September 2012 EPA/600/R-12/679

Environmental Technology Verification Report

Releasable Asbestos Field Sampler

Prepared by

Battelle The Business of Innovation

Under a cooperative agreement with

EPA U.S. Environmental Protection Agency



Environmental Technology Verification Report

ETV Advanced Monitoring Systems Center

Releasable Asbestos Field Sampler

by

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Notice

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Foreword

The EPA is charged by Congress with protecting the nation's air, water, and land resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, the EPA's Office of Research and Development provides data and science support that can be used to solve environmental problems and to build the scientific knowledge base needed to manage our ecological resources wisely, to understand how pollutants affect our health, and to prevent or reduce environmental risks.

The Environmental Technology Verification (ETV) Program has been established by the EPA to verify the performance characteristics of innovative environmental technology across all media and to report this objective information to permit issuers, buyers, and users of the technology, thus substantially accelerating the entrance of new environmental technologies into the marketplace. Verification organizations oversee and report verification activities based on testing and quality assurance protocols developed with input from major stakeholders and customer groups associated with the technology area. ETV consists of six environmental technology centers. Information about each of these centers can be found on the Internet at http://www.epa.gov/etv/.

Effective verifications of monitoring technologies are needed to assess environmental quality and to supply cost and performance data to select the most appropriate technology for that assessment. Under a cooperative agreement, Battelle has received EPA funding to plan, coordinate, and conduct such verification tests for "Advanced Monitoring Systems for Air, Water, and Soil" and report the results to the community at large. Information concerning this specific environmental technology area can be found on the Internet at http://www.epa.gov/etv/centers/center1.html.

Acknowledgments

The authors wish to acknowledge the contribution of the many individuals, without whom, this verification testing would not have been possible. Quality assurance (QA) oversight was provided by Michelle Henderson, U.S. EPA and Rosanna Buhl and Betsy Cutie, Battelle. We gratefully acknowledge Dr. Mark Follansbee and Ms. Patricia Billig of SRC, Inc., Dr. Jonathan Thornburg, of the Research Triangle Institute and Mr. Dave Ferguson, Dr. Bill Barrett, and Mr. Jim Konz of EPA for being stakeholders and providing review of the test/QA plan and this verification report.

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List of Abbreviations

ABS	Activity based sampling
ADQ	Audit of data quality
AMS	Advanced monitoring systems
ATSDR	Agency for Toxic Substances and Disease Registry
сс	Cubic centimeter
COC	Chain-of-custody
DQI	Data quality indicators
EPA	U.S. Environmental Protection Agency
EQM	Environmental Quality Management, Inc.
ETV	Environmental technology verification
HAZWOPER	Hazardous waste operations and emergency response
ISO	International Organization for Standardization
LA	Libby amphibole asbestos
lpm	Liters per minute
LRB	Laboratory record book
MCE	Mixed cellulose ester
NIST	National Institute of Standards and Technology
NVLAP	National voluntary laboratory accreditation program
NYDOH	New York Department of Health
OU	Operable unit
PE	Performance evaluation
PLM	Polarized light microscopy
QA	Quality assurance
QC	Quality control
QAO	Quality assurance officer
QMP	Quality management plan
RAFS	Releasable asbestos field sampler
RMO	Records management office
RPD	Relative percent difference
RSD	Relative percent standard deviation
SOP	Standard operating procedure
	1 81

TQAP	Test/quality assurance plan
TSA	Technical systems audit

vic verification test coordinator	VTC	Verification test	coordinator
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Chapter 1 Background

The U.S. Environmental Protection Agency (EPA) supports the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing highquality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works in partnership with recognized testing organizations, with stakeholder groups consisting of buyers, vendor organizations, and permit issuers, and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible. The definition of ETV verification is to establish or prove the truth of the performance of a technology under specific, pre-determined criteria or protocols and a strong quality management system. The highest-quality data are assured through implementation of the ETV Quality Management Plan. <u>ETV does not endorse, certify, or approve technologies</u>.

The EPA's National Risk Management Research Laboratory (NRMRL) and its verification organization partner, Battelle, operate the Advanced Monitoring Systems (AMS) Center under ETV. The AMS Center recently evaluated the performance of the Releasable Asbestos Field Sampler for field sampling of asbestos.

Chapter 2 Technology Description

This report provides results for the verification testing of the Releasable Asbestos Field Sampler (RAFS). The following is a description of the RAFS based on information provided by the vendor. The information provided below was not verified in this test.

The RAFS, owned by EQM (U.S. Patent No. 7,758,813), is a small, field portable system for determining the potential for exposure to asbestos fibers released from soils. The RAFS was designed to measure the emission rate of asbestos from soil (asbestos structures/sec) and concentration of asbestos in air when released (asbestos structures per cc of air). The RAFS operates *in situ* under actual soil conditions with representative moisture content and grain size. Thus, the possibility that soil conditions may change during handling, transport, and storage is eliminated.

The RAFS is a field instrument that provides an *in situ* measurement of asbestos releasability using mechanical agitation of the source material soil (Figure 1a). The RAFS consists of a variable speed, high efficiency particulate arrestor-filtered fan attached to a tunnel (6 inches by 6 inches by 24 inches) with an open bottom for exposure to the test matrix soil. The fan discharges air at the tunnel inlet through diffusers to evenly distribute the airflow. A variable speed motorized rake mechanism inside the tunnel provides consistent and reproducible agitation of the top 1/2 inch of soil. The rake mechanism has 10 tines that oscillate slightly as it traverses the tunnel back and forth to agitate the soil to aerosolize the asbestos fibers (Figure 1b). An attachment at the tunnel exit can support up to three 25-mm diameter mixed cellulose ester membrane filter cassettes with 50-mm extension cowls for asbestos collection and analysis using direct transfer TEM. This aspect of the RAFS design permits collection of concurrent samples for different sampling periods with resultant varied air volumes to obtain an acceptable particulate loading for analysis using direct transfer TEM. A typical sampling period ranges from 10 to 60 minutes, depending on the filter particulate loading. These filters are then tested for asbestos. Based on the amount of asbestos present on the filters, the likely exposure of individuals performing activities on the asbestos contaminated soil can be estimated. The person collecting the sample using the RAFS typically does not need to wear protective equipment such as a respirator.

Each filter assembly is attached with flexible tubing to an electric powered (110-volt alternating current) 1/10-horsepower vacuum pump operating at an airflow rate of approximately 13.5 liters per minute (lpm). Each pump is equipped with a flow control regulator and individually calibrated rotameter that maintains the initial flow rate of approximately 13.5 lpm.

The RAFS collects anisokinetic samples where the free stream velocity is greater than the sample velocity. Under these conditions, inertia effects are negligible and the free stream to sample concentration ratio is unity.



Figure 1. Releasable asbestos field sampler a) Instrument during sample collection b) Instrument rakes agitating the top soil (U.S. Patent Number 7,758,813)

Chapter 3 Test Design and Procedures

3.1 Test Overview

This verification test was conducted according to procedures specified in the *Test/QA Plan for Verification of Releasable Asbestos Field Sampler* (TQAP) and adhered to the quality system defined in the ETV AMS Center Quality Management Plan (QMP). Battelle conducted this verification test with funding support from the EPA's National Risk Management Research Laboratory. As indicated in the QAPP, the testing conducted satisfied EPA QA Category III requirements. The QAPP and verification report were reviewed by the following stakeholders:

- Mark Follansbee, SRC, Inc.
- Patricia Billig, SRC, Inc.
- Dave Ferguson, EPA

This verification test evaluated the performance of the RAFS while conducting asbestos samples at field sites. The main objective of the verification was to test the ability of the RAFS to measure the emission rate from soil (asbestos structures/sec) and the asbestos concentration released from soil (asbestos structures per cubic centimeter [cc] of air). To accomplish the goal of this verification test, the experimental design included generating data for performance parameters to assess the ability of the asbestos sampler through laboratory testing with asbestos fortified soil samples and field testing for direct comparison with activity based sampling (ABS). Testing of the RAFS was done in two phases.

Phase 1 of this verification test was conducted in Libby, Montana from August 2 to 6, 2010 to evaluate the sampling performance of the RAFS. The resulting concentration data was used to assess the comparability of the RAFS to site specific ABS events (i.e. ABS during raking) and the reproducibility of the samples collected by the RAFS. Operational factors were also assessed in the field.

The ability of the RAFS to detect asbestos in soil samples where asbestos was added was evaluated during Phase 2 of this verification test, which was conducted at Battelle's Laboratory in Columbus, OH. The RAFS was tested in soil with low and high moisture content amended with chrysotile asbestos. The accuracy and variability/consistency was verified in the laboratory. Testing for Phase 2 was conducted from September 13 through September 15, 2010.

3.2 Test Site Descriptions

3.2.1 Libby, Montana

Phase 1 of the verification test was field testing at the Libby, Montana OU4 Site. Details of the Libby Montana testing are provided in the TQAP. The TQAP states that testing will be done in three phases with Phase 1 and Phase 3 being field testing and Phase 2 being laboratory testing. However field testing was only done at one location, therefore field testing was done in just one

phase. This was a deviation from the TQAP. A deviation was prepared stating that the second field site was changed from Weedsport, NY to BoRit in Ambler, PA however a second field test was not conducted due to financial constraints on the project. Testing at only one site reduced the amount of data available for comparison of the RAFS to the ABS but it was deemed that testing at numerous locations at one site would provide sufficient information for the comparison.

Libby is a community in northwestern Montana, located seven miles southwest of an open pit vermiculite mine that operated from the 1920s until 1990. At Libby, vermiculite containing asbestos was mined for several years. Studies at the site later revealed that the vermiculite from the mine contains Libby amphibole type asbestos (LA) including tremolite and winchite. As a result of mining activities, asbestos was inadvertently utilized in building materials etc. and also was deposited after transport through the air. At Libby, Montana, field testing was conducted at four homes (Table 1). Throughout the report the locations would be referred to by their location code. EPA collected initial data beginning in 1999 to evaluate human exposure to LA and the efficacy of cleanup activities. Although the data varied widely, a discernible correlation between elevated LA levels in soil (by the polarized light microscopy [PLM] visual area estimation method) and elevated levels of asbestos in air were determined. The level of PPE suggested by EPA was C or D based on the asbestos levels detected in the soil.

Table 1. Addresses in Libby, Montana

Location	Location Code
California Avenue, Libby, Montana	A31
Dakota Ave., Libby, Montana	A32
Conifer Ave., Libby, Montana	A34
Flower Creek Road, Libby, Montana	A35

At each location, the RAFS was applied at five randomly chosen sampling points around each home. One sampling point was utilized for comparability testing, and the additional four sampling points were utilized for reproducibility testing. At each test site ABS was conducted by a different contractor. ABS was conducted by raking for 20 minutes around each home using low flow sampling at 4.86 L/min in the same area as the RAFS application. The ABS data was used for comparability testing.

3.2.2 Laboratory Test

Details of the laboratory test are provided in the TQAP. ⁽³⁾ The laboratory test was conducted in a temperature and humidity controlled basement laboratory at Battelle in Columbus, Ohio. In the laboratory, a tent (Figure 2) was constructed with a vacuum pump with HEPA filter installed for air flow, a decontamination area, and transparent window for viewing. The tent was large enough to allow two 4 ft by 4 ft wooden frames to be placed in the working area. The tent was constructed such that all asbestos was contained within the tent for decontamination purposes. Once the experiment was completed the tent was sprayed with an encapsulant to seal the asbestos for tent disposal.



Figure 2. Tent for asbestos laboratory test showing, a) Working and decontamination area, and b) HEPA filter vacuum pump in wall of tent

3.3 Experimental Design – Field Test

Before field analysis, the verification test coordinator (VTC) was trained on the use of the instrument by the vendor. The training included cleaning the instrument, turning on the instrument sample pumps, blowers, and rakes, taking blank samples, and measuring air speeds. Two RAFS instruments were made available for the field test although only one was utilized. For each of the four locations, the same general procedures were followed once on site. The procedures are described below.

