APPENDIX D
Summary of Available Monitoring Data for TRIM.FaTE Mercury Case Study

The test site used to compare TRIM.FaTE module outputs to environmental monitoring data was selected, in part, due to the amount and kinds of monitoring data available for comparison. This appendix provides a summary of the mercury monitoring data that are currently available for the selected test site. The data sets are organized into primarily on-site and primarily off-site monitoring efforts, with abiotic data sets presented first followed by biotic data sets. Note that several of the data sets that are listed as on-site include one or two off-site reference location measurements.

Note: Data sources are not provided because they could reveal the location and identity of the case study site.

D.1 ON-SITE MONITORING DATA

D.1.1 ON-SITE SOIL MONITORING DATA

Environmental Medium: Surface soil

Number of Data Points: 11 data points from 11 locations

Measurement Endpoint(s) (Units): Total mercury dry weight concentration (mg/kg)

Sampling Date(s): June 6-7, 1995, October 27, 1997

Sample Location(s): 10 data points from 10 on-site and 1 data point from a reference location

Purpose of Monitoring: 1995 and 1997 site investigations

Range: 0.18 - 10.3 mg/kg, dry weight

Mean and Standard Deviation: 5.05 ± 3.47 mg/kg, dry weight (median = 4.8 mg/kg, dry weight)

Other Information: These data correspond in time and location to the earthworm monitoring data (see below) and overlap with 6 of the 61 surface soil samples listed below. Some of these samples maybe contaminated by on-site point source releases.

Environmental Medium: Surface and subsurface soil

Number of Data Points: 113 data points of which 61 are from 0 - 0.5 feet including 2 not analyzed (NA) and 6 duplicates, and 52 are from 1 - 1.5 feet including 2 ND at detection level of 0.1 mg/kg, 4 NA, and 4 duplicates

Measurement Endpoint(s) (Units): Total mercury dry weight concentration (mg/kg)

Sampling Date(s): August 16, 1994, August 17, 1994, August 18, 1994, May 3, 1995, May 4, 1995, June 6, 1995, June 7, 1995

Sample Location(s): On-site from 56 locations

Purpose of Monitoring: 1995 and 1997 site investigations

Range: (1) At 0 - 0.5 feet: 0.14 - 310 mg/kg
(2) At 1 - 1.5 feet: $\leq$ 0.1 - 80 mg/kg

Mean and Standard Deviation: (1) At 0 - 0.5 feet: 30.1 ± 47.6 mg/kg (median = 13 mg/kg)
(2) At 1 - 1.5 feet: 12.4 ± 16.3 mg/kg (median = 6.2 mg/kg)

Other Information: These data also include measurement of soil pH in some cases. Some of these samples maybe contaminated by on-site point source releases.

Environmental Medium: Surface soil

Number of Data Points: 56 data points including 6 duplicates from 50 different sampling sites

Measurement Endpoint(s) (Units): Total mercury dry weight concentration (mg/kg)

Sampling Date(s): September/October 1997

Sample Location(s): On-site from 50 locations

Purpose of Monitoring: 1997 site investigation

Range: < 0.20 - 310 mg/kg dry weight

Mean and Standard Deviation: 5.37 ± 11.4 mg/kg, dry weight (median = 1.2 mg/kg, dry weight)

Other Information: Some of these samples maybe contaminated by on-site point source releases.

Environmental Medium: Surface and subsurface soil.

