Methyl Mercury Explanatory Notes

Table 1. Methyl Mercury Data Field Descriptions.

Field Name	Description
SiteID	a unique 4 character identifier for the site comprised of the 2 letter state or province abbreviation followed by a 2-digit number; SiteIDs are consistent across all NADP networks.
dateOn	date and time that the first component sample was deployed
dateOff	date and time that the last component sample was removed
midDate	date and time midway between when the first component sample was deployed and the last component sample was removed. This value is used when determining the calendar year with which to associate the sample.
subppt	precipitation amount (in millimeters) used to calculate deposition. The value may include substitute data for any missing record from the raingage. It is the sum of all precipitation during the sampling period.
raingage	precipitation amount (in inches) reported by the raingage for the entire sampling period.
sVol	total volume (in mL) of the component samples forming the composite
samples	number of component samples in the date range for the composite, regardless of sample validity
samples_w_volume	numbers of component samples of sufficient volume to contribute to the composite, regardless of sample validity
conc	net concentration of methyl mercury in ng/L
QR	Quality Rating code for the component sample (see Table 2)
note_code1	code providing additional information about each (sequential) component sample of the composite, and any irregularities in its collection, handling, or analysis (see Table 3)
note_code2	
note_code3	
note_code4	
note_code5	
note_code6	
note_code7	
note_code8	
note_code9	
note_code10	
note_code11	
note_code12	
note_code13	
note_code14	
note_code15	
note_code16	

Table 2. Quality rating (QR) codes.

QR Code	Description
A	Valid samples of the highest quality. No known field or laboratory problems that would lessen or otherwise compromise the integrity of the sample.
B	Valid samples of unknown quality. See Table 3 for a list of factors that impact the quality of a sample.
C	Invalid samples. See Table 3 for a list of factors that compromise the quality of a sample.

QR codes are assigned based on the following logic:

1. QR code assigned to the corresponding MDN sample (if a split sample), OR
   Lowest QR code from the group of component MDN samples (if a composite sample),

2. C coded, if problems occur during analysis for methyl mercury

Debris types (i.e., bird droppings, cloudy or discolored, soot/ash/dirt particles, insect/animal matter, or leaves/twigs/pollen/plant matter) recorded by the field operator are included as part of the data record. In and of themselves, they do not define sample validity. The data user is encouraged to consider the presence/absence/type of debris as part of any analysis. For a composite sample, the presence of debris in a single component sample indicates the presence of the same debris type in the composite sample.

MDN note codes are presented in Table 3. These codes help describe the quality of an MDN sample. Note codes for methyl mercury samples are inherited from the corresponding component MDN samples as described above. All component samples that contribute sample volume to the composite methyl mercury sample are considered when assigning note codes to the composite sample. Dry samples, or samples of insufficient volume to contribute an aliquot for the methyl mercury analysis are not considered when assigning note codes to the composite sample.