3.3.1 Prepare Instrument for Sample Collection

- 1) *Sanitize equipment* Once onsite the instrument was sanitized using 409 All Purpose cleaner and lint free towels (Figure 3a).
- 2) Equipment Blank An equipment blank sample was taken first for 10 minutes (Figure 3b). In order to take the equipment blank, the instrument was placed on a clean sheet of aluminum and an open filter placed in Position 2 (middle position) on the RAFS. The blower and sample pump at Position 2 remained on for the 10 minute duration. After 10 minutes, the filter was collected, covered, and stored.
- 3) *Record Air Speed within RAFS* A Davis rotating wave anemometer was used to collect the wind speed in the tunnel of the RAFS after processing the equipment blank. In order to take the wind speed, the blower was left on for 1 minute while the anemometer recorded the air speed (Table 2). The rake was left off during this measurement. The target setting was between 280 and 380 ft/min.

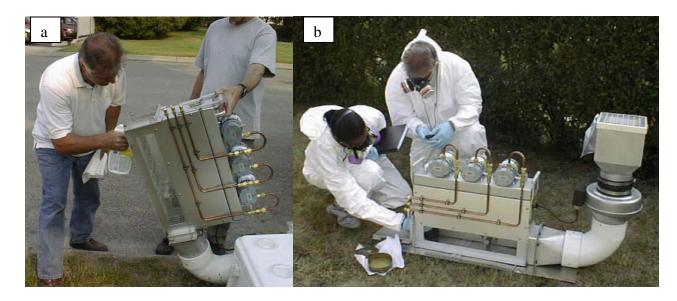


Figure 3. RAFS preparation, a) RAFS being sanitized, and b) Equipment blank being taken at a new location

3.3.2 Sample Collection

The general sample collection procedures are outlined in this section however the specific sampling conducted at each location is described later in the document.

- Measure flow at sampling pumps The RAFS holds three filters and can therefore collect triplicate samples during one application. Three individual sampling pumps are attached to each sampling point. Before samples are taken, the flow rate at each of the filter points is measured with a DryCal DC-Lite primary air flow meter and recorded. The target flow rate is 13 – 14 L/min. The flow meters on the sampling pumps can be adjusted to obtain an acceptable flow rate. The Dry Cal DC-Lite flow meter or rotameter calibration curve is provided in Figure 4. The duplicate rotameter readings were identical and therefore within the 5% RSD acceptance criteria of the test (Table 2).
- 2) Load instrument and determine sampling time Three clean filters are loaded onto the RAFS, and the particle count flowing through the RAFS is determined using a Met One particle counter. The Met One particle counter reading is one of the variables used to determine the sampling time in addition to visible observation of the loading of the filter samples after a sample has been collected for the selected sampling time (Table 3).
- 3) Blanks Open and closed field blanks were taken at each location (home). Open field blanks were taken by waving an open filter gently for 30 sec then closing and storing. Closed field blanks were taken by randomly choosing a filter from the filter lot and then labeling it as closed field blank.
- 4) *Rake Speed* The rake speed was obtained by the counts of rake counter and the length of the sampling period. However the rake counter was not functional during the duration of the laboratory and field tests. This prevented the rake speed from being verified

however the actual rake speed setting remained the same for all test locations. The target rake setting is 1 cycle/20-30 sec.

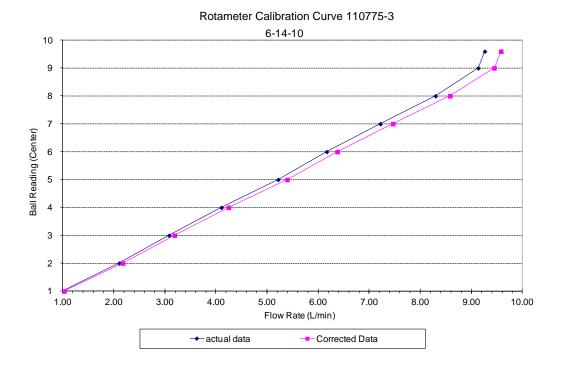


Figure 4. Air flow meter calibration curve

Table 2. Rotameter and anemometer measured blower speed during collection of	
equipment blank and samples	

Sample	Rotameter reading (L/min)		Sampling time (min)	Anemometer measured fan speed ft/min
	13.61	13.61	10	281
Equipment blank	13.56	13.56	10	250
RAFS1-LOW-L1-1	13.98	13.98	8	
RAFS1-LOW-L1-2	13.61	13.61	8	323
RAFS1-LOW-L1-3	13.40	13.40	8	
RAFS1-LOW- L2-1	13.98	13.98	8	
RAFS1-LOW- L2-2	13.61	13.61	8	355
RAFS1-LOW- L2-3	13.40	13.40	8	
RAFS1-LOW-L3-1	13.98	13.98	8	
RAFS1-LOW-L3-2	13.61	13.61	8	316
RAFS1-LOW- L3-3	13.40	13.40	8	
RAFS2-LOW-L1-1	13.68	13.68	8	
RAFS2-LOW-L1-2	13.56	13.56	8	346
RAFS2-LOW-L1-3	13.34	13.34	8	
RAFS2-LOW-L2-1	13.68	13.68	8	
RAFS2-LOW- L2-2	13.56	13.56	8	322
RAFS2-LOW- L2-3	13.34	13.34	8	
RAFS2-LOW-L3-1	13.68	13.68	8	
RAFS2-LOW-L3-2	13.56	13.56	8	321
RAFS2-LOW-L3-3	13.34	13.34	8	
RAFS1-HIGH-L1-1	13.98	13.98	8	
RAFS1-HIGH- L1-2	13.61	13.61	8	345
RAFS1-HIGH-L1-3	13.40	13.40	8	
RAFS1-HIGH- L2-1	13.98	13.98	8	
RAFS1-HIGH- L2-2	13.61	13.61	23	324
RAFS1-HIGH- L2-3	13.40	13.40	23	
RAFS1-HIGH-L3-1	13.98	13.98	8	
RAFS1-HIGH- L3-2	13.61	13.61	23	317
RAFS1-HIGH- L3-3	13.40	13.40	23	

Rotameter Test Design Criteria 13 – 14 L/m Anemometer Test Design Criteria 280 – 380 ft/min

3.3.3 Additional Measurements

- 1) Weather Measurements At each location, wind speed, barometric pressure, and humidity were measured.
- 2) *Measure Soil Moisture* Soil moisture readings were taken at five specific spots around each sampling point (Figure 5). The five spots were co-located at the four sides of the RAFS and the middle of the RAFS tunnel.



Figure 5. Collection of soil moisture readings

3.3.4 Experimental Design Specific to Location

Four locations in Libby Montana were selected for asbestos sampling.

Site A31

The first location where sampling was conducted was Site A31. The instrument was prepared for sampling as outlined in section 3.3.1. At the first sampling point (back yard), three clean filters were loaded onto the RAFS. The blower and rake were set to the highest setting with all sampling pumps on, and a sample was taken for 5 minutes. The Met One particle counter reading was > 10,000 indicating that the particle count through the RAFS chamber was very high. Upon visually observing the three filters, this was confirmed as they were found to be overloaded i.e. the filter was completely covered with a very dark layer of soil, so that sampling point was voided. A second sampling point was selected (other side of back yard), and samples were collected for the same period of time with the rake at half speed. Filters were again found to be overloaded, and the samples were voided. The third sampling point was selected at the front

left of the home. The dryness of the top soil indicated that the filters would again be overloaded. The soil moisture ranged from 2.2 to 2.8% at one of the sampling locations. Conversations with the EPA personnel, led to a deviation in the TQAP allowing for overloaded samples to be collected and analyzed by the indirect method vs. the direct method as stated in the TQAP. The laboratory analysis of overloaded samples is discussed in section 3.5.3.2. As a result three additional sampling points were selected with the first filter being removed after one minute of operating the instrument, and the remaining two filters removed after 10 minutes of operating the instrument (Table 3). The sampling times were determined by visually observing the filter after each sampling time and by checking the particle reading on the Met One particle counter. This sample collection time was conducted at four sampling points around the home for reproducibility testing while one additional sampling point was selected for the reproducibility parameter testing where the instrument sample collection time was 5 minutes for each of the three filters.

Additional measurements were collected as described in section 3.3.3. Soil samples collected in 1 L plastic bottles were taken from each sampling point. The soil samples were taken from the footprint of the RAFS at the sampling point about 1 in to 2 in depth. In summary, five soil samples were collected, and 18 RAFS filters were collected, the first three of which were voided.

Site A32

At the first sampling point, in the front yard of the residence, soil moisture content was very low ranging from 2.2% to 4.1% as experienced at the previous sampling location. The sampling time used was therefore the same with the first filter being removed after one minute and the two additional filters being pulled after the instrument had been run for 10 minutes. The reproducibility samples were again collected for a sampling time of 5 minutes (Table 3). Sample collection was attempted at 6 sampling points around the residence. One sampling point was voided because the particle count was too low (<10) leading to filters that were not well loaded. Five soil samples were collected at the five sampling points where the RAFS was successfully applied. A total of 18 filters was collected, three of which were voided due to low particle count. Additional field measurements were taken as outlined in section 3.3.3.

Site A34

At this location the yard of the residence was covered in grass so for each sampling point a 12" by 30" area was trimmed with shears, and a rake was used to loosen the soil before the RAFS was applied. While preparing the sampling points, visible vermiculite was observed in the top soil. Due to the high moisture content of the yard, once the sampling points were prepared the top layer was allowed to dry out before the RAFS was applied. The sampling points were located at the back, right side, and front of the house because the soil at the left of the house was water soaked and muddy. Soil moisture content at the sampling points ranged from 3.5% to 8.5% at one point and as high as 33.1% to 36% at another sampling point. When determining the sample time, the first filter was removed after 5 minutes of operating the RAFS, the second filter was removed after 10 minutes, and the third filter after 20 minutes. This was determined to be ideal sample collection time for this location due to the variable moisture content of the soil. The RAFS was applied at seven sampling points at this location, four of which were utilized for

comparability testing and one additional sampling point for reproducibility testing. The reproducibility samples were collected for five minutes as was done at the previous location. Soil samples were collected from each of the sampling points. Additional field measurements were taken as outlined in section 3.3.3.

Site A35

At the fourth location, the instrument was prepared for sample collection as outlined in section 3.3.1. The first sampling point was located in a horse shoe pit at the right side of the house where vermiculite was visible. Due to the low soil moisture content and the particle count, the sampling times selected were one minute for the first filter and 10 minutes sampling time for the two additional filters. The RAFS was applied at 5 locations around the house. At four of the locations comparability samples were collected, and in the additional location reproducibility samples were taken as outlined in section 3.3.3.

3.3.5 Activity Based Sampling (ABS)

ABS sampling was conducted by CDM, the contractor hired to conduct ABS throughout the Libby, Montana area. For each sampling location, a low flow personal sampling pump with a filter was attached to the individual conducting the ABS sampling. At each of the four locations ABS was done by raking for a total of 20 minutes at a specific sampling point around the home (Figure 6). When possible, the sampling point corresponded to a RAFS sampling point. There was a deviation from the TQAP in the ABS analysis. The TQAP stated that ABS should be conducted within 24 hours of the RAFS being applied at the home. However at one of the locations due to the rainy weather and subsequent high moisture content of the soil, ABS could not be conducted within 24 hrs of the RAFS. At this location, ABS was conducted nine days after the RAFS was applied. The effect of this is expected to be minimal.