Number of Data Points: 33 data points from 4 locations, including 19 from 0 - 0.5 feet, 8 from 0 - 0.2 feet, and 6 from 1 - 1.5 feet

Measurement Endpoint(s) (Units): Total mercury dry weight concentration (mg/kg)

Sampling Date(s): November 3, 1997, November 6, 1997, November 14, 1997

Sample Location(s): On-site from 14 sites clustered around 1 location, 11 sites clustered around another location, and 4 sites each clustered around 2 other locations

Purpose of Monitoring: Delineation soil sampling for 1997 site investigation

Range: (1) 0 - 0.5 feet: 0.1 - 42.5 mg/kg, dry weight
(2) 0 - 0.2 feet: 4.5 - 126.9 mg/kg, dry weight
(3) 1-1.5 feet: 0 - 6.4 mg/kg, dry weight

Mean and Standard Deviation: (1) 0 - 0.5 feet: 8.3 ± 12.6 mg/kg, dry weight
(2) 0 - 0.2 feet: 23.8 ± 41.8 mg/kg, dry weight
(3) 1-1.5 feet: 3.5 ± 2.5 mg/kg, dry weight

Other Information: Some of these samples maybe contaminated by on-site point source releases.

Environmental Medium: Subsurface soil

Number of Data Points: 107 data points, including 25 data points from 2 cores in different locations in 1995 including 3 duplicate samples and 9 ND, and 82 data points from 8 cores in different locations in 1997 including 8 duplicate samples and 2 ND. Data are provided in 2 foot intervals from 0 feet to up to 57 feet in some cores.

Measurement Endpoint(s) (Units): Total mercury dry weight concentration (mg/kg)

Sampling Date(s): 1995 and 1997

Sample Location(s): On-site from 10 different locations

Purpose of Monitoring: 1995 and 1997 site investigations

Range: 0.00 - 239.30 mg/kg (for entire data set, regardless of depth and year)

Mean and Standard Deviation: Due to the nature of this data set, a mean and standard deviation were not calculated.

Other Information: Some of these samples maybe contaminated by on-site point source releases.

D.1.2 ON-SITE BIOTA MONITORING DATA

Environmental Medium: Deer mouse (Peromyscus maniculatus)

Number of Data Points: 9 data points from 9 locations

Measurement Endpoint(s) (Units): (1) Total Mercury concentration (mg/kg, wet weight, whole body)
(2) Percent moisture (%)

Sampling Date(s): June 1995

Sample Location(s): (1) 7 from on-site locations
(2) 2 from an off-site reference location

Purpose of Monitoring: 1995 Site Investigation

Range: (1) On-site: 0.06 - 0.198 mg/kg, wet weight; 70.4 - 77.1 % moisture
(2) Off-site: 0.016 - 0.087 mg/kg, wet weight; 73.5 - 77.3 % moisture

Mean and Standard Deviation: (1) On-site: 0.100 ± 0.063 mg/kg, wet weight; 74.2 ± 2.3 % moisture
(2) Off-site: 0.0515 ± 0.050 mg/kg, wet weight; 75.4 ± 2.7 % moisture

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Environmental Medium: Earthworm (Species not specified)

Number of Data Points: 11 data points from 11 locations

Measurement Endpoint(s) (Units): (1) Total mercury concentration (mg/kg, wet weight)
(2) Percent moisture (%)

Sampling Date(s): June 6-7, 1995, October 27, 1997

Sample Location(s): 10 data points on-site and 1 data point from a reference location

Purpose of Monitoring: 1995 and 1997 site investigations

Range: (1) On-site: 0.087 - 2.82 mg/kg, wet weight; 84.3 - 88.6%
(2) Off-site: 0.044 mg/kg, wet weight; 87.9 % (single values)

Mean and Standard Deviation: (1) On-site: 0.044 mg/kg, wet weight; 87.9 % (single value, no standard deviation)
(2) Off-site: 0.982 ± 0.79 mg/kg, wet weight; 86.3 ± 1.2 %

Other Information: These data correspond in time and location to one set of soil monitoring data (see above)

D.2 OFF-SITE MONITORING DATA

D.2.1 OFF-SITE AIR MONITORING DATA

Environmental Medium: Ambient air

Number of Data Points: Approximately 9,000 data points from 3 continuous monitoring stations. Data quality flags are included indicating automatic calibration, power failure, valid measurement, standard addition, maintenance and manual calibrations, equipment failure or malfunction, no peak (i.e., below detection limit), overload (beyond analyzer range), and suspect data (based on quality assurance measures).