Table 3. MDN and Methyl Mercury Note Codes

Note Code	Description	Cause	QR Code
d	debris in sample	● one, or more, boxes in Block 5 **Observations** of the MOF indicate visible contamination in the sample ● sample record indicates "Debris Detected at HAL"	B
e	extended duration sample	● sample duration exceeds 194 hours	
h	sample handling problem	● sample bottle leaked during shipment to, or from site ● sample record indicates "Bag Leak" ● sample record indicates "Bag Open" ● sample received at the lab 16-30 days after dateoff	
i	low sample volume	● 1.5 mL ≤ bottle catch < 10 mL	
m	missing information on MOF	● incomplete information on the MOF ● Precipitation Record missing ● T_{min} missing ● T_{max} missing ● sample record indicates "Do Not Use Gauge" ● sample record indicates "Event Recorder" did NOT work ● sample record indicates Raingage data was NOT submitted	
z	site operations problem	● sample record indicates T_{min} < 32˚F ● sample record indicates T_{max} > 120˚F ● sample record indicates sensor and motorbox did NOT operate properly ● sample record indicates "Site Operations" problem	
b	bulk sample	● MDN collector configured to be open continuously for any portion of the sampling period ● sample record indicates "Bulk Sample"	C
c	gross contamination	● sample appearance and analytical results indicate significant contamination of the sample, particularly in conjunction with field notes ● sample record indicates "Contaminated"	
f	field protocol problem	● problem in the field compromised the integrity of the sample (e.g., the sample was spilled, liquid in the overflow container poured into the sample bottle) ● sample record indicates "Field Protocol" problem ● sample record indicates "Sample Condition" problem ● sample record indicates "Site Environment" problem	
l	lab protocol problem	● problem in the lab compromised the integrity of the sample (e.g., the sample was spilled, the sample was lost) ● sample record indicates "Lab Protocol" problem	
n	no sample received within 30 days of collection	● site shipped sample, but the sample was not received by the lab (e.g., sample lost in transit) ● sample received by the lab more than 30 days after dateoff ● sample record indicates "Shipping Damage"	
p	missing precipitation record	● raingage data missing AND bottle catch missing ● raingage data missing AND sample record indicates "Do Not Use Bottle Catch" ● sample record indicates "Do Not Use Gauge" AND bottle catch missing ● sample record indicates "Do Not Use Gauge" AND "Do Not Use Bottle Catch"	
u	undefined sample	● MDN collector open for extended periods of time during which no precipitation was reported ● sample record indicates "Undefined Sample"	
v	low collection efficiency	● raingage > 0.03" AND bottle catch < 1.5 mL ● (bottle catch)/raingage < 10%	

Methyl Mercury Analysis

Two options (split sample and composite sample) are available for methyl mercury analysis of NADP wet-deposition samples. For a split sample, an aliquot is taken from a single MDN (total mercury) sample for methyl mercury analysis. For a composite sample, a percentage of each weekly MDN sample is taken for four consecutive weeks. The resulting composite sample is then analyzed for methyl mercury. As the QR code of a component sample is not known at the time the aliquot is taken, an invalid (QR code of C) sample may contribute to the composite volume. The resulting composite sample will be assigned a QR code of C during the data review process.

All samples are preserved using 1% volume:volume HCl and are stored in a refrigerator (4˚C) until analysis. Table 4 provides further detail regarding sample volumes for both split samples and composite samples.

Table 4. Sample Aliquots

MDN sample mass (g)	methyl mercury sample	
	split mass (g)	composite mass (g)
MDN ≤ 25	0 (no aliquot taken)	0 (no aliquot taken)
25 < MDN ≤ 50	0.10 x MDN	0.10 x MDN
50 < MDN ≤ 150	0.25 x MDN	
MDN > 150	0.50 x MDN, with a maximum aliquot of 140 mL	

The reporting limit is based on the mass of methyl mercury that is measured in a sample. Samples that were analyzed prior to 18 April 2007 require a minimum mass of 0.0050 ng. Samples that were analyzed on 18 April 2007, or later, require a minimum mass of 0.0025 ng.

The methyl mercury concentrations for all samples submitted after 01 October 2002 were calculated using the equation listed below. In September 2013, the laboratory began using this equation to calculate the concentration of methyl mercury in a precipitation samples. Prior to that date, a different set of equations was used. As a result, values retrieved from the NADP website will differ from preliminary data sent to site supervisors and sponsors. The concentration of methyl mercury for samples collected prior to October 2002 were not re-calculated with these equations. Insufficient data precludes re-calculation of the methyl mercury concentration for these records.

$$\text{Concentration (ng/L)} = \frac{(Peak\ Height - Bubbler\ Blank\ Height) x\ Dilution\ Factor}{0.05\ x\ Calibration\ Factor\ x\ Distillation\ Factor} - \text{Preparation Blank}$$

where,

$$\text{Dilution Factor} = \frac{50\ mL}{Analysis\ Volume\ (mL)}$$