Figure 6. ABS sampling

Field Site	Sampling Objective	Sample collection time
	Comparability	Filter 01 - 5 min Filter 02 - 5 min Filter 03 - 5 min
Site A31	Reproducibility	Filter 01 - 1 min Filter 02 - 5 min Filter 03 - 5 min
Site A32	Comparability	Filter 01 - 5 min Filter 02 - 5 min Filter 03 - 5 min
SILC ASZ	Reproducibility	Filter 01 - 1 min Filter 02 - 10 min Filter 03 - 10 min
Site A34	Comparability	Filter 01 - 5 min Filter 02 - 5 min Filter 03 - 5 min
Site A54	Reproducibility	Filter 01 - 5 min Filter 02 - 10 min Filter 03 - 20 min
Cite 425	Comparability	Filter 01 - 5 min Filter 02 - 5 min Filter 03 - 5 min
Site A35	Reproducibility	Filter 01 - 1 min Filter 02 - 10 min Filter 03 - 10 min

 Table 3. RAFS sampling times used for each location and test parameter

3.4 Experimental Design – Laboratory Test

The purpose of the laboratory test was to measure the accuracy as well as variability/consistency of the RAFS. This was accomplished by assessing the RAFS ability to release asbestos from soil as a function of environmental conditions, specifically asbestos concentration in soil and soil moisture content. Two different soil moisture levels were used: low and high. For the laboratory test, two RAFS were used. A few minor deviations from the TQAP were implemented during the laboratory testing. The TQAP stated that Chrysotile "A" Rhodesian Asbestos (0.1 g) would be used to amend the soil but due to the unavailability of Chrysotile "A", a Chrysotile "B" laboratory standard was used (Appendix A). The TQAP suggested that the moisture content for the low moisture content soil would be 5% and for the high

moisture content soil would be 15%. However during testing, the low moisture content soil was found to be between 9% and 12% and the high moisture content soil was found to be between 14% and 18%.

3.4.1 Wooden Frame and Soil Preparation

Initially the experiment was designed to be conducted in two, 4 ft by 4 ft wooden frames but due to the limited availability of soil and sand and the realization that one 4 ft by 4 ft wooden frame could incorporate the RAFS footprint 6 times, the size of the additional wooden frame was reduced to 4 ft by 32 in. The reduction in size of the second wooden frame was a minor deviation from the TQAP. Figure 7 shows the footprint of the RAFS in each wooden box.

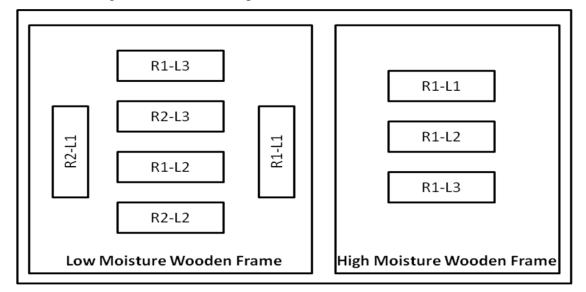


Figure 7. Locations of wooden frames and RAFS within tent (R1 and R2 = RAFS 1 and RAFS 2 and L1, L2 and L3 refers to the three sampling points at which the RAFS was applied)

Sand and soil in one part sand to two parts soil ratio was mixed in a cement mixer for 15 minutes until homogenized (Figure 8a). After mixing the soil and sand, the soil moisture of the mixture was measured at 8.1%. Three liters of water was added to the soil/sand mixture, and this was mixed for an additional 15 minutes resulting in a moisture content of 13.5%. An additional 3 L was added to the soil moisture reading of approximately 21.5%. Each wooden frame was lined with a poly vinyl material for easy disposal of the asbestos containing soil after the experiment was complete and to prevent the wooden frames from becoming contaminated. The wooden frames were filled with the soil, and the soil was gently compressed until the surface was level (Figure 8b). Several impressions of the footprint of the RAFS were made in each wooden frame to indicate where the RAFS would be placed for each test. Figure 8c shows the soil being mixed, and the wooden frames being packed.



Figure 8. Soil and wooden frame preparation, a) Soil, sand and water being mixed, b) Wooden frame being packed and leveled, c) RAFS footprint impressions

3.4.2 Asbestos Preparation

Approximately 0.1 g of Chrysotile "A" Rhodesian Asbestos standard obtained from Forensic Analytical (Appendix A) was mixed into 200 mL of water in a volumetric flask and sonicated for 4 hours to separate and distribute the asbestos fibers throughout the water. Initially the asbestos fibers were lumped together in the flask but after sonicating, the mixture was milky white indicating that the asbestos fibers were distributed throughout the water. Figure 9 shows the asbestos fibers being sonicated. The 200 ml was divided into two 100 ml volumetric flasks to allow faster separation of the asbestos fibers. After sonicating, the asbestos fibers in water were transferred to a typical 0.5 um nozzle spray bottle for application to the soil. This was a deviation from the TQAP as the TQAP states the asbestos would be mixed with the soil. Spraying the surface of the soil allowed better distribution and increased the chances of the asbestos being detected in the soil. The asbestos solution was first sprayed onto a black surface to ensure that the nozzle would not become clogged.



Figure 9. Asbestos fibers distributed in water and sonicated

3.4.3 Accuracy Test

The accuracy of the sampler was verified by two methods

- 1) Measuring the asbestos releasability from soil using the RAFS in soil known to contain asbestos.
- 2) Measuring the ability of the RAFS to release asbestos from soil at two different moisture contents.

3.4.3.1 Varying Moisture Content

Two different moisture conditions were used for this test, low (5%) and high (15%). One wooden frame contained soil of low moisture content, and the second and smaller wooden frame contained soil of high moisture content. Where the RAFS was to be applied for this test, 25 mL of the asbestos in water mixture was sprayed on to the surface of the footprint and allowed to dry for approximately 30 minutes for the high moisture test and one hour for the low moisture test. After the drying time, the moisture content of the soil at each of the RAFS footprint was measured. The RAFS was prepared for collecting samples then loaded with three clean filters and applied for measurement. The fan speed, rake power, and air sample volume was recorded.

3.4.3.2 Measuring the Releasability in Soil Known to Contain Asbestos

For the measurement of accuracy, additional RAFS application was not taken because for each of the RAFS footprints and moisture contents, asbestos was added to the soil. Therefore the RAFS ability to sample asbestos from soil containing asbestos could be assessed from any of its applications.

3.4.4 Variability/Consistency

In the laboratory, two RAFS were used to measure the releasability of asbestos from soil known to contain asbestos in order to assess whether RAFS sampling ability was the same between instruments. Each sampler was applied three times within the 4 ft by 4 ft wooden frame containing soil known to contain asbestos. The low moisture content soil was utilized for this test. There were therefore six footprints on which the RAFS was applied for the variability/consistency test: three for one of the RAFS labeled RAFS 1 and three for the additional RAFS labeled RAFS 2. The RAFS was prepared for collecting samples as indicated in Section 3.3.1. The fan speed, rake power, and sample volume collected were recorded and remained constant for both samplers. Eight minutes was determined to be an ideal sampling time for the low moisture samples and 23 minutes for the high moisture samples.

The first two samples taken were RAFS1-LOW-L1 and RAFS2–LOW-L2 (Figure 7). RAFS1 and RAFS 2 represent the two different RAFS. LOW and HIGH represent the moisture level in the soil. The sampling point was labeled by L1, L2, or L3 since each RAFS was applied at three sampling points. For the first application, the two RAFS were applied on the two side footprints in the wooden frame containing the low moisture soil. These samples were used to determine the length of sampling time for samples taken from the low moisture wooden frames. After five minutes the filter at location 1 was removed and visually inspected. Due to low loading of the

filter, sampling was continued for an additional three minutes at which point the filter was sufficiently loaded. All additional low moisture samples were taken for 8 minutes.

3.5 Laboratory Methods

3.5.1 Soil Method

All field soil samples were analyzed by PLM 1000 method and the SRC Libby Method. This is a deviation from the TQAP. The TQAP stated that the asbestos in the soil would be determined by the PLM 1000 method. In addition to the PLM methods, the soil was also analyzed by the SRC Libby Method. This method has been modified from the EPA Test Method "Method for the Determination of Asbestos in Bulk Building Materials" (EPA/600/R-93/116) specifically for Libby asbestos. This was necessary because the PLM method yielded no detects for all soil samples. The soil samples from SiteA32 were analyzed at a second laboratory by the SRC Libby method due to the lack of detection of asbestos by the first laboratory.

At Reservoir Analytical, samples were analyzed by EPA/600/R-93/116 with additional preparation and methodology for soil samples according to SRCLIBBY- 03, Revision 2, "Analysis of Asbestos Fibers in Soil by Polarized Light Microscopy and SRC-LIBBY-01, Revision 2, "Qualitative Estimation of Asbestos in Coarse Soil by Visual Examination Using Stereomicroscopy and Polarized Light Microscopy." Samples were sieved to separate coarse and fine fractions. None of these samples contained a coarse fraction. The fine fraction was quartered and ground before PLM examination.

3.5.2 Filter Analysis Method

3.5.2.1 Direct Analysis

For direct analysis, quarter sections were excised from the sample filters collapsed in a solution of dimethylformamide (DMF), glacial acetic acid, and deionized water (35:15:50) on a slide warmer, etched in a low temperature plasma etcher for seven minutes, and evaporatively coated with carbon. Subsections of the coated filters were mounted on 200-mesh copper TEM grids in pure DMF in a modified Jaffe-wick apparatus for at least one hour followed by a brief acetone rinse. The prepared grids were stored in a number of grid boxes. A laboratory filter blank was prepared alongside the samples.

Analyses were conducted on a Philips CM12 TEM at 75-100 keV accelerating voltage and ~19,000x magnification. Ten grid openings were analyzed on each sample, leaving open the option for analyses of additions openings at a later date. Raw data were recorded on National Asbestos Data Entry Spreadsheets (NADES). The six regulated asbestos minerals are recorded including Libby Amphiboles, other amphiboles, and non-asbestos mineral fibers.

All filters generated in the field were analyzed for asbestos by TEM direct transfer technique using ISO Method 10312:1995. The target analytical sensitivity is 0.005 structure/cm³. The aspect ratio for analysis is 3:1. All structures 0.5 μ m or longer in length were quantified with the following breakdown according to ranges by length: from 0.5 to 5.0 μ m, between 5 μ m and 10.0 μ m, and longer than 10 μ m. Ten grid openings were analyzed.

3.5.3.2 Indirect Analysis

Analyzing samples by indirect analysis was a deviation from the TQAP. The TQAP stated that samples would be analyzed by direct TEM analysis. However due to the low moisture content of the soil at several homes during the field test, the filters were overloaded after only a short sample collection time. The indirect analysis method allowed these overloaded samples to be analyzed.

Each sample was prepared using the gravimetric technique. A representative subsample was weighed, ashed for eight hours, and reweighed to determine the proportion of the organic component. The ashed residue was ground in concentrated hydrochloric acid, dried, and reweighed to determine the acid soluble component weight percentage. The residual material was analyzed for asbestos using polarized light microscopy. Asbestos quantitation was performed using the semi quantitative Point Count method following the general guidelines in EPA Method 600/R-93/116. The analytical sensitivity for the method is calculated as the asbestos concentration that results from one point counted in the analysis adjusted using the residual weight of the sample. The limit of detection for this method was not determined.