Measurement Endpoint (Units): One-hour average total gaseous mercury (ng/m^3)

Sampling Date(s): September 4, 1998 to January 9, 1999 (hourly samples throughout period)

Sample Location(s): (1) Approximately 1,500 feet southeast of facility
(2) approximately 4,300 feet north-northwest of the facility
(3) approximately 6,400 feet north-northwest of the facility

Purpose of Monitoring: To provide data to the state environmental agency as a result of a consent agreement enforcement order

Range: (1) 0.834 - 157 ng/m^3
(2) 0.993 - 25.8 ng/m^3
(3) 0.565 - 14.8 ng/m^3

Mean and Standard Deviation: (1) 9.96 ± 15.52 ng/m^3 (includes values with all types of data flags)
(2) 2.46 ± 2.15 ng/m^3 (includes values with all types of data flags)
(3) 1.85 ± 1.66 ng/m^3 (includes values with all types of data flags)

Other Information: Corresponding meteorological data are also available from an on-site monitoring station, including approximately 1,680 data points each for (1) average hourly wind speed (mph), (2) average hourly wind direction (°N), (3) average hourly ambient temperature

(°C), and (4) average hourly solar radiation (W/m^2) from 1 continuous monitoring station from November 1, 1998 to January 9, 1999. Another data set of meteorological parameters that can be used as inputs to TRIM.FaTE is available from a continuous monitoring station in Portland, ME. This data set includes approximately 8,760 hourly averaged measurements from each year from 1990 to 1995 for wind speed (m/s), wind direction (degrees), rural and urban mixing height (m), precipitation rate (mm/hour), precipitation type (unitless), ambient temperature (°K), stability class (unitless), friction velocity (m/s), monin-obukhov length (m), and surface roughness length (m).

D.2.2 OFF-SITE SURFACE WATER MONITORING DATA

Environmental Medium: Surface water

Number of Data Points: 5 data points in 5 locations

Measurement Endpoint(s) (Units): Total mercury concentration (ug/L) (unfiltered samples)

Sampling Date(s): June 1995

Sample Location(s): (1) 2 samples located in adjacent river upstream of facility
(2) 3 samples located in adjacent river downstream of facility

Purpose of Monitoring: 1995 site investigation

Range: (1) Upstream: 0.00359 - 0.00529 ug/L
(2) Downstream: 0.000646 - 0.0703 ug/L

Mean and Standard Deviation: (1) Upstream: 0.004 ± 0.001 ug/L (median = 0.004 ug/L)
(2) Downstream: 0.034 ± 0.033 ug/L (median = 0.027 ug/L)

Environmental Medium: Surface water

Number of Data Points: 50 data points plus 6 not analyzed from 14 locations at ebb tide, flood tide, high tide, and low tide

Measurement Endpoint(s) (Units): Total mercury concentration (ng/L)

Sampling Date(s): August 18-19, 1997

Sample Location(s): In adjacent river

Purpose of Monitoring: 1995 site investigation

Range: 4.09 (flood tide) - 173 (ebb tide) ng/L

Mean and Standard Deviation: 15 ± 37.71 ng/L

D.2.3 OFF-SITE SEDIMENT MONITORING DATA

Environmental Medium: Sediment

Number of Data Points: 1 data point based on a single measurement each from 4 different off-site ponds and lakes, including measurements from the pond that is part of the mercury case study

Measurement Endpoint(s) (Units): Total mercury concentration in the upper 2 cm of the sediment in the deepest part of the waterbody (mg/kg, dry weight)

Sampling Date(s): (1) September 19, 1996
(2) September 26, 1996
(3) September 20, 1996
(4) September 20, 1996

Sampling Location(s): four nearby offsite lakes and ponds. Deepest part of each waterbody.

