.7 LABORATORY FACILITIES

Available Lab Space None ____ Good ____ Fair ____ Poor ____ Shared? Yes ____ No ____

Distance from site (Indicate m or km.) _____

pH Meter None _____ Manufacturer _____ Model _____

Probe None _____ Manufacturer _____ Model _____

Conductivity Meter None _____ Manufacturer _____ Model _____

Cell None _____ Manufacturer _____ Model _____

Balance None _____ Manufacturer _____ Model _____

Type of low conductivity water available

Deionized _____ Distilled _____ Bottled _____

Special problems or conditions

_____

_____

_____

3.8 OTHER

Please submit these items with the worksheet:

- Topographic maps (1:24,000 and 1:250,000) **Please mark the location of the site on the maps.**
- Site sketch (scale drawing of site using template provided)
- Photos of collector or planned collector location in 8 directions (N, NE, E, SE, S, SW, W, NW). Digital images are preferred.

PERSON WHO COMPLETED THIS FORM

Name_____ Title: _____

Phone_____ Fax _____

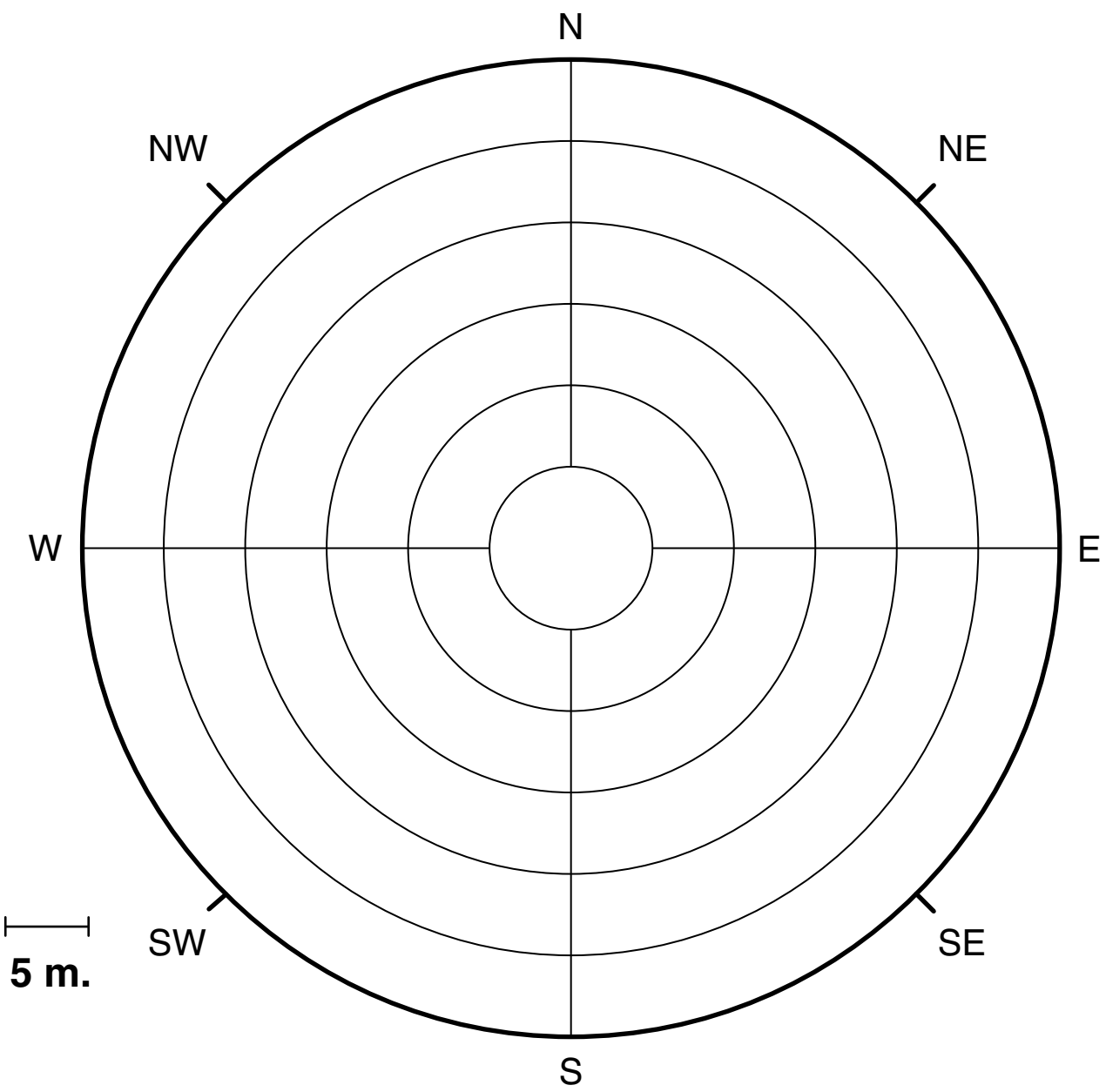
Address _____

_____

E-mail address _____

NADP 30-Meter Site Sketch Template

SITE NAME _____ DATE _____



	NADP Collector
	Belfort Raingage
	Buildings
AQ	Air Quality Shelter
	Fence
M	Meteorological Instrument
	Platform
	Post
	Power Line
	Solar Panel
	Stick Gage
	Tower

	Trees
	Shrubs
	Weeds
	Mown Grass
	Bare Ground
	Sparse Vegetation
	Rock
	Water

-SEE INSTRUCTIONS IN SECTION 3.8

APPENDIX B - Condensed Siting Criteria for Establishing Regionally Representative NADP/NTN Sites

CONDENSED SITING CRITERIA FOR ESTABLISHING REGIONALLY REPRESENTATIVE NADP/NTN SITES

Critical distances (see Section 2.3 for more details)

Sources	Distance from the collector	
	Minimum	Becomes background*
Regional Requirements:		
Heavy industry (chem plants, power plants)	10 km (20 km if upwind)	50 km
Suburban/urban populations	10 km (20 km if upwind)	50 km
if population >75,000	20 km (40 km if upwind)	50 km
Local Requirements:		
Moving sources	100 m	10 km
Feedlots/dairy barns, etc.	500 m	1000 m
Grazing animals	20 m	
Surface storage	100 m	1000 m
Parking lots	100 m	200 m

On-Site Requirements:	Minimum	Maximum
Raingage (must be in same plane as the collector ±1 ft)	5 m	30 m
Critical angles		
Buildings	Outside 30° cone of mean wind direction	
Projection angle	45°	
Slope	level	15%

* Distance from the collector beyond which source is thought to be undistinguishable from background.