Location	Phase	Performance Parameter	Objective	Variable	Comparison Based On	Testing Frequency
Field	1&3	Reproducibility	Determine the reproducibility within the RAFS during application at a sampling point	Asbestos concentration on three filters within the RAFS	Asbestos concentration on the three filters produced at each sampling point.	Triplicate filters from at least 4 sites, at Libby, MT
	1 & 3	Comparability	Determine the ability of the RAFS to measure the releasability of asbestos from soil at the same accuracy as the EPA accepted method, ABS.	Asbestos concentration obtained by the average of the concentration on three filters within the RAFS. ABS filter asbestos concentration	Soil samples, ABS and the RAFS were applied at the same sampling point and the asbestos concentration obtained from each will be compared.	The RAFS was applied five sampling points at each home and ABS was applied at one of the sampling points corresponding to a RAFS sampling point at each home
Laboratory	2	Accuracy	Determine the ability of the RAFS to measure the releasability of asbestos from soil that is known to contain asbestos fibers.	Average asbestos concentration obtained from the three filters within the RAFS at different soil moisture contents	Whether or not asbestos is detected by the RAFS in soil known to contain asbestos. Asbestos concentration determined in soil known to contain asbestos at different soil moisture contents	The RAFS was applied at several locations within the 4ft by 4ft wooden frame with soil
Laboratory (Continued)	2	Variability and Consistency	Determine the consistency in data obtained between two different instruments	Average concentration of asbestos from three filters within the RAFS of two RAFS instruments.	Average asbestos concentration detected on the three filters produced at each sampling point from two independent samplers at the same location	The RAFS was applied at three different sampling locations in soil known to contain asbestos. A second independent sampler was also being applied in the soil known to contain asbestos.

 Table 4. Summary of performance parameters and testing frequency

Chapter 4 Quality Assurance/Quality Control

QA/quality control (QC) procedures were performed in accordance with the QMP for the AMS Center and the TQAP for this verification test. During testing there were five deviations from the RAFS. The first deviation is discussed in section 3.6.3.2 and allowed overloaded filters to be analyzed by the indirect methods instead of being voided. The second deviation is discussed in section 3.3.5 and stated why ABS was not always conducted within 24 hrs of the RFAS being applied at the sampling location. Deviation 3 in section 3.2.1 discussed the change in location of the second field site; however a second field site was not tested during this ETV verification. Deviation 4 discussed in sections 3.5 and 3.5.1 was a collection of minor deviations conducted during the laboratory testing phase. The last deviation, outlined in section 3.5.1, discusses the additional analysis of the soil samples. The soil samples were analyzed by both the PLM 1000 method and the SRC Libby Method by one laboratory and five of the soil samples were analyzed by a different lab, Reservoir Analytical, with more experience in the SRC Libby Method.

4.1 Quality Control Samples

As part of the QC requirements for equipment blanks, open, or field blanks, and closed, or lot blanks (LB), were taken at each of the location (homes) and analyzed by the same method as the sample filters. Table 11 presents the analytical results of the blank samples showing that counts were always below the analytical sensitivity of the method.

Site A31									
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	Total Str/mm2			
LBMT-A31-L1-EB	2	13.3	10	133	EB	<3.8			
LBMT-A31-L4-FB	-	-	30 sec	-	FB	<3.8			
LBMT-A31-L6-LB	-	-	-	-	LB	<3.8			
Site A32									
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	TOTAL			
LBMT-A32-L1-EB	2	13.4	10	134	EB	<7.7			
LBMT-A32-L4-FB	-	-	-	-	FB	<7.7			
LBMT-A32-L5-LB	-	-	-	-	LB	<7.7			
	Site A34 Category IV (visible vermiculite)								
Sample ID RAFS Port Flow (Lpm) Time (min) Vol (L) Type					Туре	TOTAL			
LBMT-A34-L1-EB	2	13.3	10	133	EB	<3.8			
LBMT-A34-L4-FB	-	-	30 sec	-	FB	<3.8			
LBMT-A34-L6-LB	-	-	NA	-	LB	<3.8			
Site A35 Category IV (visible vermiculite)									
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	TOTAL			
LBMT-A35-L1-EB	2	13.3	10	133	EB	<3.8			
LBMT-A35-L2-FB	-	-	30 sec	-	FB	<3.8			
LBMT-A35-L5-LB	-	-	-	-	LB	<3.8			

Table 5. Blank sample results

4.2 Audits

4.2.1 Performance Evaluation Audit

Battelle did not conduct a performance evaluation audit because the laboratory was accredited by the National Institute of Standards & Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for the performance of Airborne Asbestos Analysis by Transmission Electron Microscopy (TEM).

4.2.2 Technical Systems Audit

A Technical Systems Audit (TSA) was conducted on September 15 and 30, 2010. The purpose of the audit was to:

- Evaluate activities related to the verification testing of the asbestos sampler
- Review equipment calibration, materials, test setup, documentation and records associated with the verification testing
- Verify that laboratory operations and sampler operation at Battelle Columbus were compliant with TQAP requirements and that the required documentation was being completed in real time to ensure data traceability.

There were five findings and one observation determined through the TSA audit.

All finding were found to have documented responses in the deviation reports and the RAFS Manual.

4.2.3 Data Quality Audit

An Audit of Data Quality (ADQ) was conducted on September 20 and 21, 2011 for all phases of testing. The ADQ was conducted by Mr. Zachary Willenberg, Battelle AMS Center Quality Assurance Officer. A generic ADQ audit checklist was used to review the project requirements defined in the Test/QA Plan (TQAP), Version 1.0, for Verification of TSA for Verification of Releasable Asbestos Field Sampler dated August 2, 2010. The purpose of the audit was to:

- Evaluate activities related to the verification testing of the asbestos sampler
- Review documentation and records associated with the verification testing
- Verify that laboratory operations and sampler operation were compliant with TQAP requirements and that the required documentation was completed
- Verify that reported data for both laboratory and sampler operations were compliant with the TQAP requirements.

The data were submitted on September 20, 2011, and the ADQ was conducted on September 20-21, 2011, approximately one year after the data were collected. The audit consisted of a review of the TQAP to identify data quality requirements and review of raw and processed data. Raw data consisted of field data collection forms used to document testing events and one spreadsheet (Tables for report.xlsx). Processed data consisted of worksheets, covering site information, soil moisture, field soil results, comparability, reproducibility, lab results and field blanks. The audit reviewed the following data quality elements: collection of reference method samples, quality control sample results, sample results, and documentation. One hundred percent (100%) of the sample collection and quality control (QC) data were reviewed; at least 10% of the data calculations were verified vs. the raw data.

Chapter 5 Test Results

The RAFS TQAP described several statistical methods including standard deviation, ANOVA and t-test that could be used to evaluate the reproducibility, comparability, variability and consistency of the RAFS. However, due to the lack of detection of asbestos in both the soil and filter samples statistical analysis of the data could not be completed.

5.1 Soil Results

At each of the sampling points in both the field (Table 6) and laboratory test (Table 7), soil moisture readings were taken. Soil moisture content is critical when utilizing the RAFS that tests the releasability of asbestos from soil within an acceptable range of < 35%. For all of the sampling points the soil moisture content was less than 35%. Although in most cases more than 5 moisture content readings were taken, the relative standard deviation was not within the 5% acceptance criteria set for the test. This was likely due to the heterogeneity of the soil causing soil moisture content to vary in samples within the footprint of the RAFS.

	Sampling	Soil Moisture Readings							
Field Site	Point	1	2	3	4	5	Avg	StDev	RSD
Site A31	L2	5.1	5.6	6.6	3.6	3.6	4.9	1.3	27%
	L3	2.7	1.7	1.7	4.6	2.2	2.6	1.2	46%
	L4	2.2	2.2	2.7	2.2	2.8	2.4	0.30	13%
	L5	3.6	6.1	5.1	2.7	1.7	3.8	1.8	47%
	L6	4.6	3.6	4.6	3.6	3.6	4.0	0.55	14%
Site A32	L1	2.7	2.7	2.2	4.1	2.7	2.9	0.72	25%
	L2	4.6	5.1	6.6	6.6	7.1	6.0	1.1	18%
	L3	7.6	8.1	9.0	11	11	9.1	1.3	15%
	L5	7.6	9.6	8.9	7.6	8.2	8.4	0.87	10%
	L6	3.3	2.6	2.7	3.3	4.3	3.2	0.68	21%
Site A34	L1	7.1	7.1	3.5	8.1	5.6	6.3	1.8	28%
	L2	20	21	18	22	19	20	1.5	7.4%
	L3	21	13	14	16	18	16	3.2	20%
	L4	31	32	24	31	31	30	3.4	11%
	L5	33	31	26	32	31	31	2.7	8.7%
Site A35	L1	4.6	12	16	15	6.1	11	5.2	48%
	L2	7.1	6.6	4.6	5.6	7.6	6.3	1.2	19%
	L3	8.5	19	22	9.0	10	14	6.3	46%
	L4	7.1	8.5	13	6.6	7.6	8.6	2.6	30%
	L5	9.0	9.0	11	10	9.0	9.5	0.71	7.4%

Table 6. Soil moisture readings at Libby, Montana sampling locations

In the laboratory study the low moisture content soil ranged in moisture from 9.5% to 13% and the high moisture content ranged from 13.5% to 20.8% (Table 6). Variability in soil moisture content occurred due to uneven drying of the soil after spraying with the asbestos fibers because of the natural heterogeneity of the soil. Although the laboratory test was conducted in a control setting with a soil created from a mixture of soil, sand and water the relative standard deviation of the moisture content at one RAFS footprint was greater than the acceptance criteria of 5%. However soil moisture content was always below the 35% threshold required for the RAFS.

Sample	Soil Moisture							
Location	1	2	3 4		5	Average	StDev	RSD
RAFS1-LOW- L1	11	9.0	9.5	9.0	11	9.8	0.91	9.3%
RAFS1-LOW- L2	13	12	13	11	12	12	0.61	5.1%
RAFS1-LOW- L3	12	8.5	11	9.5	10	10	1.1	11%
RAFS2-LOW-L1	11	12	13	10	11	11	1.3	11%
RAFS2-LOW- L2	13	12	12	11	12	12	0.74	6.2%
RAFS2-LOW- L3	8.1	11	9.5	9.0	12	9.8	1.5	15%
RAFS1-HIGH- L1	15	14	14	15	15	15	0.88	6.0%
RAFS1-HIGH- L2	21	18	19	18	17	19	1.5	8.2%
RAFS1-HIGH- L3	17	14	21	18	17	18	2.3	13%

 Table 7. Soil moisture at each sampling point in laboratory study

Before measuring the asbestos count on the filters the asbestos count was determined in the soil samples from the field (Table 8) and laboratory samples (Table 9). If asbestos was detected in the soil then the filters were analyzed. If the asbestos count in the soil was not detectable (ND) or trace counts, the filters from the field samples were not analyzed.