Purpose of Monitoring: To determine if lakes and ponds are measurably affected by small, local air emission sources of mercury

Range: N/A (single value provided)

Mean and Standard Deviation: (1) 0.319 mg/kg (no SD available)
(2) 0.157 mg/kg (no SD available)
(3) 0.201 mg/kg (no SD available)
(4) 0.132 mg/kg (no SD available)

D.2.4 OFF-SITE BIOTA MONITORING DATA

Environmental Medium: Juvenile loon

Number of Data Points: 1 data point from 1 location

Measurement Endpoint(s) (Units): Blood total mercury concentration (ppm, wet weight) from single loon

Sampling Date(s): July 1998

Sample Location(s): Pond located southeast of the facility that is part of the mercury case study

Purpose of Monitoring: Mercury risk assessment

Range: N/A

Mean and Standard Deviation: 1.3 ppm, wet weight (single value, no standard deviation)

Environmental Medium: Loon egg

Number of Data Points: 3 data points from 1 location

Measurement Endpoint(s) (Units): Total average mercury concentration (ppm, wet weight) from multiple measurements

Sampling Date(s): June 1998

Sample Location(s): Pond located east of the facility

Purpose of Monitoring: Mercury risk assessment

Range: 1.6 - 1.8 ppm, wet weight

Mean and Standard Deviation: 1.73 ± 0.12 ppm, wet weight

Other Information: The sediment mercury concentration in this pond is 0.319 mg/kg.

Environmental Medium: Loon egg

Number of Data Points: 1 state average based on a sample size of 43

Measurement Endpoint(s) (Units): Total mercury concentration (ppm, wet weight)

Sampling Date(s): June 1998

Sample Location(s): Ponds and lakes in facility's state

Purpose of Monitoring: Mercury risk assessment

Range: N/A

Mean and Standard Deviation: 0.93 ± 0.55 ppm

Environmental Medium: Adult male loon

Number of Data Points: (1) 6 data points from 6 locations
(2) 1 state average based on a sample size of 67

Measurement Endpoint(s) (Units): Blood total mercury concentration (ppm, wet weight)

Sampling Date(s): July - August, 1997-1998

Sample Location(s): Ponds and lakes in facility's state

Purpose of Monitoring: Mercury risk assessment

Range: (1) 0.61 - 3.71 ppm, wet weight for 6 locations
(2) Not provided

Mean and Standard Deviation: (1) 2.62 ± 1.23 ppm, wet weight for 6 locations
(2) 2.5 ± 1.1 ppm, wet weight for state average

Environmental Medium: Adult female loon

Number of Data Points: (1) 1 data point from 1 location
(2) 1 state average based on a sample size of 64

Measurement Endpoint(s) (Units): Mercury total blood concentration (ppm, wet weight)

Sampling Date(s): July 1998

Sample Location(s): Ponds and lakes in facility's state

Purpose of Monitoring: Mercury risk assessment

Mean and Standard Deviation: (1) 1.16 ppm, wet weight (single value, no standard deviation) for 1 location
(2) 2.1 ± 1.5 ppm, wet weight for state average

Range: (1) N/A for 1 location
(2) Not provided

Environmental Medium: Juvenile loon

Number of Data Points: (1) 5 data points from 5 locations
(2) 1 state average based on a sample size of 52

Measurement Endpoint(s) (Units): Total mercury blood concentration (ppm, wet weight)

Sampling Date(s): July - August, 1997 - 1998

Sample Location(s): Ponds and lakes in facility's state

Purpose of Monitoring: Mercury risk assessment

Range: (1) 0.01 - 0.64 ppm, wet weight for 5 locations
(2) N/A

Mean and Standard Deviation: (1) 0.22 ± 0.24 ppm, wet weight for 5 locations
(2) 0.22 ± 0.29 ppm, wet weight for state average

Environmental Medium: White perch

Number of Data Points: 35 mercury concentration and fish length data points from 4 waterbodies, including (1) 10 data points from 1 pond, (2) 8 data points from 1 pond, (3) 11 data points from 1 pond, and (4) 6 data points from 1 lake