Table 8. Fiel	d test soil	asbestos	results
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Sample ID	Commute		Method SRCLIBBY- 03						
	Sample Description	Method PLM 1000	Asbestos Type Detected	Analytical Sensitivity	Method SRCLIBBY- 03	(LA)	(OA)	(Ch)	
Site A31									
LBMT-A31-L2-01-Soil	Composite Soil	<0.07%	Actinolite	0.07	ND				
LBMT-A31-L3-01-Soil	Composite Soil	ND	ND	0.08	ND	Not analyzed			
LBMT-A31-L4-01-Soil	Composite Soil	ND	ND	0.09	ND				
LBMT-A31-L5-01-Soil	Composite Soil	ND	ND	0.06	ND				
LBMT-A31-L6-01-Soil	Composite Soil	<0.08%	Actinolite	0.08	Trace actinolite				
Site A32									
LBMT-A32-L1-01-Soil	Composite Soil	ND	ND	0.08	ND	ND	ND	ND	
_BMT-A32-L2-01-Soil	Composite Soil	ND	ND	0.08	ND	ND	ND	ND	
_BMT-A32-L3-01-Soil	Composite Soil	ND	ND	0.08	ND	ND	ND	ND	
_BMT-A32-L5-01-Soil	Composite Soil	ND	ND	0.06	ND	Fremolite	ND	ND	
_BMT-A32-L6-01-Soil	Composite Soil	ND	ND	0.07	ND	Fremolite	ND	ND	
Site A34 - Category I	V (visible vermi	iculite)							
LBMT-A34-L1-01-Soil	Composite Soil	ND	ND	0.09	ND				
LBMT-A34-L3-01-Soil	Composite Soil	ND	ND	0.08	ND				
_BMT-A34-L4-01-Soil	Composite Soil	ND	ND	0.07	ND	N	lot analyz	ed	
LBMT-A34-L5-01-Soil	Composite Soil	ND	ND	0.08	Trace actinolite	1			
LBMT-A34-L6-01-Soil	Composite Soil	<0.07%	Actinolite	0.07	Trace actinolite				
Site A35- Category IV	/ (visible vermi	culite)							
LBMT-A35-L1-01-Soil	Composite Soil	ND	ND	0.06	ND				
LBMT-A35-L2-01-Soil	Composite Soil	ND	ND	0.07	ND	Not analyzed			
LBMT-A35-L3-01-Soil	Composite Soil	ND	ND	0.07	ND				
_BMT-A35-L4-01-Soil	Composite Soil	ND	ND	0.09	ND				
LBMT-A35-L5-01-Soil	Composite Soil	ND	ND	0.07	ND				
Notes									
_A = Libby Amphibole	OA = Other Amp	hibole	Ch = Chysolite	ND = None De	etected				
SRCLIBBY-03 = EPA/600/	/R-93/116 modified	d for Libby asbes	tos						

The laboratory soil samples were analyzed by both the PLM and Libby Method (Table 9) the results of which were all non detect or at the analytical sensitivity of the instrument. Due to the lack of detection of asbestos in the soil samples the filters were not analyzed for asbestos. Although the RAFS may provide a more sensitive method for detecting asbestos in soil, due to financial constraints on the project the corresponding filters were not analyzed.

			Analytical
Location	PLM 1000	SRCLIBBY- 03	Sensitivity
RAFS1-HIGH-L1	ND	<0.06% crysotile	0.06
RAFS1-HIGH-L2	ND	<0.06% crysotile	0.06
RAFS1-HIGH-L3	ND	<0.06% crysotile	0.06
RAFS1-LOW-L1	ND	<0.05% crysotile	0.05
RAFS1-LOW-L2	ND	ND	0.05
RAFS1-LOW-L3	ND	ND	0.05
RAFS2-LOW-L1	ND	ND	0.05
RAFS2-LOW-L2	ND	ND	0.05
RAFS2-LOW-L3	ND	ND	0.05
LAB-BLK-HIGH-SOIL	ND	ND	0.07
LAB-BLK-LOW-SOIL	ND	ND	0.06
SRCLIBBY- 03 = EP	A/600/R-93	/116 modified fo	r Libby asbestos

Table 9. Laboratory study soil results

5.2 Comparability

The purpose of the comparability test was to compare the ability of the RAFS to detect asbestos in soil relative to the reference method of ABS. Although analysis of soil indicated only trace levels of asbestos, in a few samples the corresponding RAFS filters were analyzed for asbestos. For all filter samples except one, asbestos was not detected above the analytical sensitivity. The sample where asbestos was detected was as an ABS sample at the Site A32 at 0.32 f/cc.

5.3 Reproducibility

Reproducibility was evaluated by comparing the asbestos counts detected in each of the three filters obtained at each sampling point. For the reproducibility test only two filters were analyzed to reduce cost of the analysis. The results of the two filters were compared to determine if the RAFS sample ports were reproducible. Due to the fact that most of the data received were at or below the analytical sensitivity statistics could not be conducted on the data.

5.4 Variability/Consistency and Accuracy

These parameters were to be evaluated during the laboratory study. However since the filters were not analyzed these parameters could not be evaluated. The laboratory filter samples were not analyzed because soil sample analysis was not able to detect the Chrysotile A asbestos fibers. Although it may be possible for the RAFS to trap fibers on the filters that were not detected in

the soil, financial constraints on the project prevented the filters from being analyzed.

			Site A	.31				
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	TOTAL (structures/cc)	>5 µm	Analytical Sensitivity	RPD
LBMT-A31-L2-01	1	13.8	5	68.9	0.022	< 0.022	0.022	
LBMT-A31-L2-02	2	13.3	5	66.7	0.022	0.022	0.022	
LBMT-A31-L2-03	3	13.5	5	67.4	< 0.022	< 0.022	0.022	
ABS	-	4.95	20	99.0	< 0.015	< 0.015	0.015	
			Site A	.32				
LBMT-A32-L3-01	1	13.5	5	67.5	< 0.058	< 0.058	0.058	
LBMT-A32-L3-02	2	13.4	5	67.1	0.058	< 0.058	0.058	
LBMT-A32-L3-03	3	13.6	5	67.8	< 0.058	< 0.058	0.058	
ABS	-	4.54	19	86.3	0.316	0.136	0.045	-138%
		Site A34 -	Category IV	(visible verr	niculite)			
LBMT-A34-L3-01	1	13.6	5	68.0	< 0.022	< 0.022	0.022	
LBMT-A34-L3-02	2	13.3	5	66.6	< 0.022	< 0.022	0.022	
LBMT-A34-L3-03	3	13.4	5	67.1	< 0.022	< 0.022	0.022	
ABS	-	4.04	20	80.8	<0.018	<0.018	0.018	
		Site A35-	Category IV	(visible vern	niculite)			
LBMT-A35-L5-01	1	13.6	5	68.2	< 0.022	< 0.022	0.022	
LBMT-A35-L5-02	2	13.3	5	66.5	<0.022	< 0.022	0.022	
LBMT-A35-L5-03	3	13.8	5	69.1	< 0.021	< 0.021	0.021	
ABS	-	4.86	20	97.2	< 0.015	< 0.015	0.015	

Table 10. Comparability test results from each of the locations and sampling points

<u> </u>				Site A31				
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	TOTAL	>5 µm	Analytical Sensitivity
LBMT-A31-L3-01	1	13.8	1	13.8	S	<0.1075	<0.1075	0.1075
LBMT-A31-L3-02	2	13.3	10	133	S	<0.0111	<0.0111	0.0111
LBMT-A31-L4-01	1	13.8	1	13.8	S	<0.1075	<0.1075	0.1075
LBMT-A31-L4-02	2	13.3	10	133	S	<0.0111	<0.0111	0.0111
LBMT-A31-L5-01	1	13.8	1	13.8	S	<0.1075	<0.1075	0.1075
LBMT-A31-L5-02	2	13.3	10	133	S	<0.0111	<0.0111	0.0111
LBMT-A31-L6-01	1	13.8	1	13.8	S	<0.1075	<0.1075	0.1075
LBMT-A31-L6-02	2	13.3	10	133	S	0.1330	0.1000	0.0111
				Site A32				
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	TOTAL	>5 µm	Analytical Sensitivity
LBMT-A32-L1-01	1	13.5	1	13.5	S	<0.2193	<0.2193	0.2193
LBMT-A32-L1-02	2	13.4	10	161	S	<0.0908	<0.0908	0.0908
LBMT-A32-L1-03	3	13.6	10	163	S	-	-	-
LBMT-A32-L2-01	1	13.5	1	13.5	S	<0.2193	<0.2193	0.2193
LBMT-A32-L2-02	2	13.4	10	161	S	<0.0242	<0.0242	0.0242
LBMT-A32-L2-03	3	13.6	10	163	S	-	-	-
LBMT-A32-L5-01	1	13.5	1	13.5	S	<0.2193	<0.2193	0.2193
LBMT-A32-L5-02	2	13.4	10	148	S	<0.0264	<0.0264	0.0264
LBMT-A32-L5-03	3	13.6	10	149	S	-	-	-
LBMT-A32-L6-01	1	13.5	1	13.5	S	0.2193	0.2193	0.2193
LBMT-A32-L6-02	2	13.4	10	161	S	0.0968	0.0242	0.0240
LBMT-A32-L6-03	3	13.6	10	163	S	-	-	-
			A34 - Catego	ory IV (visible	e vermicul	ite)		
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	TOTAL	>5 µm	Analytical Sensitivity
LBMT-A34-L1-01	1	13.6	5	68.0	S	0.0220	0.0220	0.0220
LBMT-A34-L1-03	3	13.4	20	268	S	0.0055	0.0055	0.0055
LBMT-A34-L4-01	1	13.6	5	68.0	S	<0.0220	<0.0220	0.0220
LBMT-A34-L4-03	3	13.4	20	268	S	0.0170	0.0055	0.0055
LBMT-A34-L5-01	1	13.6	5	68.0	S	<0.0220	<0.0220	0.0220
LBMT-A34-L5-03	3	13.4	20	268	S	<0.0055	<0.0055	0.0055
LBMT-A34-L6-01	1	13.6	5	68.0	S	<0.0220	<0.0220	0.0220
LBMT-A34-L6-03	3	13.4	20	268	S	<0.0055	<0.0055	0.0055
		Site	A35- Catego	ory IV (visible	e vermicul	ite)		
Sample ID	RAFS Port	Flow (Lpm)	Time (min)	Vol (L)	Туре	TOTAL	>5 µm	Analytical Sensitivity
LBMT-A35-L1-01	1	13.6	1	13.6	S	<0.110	<0.110	0.110
LBMT-A35-L1-02	2	13.3	10	133	S	<0.011	<0.011	0.011
LBMT-A35-L2-01	1	13.6	1	13.6	S	<0.110	<0.110	0.110
LBMT-A35-L2-02	2	13.3	10	133	S	<0.110	<0.011	0.011
LBMT-A35-L3-01	1	13.6	2	27.3	S	<0.054	<0.054	0.054
LBMT-A35-L3-02	2	13.3	10	133	S	<0.022	<0.022	0.011
LBMT-A35-L4-01	1	13.6	1	13.6	S	<0.110	<0.110	0.109
LBMT-A35-L4-02	2	13.3	10	133	S	<0.011	<0.011	0.011

Table 11. Results of reproducibility testing in the field

5.5 Operational Factors

The operational factors analyzed were ease of use, training, and sustainability (sampling time, waste produced, and the amount of protective equipment required by the individual operating the instrument). The VTC found that the RAFS was easy to use. The VTC was trained in the field by John Kominsky of EQM to clean and use the RAFS. The RAFS was assembled in the field and powered on. To operate the RAFS a source of electricity was required. For this verification test a generator was taken to the field. The controls used to operate the RAFS were easy to use and read. Following a 30 minute training, the VTC was comfortable operating the RAFS. The RAFS was 4 feet long by 2 feet wide and 30 inches tall and could be carried by one person (Figure 10). Minimal waste was produced by using the RAFS. The main waste material was lint free paper towels used to clean the RAFS before use. Although PPE was not required when using the RAFS because of the EPA level of protection required, PPE was used at several of the locations due to the EPA requirements post EPA testing of the asbestos counts at the locations.



Figure 10. RAFS being transported from sampling point to sampling point by one individual

Chapter 6 Performance Summary

The performance of the RAFS was evaluated for its reproducibility, comparability, accuracy and variability/consistency. Verification tests were conducted in two phases, field and laboratory tests. During the field tests the performance parameters of reproducibility and comparability were tested. The field tests were conducted at one field site in Libby, Montana. The verification parameters accuracy and variability/consistency were tested during the second phase of testing in the laboratory. The reference method for this verification test was ABS.

Comparability

The comparability tests for the RAFS were conducted at four locations which corresponded to the yards of four homes in Libby Montana. The RAFS was applied at five sampling points around the home. At each sampling point three filters were used to obtain samples. The reference method ABS involved an individual raking for 20 minutes while wearing a personal sampling pump. The asbestos counts on the filters of the RAFS were compared to the asbestos counts in the filter from the ABS sampling. In most cases, the asbestos counts obtained from both the ABS and RAFS were below or at the analytical sensitivity of the method making it impossible to make a statistical comparison between the RAFS and ABS data. Since asbestos fibers were detected at 0.32 structures/cc from the ABS sample at Site A32 during a sampling time of 20 minutes while the RAFS filters reported non detects this may indicate that the ABS sampling had a higher sensitivity, However it must be taken into consideration that the ABS sampling was conducted over a much wider area than the footprint of the RAFS and involved raking which generated a large amount of dust particles to pass through the filter.

Reproducibility

A RAFS sampler is able to take triplicate samples. The reproducibility parameter was used to compare the results of the three filter samples taken during one application of the RAFS. Similar to the comparability test, the asbestos counts on the filters were below or at the analytical sensitivity of the method making it impossible to make a statistical comparison between the RAFS and ABS data.

Accuracy and Variability and Consistency

Laboratory tests were conducted to determine the accuracy and variability and consistency of the RAFS sampler. However due to the lack of detection of asbestos in the soil and financial constraints on the project the filters were not analyzed.

Operational Factors

The VTC found the RAFS easy to use and transport. The waste products generated while using the RAFS was minimal. Although PPE was not required to operate the RAFS, due to the EPA level of protection required for the sites being sampled PPE was used.

There are several improvements that could be made to the field and laboratory experimental design that would yield better results. These include:

1) Typically ABS is conducted for 60 to 120 minutes as recommended in the EPA SOP for ABS, however during this verification testing ABS was conducted for 20 minutes. At a

20 minute sampling adequate air may not have flowed through the filter to provide analytical sensitivity. A longer ABS sampling time may have yielded fewer none detects and results that could be statistically interpreted.

- 2) Preparation of the asbestos laboratory standard for soil application in the laboratory test involved sonication for 4 hours to suspend the asbestos fibers in the water. This agitation of the asbestos fibers may have broken the fibers into fragments that were too small to be detected by the TEM and PLM method. Although spraying asbestos suspended in water is a method used to apply asbestos to soil. The quantity did not result in high enough counts of asbestos to be detected in soil Asbestos at 0.1g was dissolved in 200 ml water and 25 ml sprayed onto the RAFS footprint 150 in². The sensitivity of the analysis method was 0.005 structures/cm³. The amount of asbestos solution sprayed onto the RAFS footprint would not have provided the necessary asbestos structures to meet the analytical sensitivity.
- 3) The indirect TEM method (ISO 13794) instead of the indirect PLM method should have been used to analyze the overloaded samples for greater comparability with the direct TEM analysis of filters.
- 4) Counting more than 10 grids would provide a higher sensitivity but due to financial constraints on the project only 10 grids were sampled.

Chapter 7 References

U.S. EPA, Environmental Technology Verification Program Quality Management Plan, EPA Report No: 600/R-08/009 EPA/600/R-03/021, U.S. Environmental Protection Agency, Cincinnati, Ohio, January 2008.

Battelle, Quality Management Plan for the ETV Advanced Monitoring Systems Center, Version 7.0, U.S. EPA Environmental Technology Verification Program, prepared by Battelle, Columbus, Ohio, November 2008.

Battelle, Test/QA Plan for Verification of Releasable Asbestos Field Sampler U.S. Environmental Protection Agency, Cincinnati, Ohio, August 2010.

Appendix A RAFS Field and Laboratory Data Sheets

Sampling Condition Parame Area: 34 Location:	AIR SAM RELEASAI Libby Opera	FS Datasheet IPLING ANI BLE ASBEST able Unit #4; L RH: 4(1	D INSTRU OS FIELD S Libby, Monta	SAMPLE na		DLLECTIK જીવ.વ	DN FORM ∳	Wind Vel:	2.4	mles/hr	Date: Tech: GPS: Altitude: Bar Press:	8/4/10 <u>Jt, NB, JK, RJ</u> <u>N 48,40169</u> <u>W 115.58776</u> <u>2051</u> feet <u>27.42</u> inches	- - - -
Weather Phenomena (e.g. rain, w		•						Direction:	F		Dew Pt:	°F	J
Location Description (e.g. vegeta	ation, soil cor	nsistency):				Bini	Seil					Test Qualifier:	
Sample	RAFS	Rotome	tor		r Reading		1	tor Data	1 -	1	lime		RTI
ID	Unit №	Pump	NO	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter ID
LBMT A34- L4-01	NI		3	.60		0	734		14	1214	1219	5 min sample	1
LBMT A3164 02	NI	2	(3	5.51		б	15 1/2		14	1214	1225	10 min sample	
LBMT A3414 03	NI	3	13	3 .41		0	361/2		44	1214	1236	20 Ain sample	
LEMT A34 L4 - FB	NI				-				I STA	1213	1213	Field Blank	
MetOne GT 521 Filename	Start	Stop	Flow Rate (L					Comments	 •	<u> </u>	<u> </u>	Vane Anemomet	er i i i i i i i i i i i i i i i i i i i
LBMT A34 L4	1214	1236	3.154		Um+	.02						353 feet/mir	ute
Soil Moisture Readings Reading 1 Reading 2 Reading 3 30-4 32-1 23.8 Additional Sample Period Comme 60 Commercial Commercial	30.6	<u>81.4</u> 4	العيدالة تحديد			Soil Samp Split # 1 2 3 4		Sample ID A34-L A34-L	1·01 50			Comments	
	new c		•			5							

Sampling Condition Parame	AIR SAM RELEASAE Libby Opera	S Datashee PLING AN BLE ASBES able Unit #4;	ID INST	LD SAMPLE		OLLECTI	ON FORM				Date: Tech: GPS: Altitude:	8/4/10 MB/514/87/PA N 48.40153 W 115.58729 feet	?
Area: 34 Location: Weather Phenomena (e.g. rain, w	vind austs):	RH: 3 Sunn J			-	86-1		Wind Vel: Direction:		mles/hr	Bar Press Dew Pt:	57.8 %	of Hg
Location Description (e.g. vegeta	RAFS	Rotome			r Reading			10(s+		Т	ime	Test Qualifier:	RTI
ID	Unit №	Pump	PARTICIPATION STOP	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter ID
48m7-A34-15-01	14	1		13.60		37	45 3/4		1/8	1329	1334	5 min sample	~
LBMT- A34-L5-02	NI	2	`	13.31		37	56.0		1/4	1329	1340	10 min ramph	-
LBM7-434-15-03	NI	3	, ⁷ ,	13-41		37	75 Yz		1/5	1329	1352	20 min Sample	
MetOne GT 521 Filename	Start	Stop		low e (L/m)				Comments	8	<u> </u>		Vane Anemomete	er
18mJ-A34-15	1329	1352	3-1	34	υ,	wit 02	L					Z94 feet/min	ute
32. Soil Moisture Readings Reading 1 Reading 2 Reading 3	32.1	34.6					le Tracking						
-30:4 52-1 23-8	30-1	St. to	NB	and over	6	Split #	LISMIF	Sample ID - A34 - L	K =0 -5			Comments	
Additional Sample Period Comme	ents	31.15	H	ored one righ mois	iture	2		-A34_ L					
60 Compet, (Catego	y I	V			3							
	<i>v</i>	0				4							
						5							

Sampling Condition Parame	AIR SAM RELEASAE Libby Opera	FS Datasheet PLING ANE BLE ASBEST(able Unit #4; Li	OS FIELD S	AMPLER (RA	A COLLECTI FS)	on form				Date: Tech: GPS: Altitude:	<u>N 48</u>	T, JY, ZD 40156 , 58748	-
Area:3 4Location:Weather Phenomena(e.g. rain, wLocation Description(e.g. vegeta)	LG vind gusts):	RH: 35 Subar	1	Temp ده ۹-۰ ۵۰۰		°F	Wind Vel: Direction:	2.1 N	mles/hr	Bar Press: Dew Pt:	Test Qual	inches c °F ifier:	of Hg
Sample	RAFS	Rotomet	er. Ro	tometer Read	ling	Agital	tor Data		1	ime			RTI
ID	Unit №	Pump N	Jo	Start Sto L/m) (L/i		Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Ci	omments	Filter ID
LEMT ASU LLOI	NI	1	[3	·w	Jsh	7 80	15		14011	,	Stark	5mn	
1 SUT A34 16 67	27	2	(3	.31	35/	275	15		LIST	NUL 44	Shar	10 min	<u> </u>
LBMT A34 16 03	1	3	. 13	.41	35/2	Jac 8/4)5		In I	426 148	Short	20 mm	
LBMT A3416 LB	NI				<u> </u>				-	-		,	
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/		I	<u> </u>	Comments					Vane Anemomete	 9r
LBMT N34 46	1401	1476	3.134		lm z						303	feet/min	ute
Soil Moisture Readings 19-9 Reading 1 [Reading 2 [Reading 3	2.5	Reading 5	814			ble Tracking			T]		
365 34 35.5	33 Starl	The 1	.~0		<u> </u>)	Sample ID				Comme	nts	
Additional Sample Period Comme	Shor ents \$14	<u>12 - 2</u> 10			2	LBMT							****
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			***********			L			1				

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Sampling Condition Parame	AIR SAM RELEASAE Libby Opera		NSTRUMENT FIELD SAMPLE y, Montana		OLLECTIC	ON FORM		48.40 115.5		Date: Tech: GPS: Altitude:	8/9/00 NB, JF, JK, RL N 49-40445 W 475-62444 \ 465 feet	-
Area: Area: Area: Area: Area: Area: Location: Neather Phenomena (e.g. rain, w Location Description (e.g. vegeta	L.7 vind gusts): ation, soil cor	RH:		Temp:	in Obr	9F	Wind Vel: Direction:	lied	mles/hr	Bar Press: Dew Pt:	: inches ⁰F Test Qualifier:	of Hg
Sample ID	RAFS Unit №	Rotometer, Pump №	Rotomete		Start Count		or Data Cycle Time (s)	Depth (inches)	T Start	ime Stop	Comments	RTI Filter ID
LBMT A34.L7 61	~	1	13.60	14.12	<u> </u>		ا5		150°C	1515	Five Minute	
LBMT A34 L7 02	Ni	2	13.31	13.54			15		1500	1521	(& minute	
LBMT 434 1703	N	3	13.41	13.99	*****		15		15000	1532	20 mmnt	
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)				Comments				Vane Anemome	ler
LBAT ABY LA	1532	1532 3	3.134	Um	202						312. feet/mi	nute
Soil Moisture Readings					Soil Sampl	o Trockin-]	
Reading 1 Reading 2 Reading 3	Reading 4	Reading 5			Split #	e macking	Sample ID			÷	Comments	
19.2 19.3 90	15.4	18.9			1	LBMT	A34 L	2015	.1		Visible Verm	i cult
Additional Sample Period Comme	ents				2	Lom	A34	\$7 or	Soil		٤٩	
60 Conifer, C					3	Lon	(A34	170	B Son 1		٤.,	
Dake counter	broken	-			4		T A34		1 .	<u></u>	~	