Measurement Endpoint(s) (Units): (1) Total mercury concentration in skinless fillet (mg/kg, wet weight)
(2) Fish length (mm)

Sampling Date(s): (1) September 19, 1996
(2) September 20, 1996
(3) September 26, 1996
(4) September 20, 1996

Sample Location(s): (1) Southeast of facility
(2) East of facility
(3) East of facility
(4) East of facility

Purpose of Monitoring: To determine if lakes and ponds are measurably affected by small, local air emission sources of mercury

Range: (1) 0.50 - 1.31 mg/kg, wet weight and 240 - 350 mm in length
(2) 0.28 - 0.72 mg/kg, wet weight and 135 - 270 mm in length
(3) 0.60 - 2.20 mg/kg, wet weight and 186 - 305 mm in length
(4) 0.32 - 0.53 mg/kg, wet weight and 185 - 202 mm in length

Mean and Standard Deviation: (1) 0.98 ± 0.25 mg/kg, wet weight and 308 ± 32 mm in length
(2) 0.45 ± 0.14 mg/kg, wet weight and 224 ± 48 mm in length
(3) 1.07 ± 0.43 mg/kg, wet weight and 231 ± 34 mm in length
(4) 0.41 ± 0.08 mg/kg, wet weight and 195 ± 8 mm in length

Environmental Medium: Short-tailed Shrew (*Blarina brevicauda*)

Number of Data Points: 1 data point from 1 location

Measurement Endpoint(s) (Units): (1) Total mercury concentration (mg/kg, wet weight, whole body)
(2) Percent moisture (%)

Sampling Date(s): June 1995

Sample Location(s): Off-site reference location

Purpose of Monitoring: 1995 Site Investigation

Range: N/A

Mean and Standard Deviation: (1) 0.064 mg/kg, wet weight (single value, no standard deviation)
(2) 73.4 % (single value, no standard deviation)

Environmental Medium: Eel (*Anguilla rostrata*)

Number of Data Points: 15 data points, including (1) 6 from upstream of the site and (2) 9 from downstream of the site

Measurement Endpoint(s) (Units): (1) Total mercury concentration (mg/kg, dry weight, fillets)
(2) Percent moisture (%)
(3) Total mercury concentration (mg/kg, wet weight, fillets)
(4) Eel weight (grams)
(5) Eel length (cm)

Sampling Date(s): June 6, 1995

Sample Locations: One location each in the river upstream and downstream of the facility

Purpose of Monitoring: 1995 site investigation

Range: (1) Upstream: 1.08 - 4.49 mg/kg, dry weight; 74.9 - 80.5 % moisture; 0.271 - 0.876 mg/kg, wet weight; 50 - 200 g; 30 - 46 cm
(2) Downstream: 1.2 - 3.64 mg/kg, dry weight; 70.5 - 81.6 % moisture; 0.259 - 0.678 mg/kg, wet weight; 50 - 375 g; 28 - 56 cm

Mean and Standard Deviation: (1) Upstream: 2.5 ± 1.1 mg/kg, dry weight; 78 ± 2 % moisture; 0.53 ± 0.2 mg/kg, wet weight; 110 ± 56.01 g; 37 ± 5.72 cm

(2) Downstream: 2.14 ± 0.81 mg/kg, dry weight; 78 ± 3 % moisture; 0.46 ± 0.14 mg/kg, wet weight; 75 ± 101.64 g; 33 ± 8.92 cm

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Environmental Medium: River minnow (killyfish) (*Fundulus heteroclitus*)

Number of Data Points: 1 data point from 1 location

Measurement Endpoint(s) (Units): Total mercury concentration (mg/kg, dry weight, composite whole body)

Sampling Date(s): August 1, 1995

Sample Location(s): In river downstream of the facility

Purpose of Monitoring: 1995 site investigation

Range: N/A

Mean and Standard Deviation: 0.447 mg/kg, dry weight (single value, no standard deviation)