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Sampling Condition Parame	AIR SAM RELEASAI Libby Oper	FS Datashee IPLING AN BLE ASBES able Unit #4;	ID INSTRU	SAMPLE		DLLECTIO	ON FORM				Date: Tech: GPS: Altitude:	815/10 NB/5K/57/RD N 48.37354 W 115.56044 7301 feet	
Area: 🌊 G Location:	LI	RH: 4			Temp:	14.0	۴	Wind Vel:	Celm	mles/hr	Bar Press:	27.68 inches	of Hg
Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta	vind gusts): ation, soil co	Sunny	Loose,	Dry	5-1			Direction:	12009		Dew Pt:	乎 Test Qualifier:	
Sample	RAFS	Rotom	eter R	lotomete	er Reading			tor Data	I	T	ime		RTI
ID	Unit №	Pump		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter
LBMT-A35-LI-EB	ł	62	2 13	330	13.51	0	0		The the	9:16	9:26	294 fpm	
LBMT-A35-L1-01	1	1	13	3-63	13.55	0	55×12		Yz	9:39	9:40	1 minute Sample	
4BMJ-A35-L1-02	1	2	. 13	3-20	13.51	0	20		Yr.	9:39	9:50	10 minute sample	
LBM9-A35-L1-03	1	3	13	.82	13,38	0	20		1/2	9.39	9;50	10 munh cample	
MetOne GT 521 Filename	Start	Stop	Flov Rate (L				<u> </u>	Comments	<u> </u>	<u> </u>		Vane Anemomet	<u> </u> >r
LBMT A35-LI-AC	9:10	9:20	3.012	•	Unite	or						308 feet/min	ute
LBMT A35 LI-	9:39	9:50	3.012	•		+ 02	r						
Soil Moisture Readings							le Tracking					-	
Reading 1 Reading 2 Reading 3	T					Split #		Sample ID				Comments	
4.6 12.0 15.9	15.4	4.1				1		-1935-LI					
Additional Sample Period Comme					1	2	LBMJ	- A35-LI	-026	1/			
603 Flower O	reek R	d Cal	kegory _	IV_		3				<u> </u>			
Horse shar prt			-			4							
						5							

Sampling Condition Parameters Area: 3.5 Location: $[1,2]$ RH: 50,3 % Temp: $(0.8.6)$ % Wind Vel: Colin. miles/hr Bar Press: $2.4.6.7$ inches % Direction: - Dew Pt: Dew Pt: Test Qualifier: Test Qualifier: Sample RAFS Rotometer. Reading Agitator Data Time (g. g. egetation, soil consistency): Q. Quocd. Start. Stop Stop Cycle Depth Start Stop Comments LBMT A35 L2 *01 N1 1 13:63 13:57 0.5 - 1/2 10026 at 0:22 10 min. Sample LSMT A35 L2 *01 N1 1 13:63 13:57 0.5 - 1/2 10026 at 0:22 10 min. Sample LSMT A35 L2 *01 N1 1 13:63 0.5 - 1/2 10026 at 0:22 10 min. Sample LSMT A35 L2 *03 N1 3 12.8* 13:38 0.5 - 1/2 10026 at 0:22 10 min. Sample LBMT A35 L2 *03 N1 3 12.8* 13:38 0.5 - 1/2 10026 at 0:22 10 min. Sample LSMT A35 L2 10:22 3:01 10:22 3:012 10 min. Sample 20 b	- 2 -
Vertice Reading (e.g. rain, wind gusts): Summary (e.g. regetation, soil consistency): Qeaked state, Los Keek (e.g. regetation, soil consistency): Qeaked state, Count (count Count Stop (count Count Time (s) (inches)) Direction: - Dew Pt: Dew Pt:	
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10Unit NePump NeStart (Um)StopStart CountStopCycleDepth (mohes)StartStopCount $[_bMT A35 L2 *01$ N11 $[3:43]$ 13.57 0.5 - $1/2$ $100E_{cort}$ $10:11$ 1 $aunuch Semple$ $_BMT A35 U2 02$ N11 $13:36$ 0.5 - $1/2$ $100E_{cort}$ $10:22$ $10 min$ $Semple$ $_BMT A35 U2 03$ N13 13.8^{cort} $13:36$ 0.5 - $1/2$ $100E_{cort}$ $10:22$ $10 min$ $Semple$ $_BMT A35 U2 03$ N13 13.8^{cort} $13:36$ 0.5 - $1/2$ $100E_{cort}$ $10:22$ $10 min$ $Semple$ $_LBMT A35 U2 03$ N13 13.8^{cort} $13:36$ 0.5 - $1/2$ $100E_{cort}$ $10:22$ $10 min$ $Semple$ $_LBMT A35 U2 01N1Fickle Black_{act}MetOne GT 521 FilenameStartStopReading 1Reading 210:223:01ZUnit g220 bfeel/mSoil Moisture ReadingsSeading 1Reading 2Reading 4Reading 51LBmr A35L2:01-5022LBmr A3512:01-5022LBmr A3512:01-5022LBmr A3512:01-5022LBmr A3512:01-502$	RTI
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Filte
LSMT A35 L2 N1 3 I3.82 I3.38 0.5 - Ye 1032 m Io: 22 Io min Sample LSMT A35 L2 N1 - - - - - - Flow MetOne GT 521 Filename Start Stop Rate (L/m) Comments Vane Anemone LBMT A35 L2 10 $\frac{10^2}{2}$ 10 : 22 3.012 Uwis g2 20 b feet/m Soil Moisture Readings Reading 1 Reading 4 Reading 5 7.1 6.4 4.4 5.4 2 LBmt A35 L2 : 01 - 502L Additional Sample Period Comments 2 LBmt A35 L2 : 02 : 502L 2 2 LBmt A35 L2 : 02 : 502L	
LBMTA35L2N1 $ -$	<u> </u>
LBMT A35 L2 N1 Flow Comments Vane Anemonia MetOne GT 521 Filename Start Stop Flow Comments Vane Anemonia LBmt A35 L2 10:22 3:012 Unit g2 3:012 10:12 3:012 10:12 <td>1-</td>	1-
MetOne GT 521 Filename Stop Rate (L/m) Comments Vane Anemone Lbrt A35 L2 10:22 3.012 Unit g2 3.012 Unit g2 3.012 Soil Moisture Readings Soil Sample Tracking Soil Sample ID Comments Comments Reading 1 Reading 2 Reading 4 Reading 5 3.012 Unit g2 3.012 Soil Moisture Readings Soil Sample Tracking Soil Sample ID Comments Comments 1 LBreat A35 12.01 - Soil 1 LBreat A35 12.01 - Soil 2 LBreat A35 12.01 - Soil 2 LBreat A35 12.01 - Soil 2 LBreat A35 12.01 - Soil 3.012	
MetOne GT 521 Filename Stop Rate (L/m) Comments Vane Anemone Lbrt A35 L2 10:22 3.012 Unit g2 3.012 Unit g2 3.012 Soil Moisture Readings Soil Sample Tracking Soil Sample ID Comments Comments Soil Moisture Reading 1 Reading 2 Reading 4 Reading 5 Soil Sample Tracking Soil Sample ID Comments 1 LBreach A35 L2 .01 - Soil 1 LBreach A35 L2 .01 - Soil 2 LBreach A35 L2 .01 - Soil 2	
Soil Moisture Readings Soil Sample Tracking Reading 3 Reading 4 Reading 5 F.1 Goil & Goil & Sample ID Comments Additional Sample Period Comments	iter
Reading 1 Reading 2 Reading 3 Reading 4 Reading 5 7.1 6.6 4.6 5.6 7.6 7.6 1 LBmg A35 12.01 - Soz 1 Additional Sample Period Comments 2 LBmg A35 12.01 - Soz 1 2 LBmg A35 12.01 - Soz 1	iinute
Reading 1 Reading 2 Reading 3 Reading 4 Reading 5 7.1 6.6 4.6 5.6 1.6 1 LBmg A35 12.01 - Soc 2 Additional Sample Period Comments 2 LBmg A35 12.01 - Soc 2 LBmg A35 12.01 - Soc	
Additional Sample Period Comments	
Additional Satisfie Fellon Comments	
603 Flower Crark, Category 4 3 LBAT A35 62-03 soil	
ABS Ricking Area, behind shed 4 LBAT ASS 12-04 5-1	
Rake counter mathemetrion.	

KARA - 406 - 291 - 7467

Sampling Condition Parame Area: A35 Location: Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta	AIR SAM RELEASAE Libby Opera eters L-3 vind gusts):		ID INS TOS FIE Libby, M	ILD SAMPLI		11.5	оĘ	Wind Vel: Direction:	Calm -	mies/hr	Date: Tech: GPS: Altitude: Bar Press: Dew Pt:	$ \frac{\frac{8/5}{10}}{\frac{NB}{5T}/5K/K} $ $ \frac{NB}{5T}/5K/K}{\frac{NB}{5T}/5K/K} $ $ \frac{NB}{5T}/5K/K}{\frac{10}{5K}/K} $ $ \frac{105.56077}{2267} $ $ \frac{100}{5}{5}$ $ \frac{100}{5}{5}{5}{5}$ $ \frac{100}{5}{5}{5}{5}$ $ \frac{100}{5}{5}{5}{5}$ $ \frac{100}{5}{5$	P If Hg
Sample	RAFS	Rotom			er Reading	4 0017		or Data		Т	ime		RTI
ID	Unit №	Pump		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter
LISMT-A35-13-01	1	,		13.63	13.58	05	7	2	44	10:30	10.32	2 min Somph	
LBMJ-A35-13-02	١	2		13.30	13,58	\$5	233/4	7	44	1	10:43		<u> </u>
LBMT-A35-13-03	1	3		13.82	13.38	Ø5		1	74		10:43	1	
MetOne GT 521 Filename	Start	Stop		Flow te (L/m)				Comments		<u> </u>		Vane Anemomete)r
- LBMT-A35-L3	10:30	1043	3.011		1	4.7						509	
	10130	1713	2.011	<u> </u>	Unit	φL					·····	Sec feet/min	ıte
Soil Moisture Readings						Soil Sampl	e Tracking					_	
Reading 1 Reading 2 Reading 3	Reading 4					Split #		Sample ID				Comments	
8.5 19.3 21.8		100				1	LEMT-	A35-L3	3-01	61/			
Additional Sample Period Comme		<u> </u>		<u></u>	1		LEMT	-135-6	-3-02	soi/			
603 K-bower (reek,	Gefeg	port.	<u>IV</u>		3							
86ff back porch						4							
						5							

Sampling Condition Parame	AIR SAM RELEASAI Libby Oper	FS Datashee PLING AN BLE ASBES able Unit #4;	ID INST TOS FIE	LD SAMPL	T DATA CO ER (RAFS)	DLLECTI	ON FORM				Date: Tech: GPS: Altitude:	8/5/10 NB, JT, J14, NB N 48-37378 W 1(5.56071 Z268 feet	-
Area: A 35 Location: Weather Phenomena (e.g. rain, v Location Description (e.g. vegeta	vind gusts):				Temp: 7		о́Е	Wind Vel: (Direction:		mles/hr	Bar Press: Dew Pt:	J7.66 inches o ∘F Test Qualifier:	f Hg
					er Reading	<u> </u>		tor Data		T	ime		RTI
Sample ID	RAFS Unit №	Rotom Pump	States of Constants	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter
LBMT A35 LY.01	NI	1		13.63	13.58	0	I		1/4	1):00	11:01	1 min sample	
LBMT 435 14-02	NI	2		12.30	13.58	0	19		1/4	11,00	1113	10 min Samph	
LBMT A35 L4 03	NI	3		13.82	13.38	0	19		44	11.00	1173	40 min Sangli	
MetOne GT 521 Filename	Start	Stop	and the second second	Flow e (L/m)				Comments		<u> </u>	<u> </u>	Vane Anemomete	
18M A35 L4 -	11:02	11.43	3.0	12								309 feet/min	ute
Soil Moisture Readings					<u> </u>	Soil Samp	le Tracking						
Reading 1 Reading 2 Reading 3	111					Split #		Sample ID				Comments	
<u> </u>	6.6	7.6				1	LBMT	A35 64	-01 So	<u>, i (</u>		119 mm	
Additional Sample Period Comme	-				٦	2	LBMT	A35 1	4 -02 "	5011			
603 Flower Crux	<u>Co</u>	it egong	4			3		-					
Lossened soll 2 m	morch	Grill	ruozy			4							
Filler or come						5							
Killer Saved, vel	id samp	,L						19-17-19-19-19-19-19-19-19-19-19-19-19-19-19-	******	- I			

ØKII	AIR SAM RELEASAE Libby Opera ters LS	Sum	ID INSTE TOS FIELI Libby, Moi S(, 4 ?	D SAMPLI ntana % woh-S Au	ER (RAFS) Temp: 7	5.0	of Soit	Wind Vel: Direction:	/ E	mles/hr	Dem Ht:	815/10 TT, N8.JK, NJ N 48.37358 W (15.56084 2285 feet 2285 feet Correct Qualifier: Roprodu	- of Hg c. h.(, hy
Sample ID	RAFS Unit №	Rotom Pump	つと 見た 一つに載い	Rotomete Start (L/m)	e r Reading Stop (L/m)	Start Count	Agital Stop Count	tor Data Cycle Time (s)	Depth (inches)	Start	ime Stop	Comments	RTI Filter ID
1.BMT A35 15 01	21)		1363	13.58	0	10		1/51	129	1134	5 min	-
LBMT A35 15 02	NI	2		13.30	13.58	0	10		1/4	1(29	1134	5 mm	
LEMT 435 1503	NI	3		13.82	13.38	Ø	10		Ny	ling	1134	5 min	-
LBMT A35 15-18	NI	0,0000000000000000000000000000000000000							~			Closed Blank	
MetOne GT 521 Filename	Start	Stop		ow (L/m)				Comments	I			Vane Anemomet	er
LEMT A35 LS	1(27	¥134	3.012	**************************************	Unt	<u>, 62</u>	14 COLORED HELE LE LE MONTANI D'ALE MONTANI LE MONTANI LE MONTANI LE MONTANI LE MONTANI LE MONTANI LE MONTANI TITI, TITI DONTANI MONTANI LE MONT	trá vy Materianska rozsi terre z kolencense (* 1909) U 1997 Materianska rozsi terre z kolencense (* 1909)	019-020-020-020-020-020-020-020-020-020-02	in an chrone an	2014 - 2014	316 feet/mir	nute
Soil Moisture Readings Reading 1 Reading 2 Reading 3 9.0 9.0 10.5 Additional Sample Period Comme 603 Flance Crue Removed Grass 5 minute Tripfice	io.c	9.0	 			Soil Samp Split # 1 2 3 4 5	1	Sample ID A35 L5 A35 L5				Comments	

Sampling Condition Parame Area: 36 Location: Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta	AIR SAN RELEASA Libby Oper iters Li Lind gusts):		FIELD SAMPLI Montana 7 %	ER (RAFS)			Wind Vel: Direction:	<u> 21</u>	ntes/hr	Date: Tech: GPS: Altitude: Bar Press: Dew Pt:	$\frac{8/5/10}{NB/5K/5T/RD}$ $\frac{NB/5K/5T/RD}{N48.54700}$ $W 115.57830$ $\frac{5229}{F}$ $\frac{5229}{F}$ $\frac{7233}{27.57}$ inches of Hg of Test Qualifier:	
	alling an eller o Angle o Angle o Angle o Angle o Angle o Angle		yaxakitikisin nganazarinin nunyazyas hinetese saya hismeten	er Reading		control because of Alexandrophy American Street	tor Data		T.	ime	an a	RTI
Sample ID	RAFS Unit №	Rotometer, Pump №	Start (L/m)	Stop (I./m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	ilter ID
LAMT ASG LI-B	NI	2 2	13.12	and all the same of the same of the same same same same same same same sam	0	20 W 107 11 2 2 4 4 2 5 10 2 1 1 1 1 1 2 4 1 2 1 1 1 1 1 2 4 1 2 1 1 1 1	201 - 2020 - 202	-17 sto	13.22	13:45	304 fpm	\sim
LOMJ-A36-L1-01	N /		13.78	a de la companya a sua da mana a sua a sua da mana da m	04	6	a the institution and the maps fail wants and any	1/4	13:00		1 min Sample -	
LBMT-A36-L1-02	N/	2	13.12	-	04	14	a) > MITERIA MARKAT MARKAT MARKAT AND IN THE MARKAT MARKAT	14 _	13:57	14:17	i O may Samph .	
LBMT-A36-L1-03	3	3	13.26	a ma di Wili Lucati ya Talimini anga Wakilan	04	16		Yy .	13:34	14:17	10 an Sample	
LBMT-A36-LI-FB	<u>~I</u>	and the classes is respective which of against in which instants interests in the first of a state of the sta	L MA		_	~		-)3:49)3:5D	Freld Blank	-
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)		angga te sana aka gang na kang ang ang ang ang ang ang ang ang ang	99 (aug 2014 / Antonia (Anto	Cornments		(Pinter) Tables (a bind) (and by) binder (for		Vane Anemometer	
LBMT A36 4-QC	1	12 2 4 5 7 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1	HOTZAB	U U	1.1 0Z	79 1.5.4 177 197 197 198 198 199 199 199 199 199 199 199 199	a yê 1994 tan 1995 têr destê bir de de ser bir de se	1927 (Tr. 1 March 2019) State State 27 (1921) 2003	100 100 112 112 112 112 112 112 112 112		304 feet/minute	
LBMJ-A36-4 -	1354	14:17 2	2.962	Rake	medt	• \$\$(fe	ment la	ition; s	tartat	14:06-	37	
Soil Moisture Readings					Soil Samp	le Tracking						
Reading 1 Reading 2 Reading 3	and a second s	a dia mandra ana mana dia mana ana ana ana ana ana ana ana ana a			Split #		Sample ID	1993 - 1994 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 -	riteriri konary belaki koner dyakani gene remerkatang belaki koner dan bahan dan b	an to sea and if a select of a <u>sea of</u> the form of a sea of a sea of a	Comments	
8.5 711 6.1	Llo.le	8.5			1	1	- A36-	1		Medicine a Manufacture of Conceptual Sciences		****
Additional Sample Period Comme	Well for the circle of wind a constraint of the strength of the strength of the strength of the strength of the	We write the instance of the second data and the second data and the second data and the second data and the se	and a second	1	2	LBMJ	- A36 -1	1-02-	soil	1017) 414 14 15 40 40 15 15 16 16 16 16 16 16 16 16 16 16 16 16 16		
36242 U.S. Hu Rake got stray i	my 2;	Category	W_		3	an of the later and the start is made to come	176. Alay Gat Alak bas Pille File James ye 1999 dat Alay di	The locate of the reaction of the same to come	Name and the second second second second second	1999 Sta debri e e 1980 Servaça da ta esta e sociação da e esc		
(Cake got Stray)	n wos;	moved to h	en bahin	reatly.	4	and the second	an a chung bah watao ng ang ang ang ang ang ang ang ang ang	NANG I ALI MUTUM DI TUMUM DI T	10 17 10 1 10 10 10 10 10 10 10 10 10 10 10 1	19-1879 Juli (1442) Make 19 (144) (144)	19 49 19 19 19 19 19 19 19 19 19 19 19 19 19	
					5							

Sampling Condition		AIR SAM RELEASAE Libby Opera	S Datashee PLING AN BLE ASBEST ible Unit #4 RH: 4	D INST TOS FIEL Libby, Mc	D SAMPLE ontana	R (RAFS)	0LLECTIC		Wind Vel:	2.5	mles/hr	Tech: GPS: Altitude:	6/5/10 TK, ST, NB, RD N 48.34700 W (15.5+834 2241 feet Z7.56 inches of	- Hg
Weather Phenomena Location Description	(e.g. rain, w	ind gusts):							Direction:	E		Dew Pt:	°F	
Location Description	(e.g. vegeta	tion, soil cor	isistency):	Pry	TO DO NOT THE OWNER OF STREET, STRE	the characterization and the second	<u>, (cm</u>	In the second	Company of the State of the Sta	n të nëng a të 1600 a të regaj të 1460 anë pagëre të të 1600 Kët nëng a të 1600 a të regaj të 1460 anë pagëre të 1600 anë të	19 (19) 19		Test Qualifier:	a laka 1 Manua sang 1 Manua 2 Manu
Sample		RAFS	Rotome	1.1.1.1.1.1	<u>Rotomete</u> Start	r Reading Stop	Start	Agita Stop	tor Data Cycle	Depth	-	ime 	Comments	RTI Filter
ID		Unit Ne	Pump	Ne	(L/m)	(l ./m)	Count	Count	Time (s)	(inches)	Start	Stop		ID
LEMT A36	-22-01	N			1324		0	1.5		1/4	14 25	1424	I min Samph	~
LOWT AZG	12-02	NI	2	Instant and the state of the state	13.(Z	a film over the state in the second state of t	6	12.5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1/4	14 25	1436	10 min Jamale	
LBMT A36	-(2-03	21	3		13.26	and a state of the	0	12.5	INTO MATERIAL CONTRACTOR CONTRACTOR	1/4	1425	1436	10 min Sample 10 min Sample	and the second s
LISMT A36	La. LB	N		69.1-5 +3.0 f il -994.cg 1/8/199 -99	212 TO TO TO BE REAL TO TO	and the second s		ND - 10 - 10 - 10 - 10 - 10 - 10 - 10 - 1		tingin (a far through a lattice book	-		Closed Blank	
MetOne GT 521 F	ilename	Start	Stop.		low 9 (L/m)			en mon di kini yang ng mang ng mang ng mang ng mang An mon di kini yang ng mang ng mang ng mang ng mang ng mang Mang ng mang ng mang ng mang ng mang ng mang ng mang	Comments				Vane Anemomete	
LOMT A36	12	1425	1436	2.91	62	Un.	702	ledy water War output may address a state over mater a state of	M = 24 - 2014 - 2 = 2 = 2 = 2 = 2 = 2 = 2 = 2 = 2 = 2	and particular state occurred and the state state of	11 41.1 10 1151 11 14 11 14 11 14 11 14 11 14 11 14 14	10-11, april-10-10-10-10-10-10-10-10-10-10-10-10-10-	29-314 feet/minu	le
Soil Moisture Reading								le Tracking					SF 915	
Reading 1 Reading 2	and have not supervised with the second	energy and a second	Presson and the second s				Split #	had an a ghi than a sea dha an an a sha a tana	Sample ID	10.100 Provide to 200 Provide the Providence of Providence of Providence of Providence of Providence of Provide	and a state of the	umma Primary of America Constants and American Constants (Constants)	Comments	
2.7 8.1	4.1	61	2.7				1	LBMT	A36 L	<u> 2015</u>	0[1		1999-1990 - James I radio J. Calesco J. B. Song and J. Sang Sur. J. Sang Sur. J. Sang Sur. J. Sang Sur. J. Sang	
Additional Sample Pe	riod Comme	nts			و و به د و بر به و		2	LB-+	A36-	لع . 67	5-1			
36242 45	Hwy 7	$z \to C$	ategory	4	d property on statest (a solution of a statest of a statest of		3	1	nia frontant su analysis attact su contribution attacts and	ige rind light store and hind of an area for strate due on				
		9 19 4 9 (10 40 10) 10 10 10 10 10 10 10 10 10 10 10 10 10	ang paramatan kanalatan kanalatan kanalatan kanalatan kanalatan kanalatan kanalatan kanalatan kanalatan kanalat	ndelige finished in scronged or the planetic at Stateme	kti marki dinizge cilitika juge en charge eo		4	1		NAT CARSES OF THE PERSON DESIGNATION				
		Renovement of a page to unapprovement and and and	naddith-ndaract attack knowed 14 ange	114 - 14 - 14 - 14 - 14 - 14 - 14 - 14			5							

Sampling Condition Parame Area: 3 Location: Weather Phenomena (e.g. rain, w	AIR SAMI RELEASAB Libby Opera tters 3 ind gusts):	BLE ASBESTO able Unit#4; Lil RH: 37- Swany	.\$ %	R (RAFS) Temp:		N FORM	Wind Vel: Direction:	< 1	mles/hr	Date: Tech: GPS: Altitude: Bar Press: Dew Pt:	- JJ	f Hg
Location Description (e.g. vegeta	tion, soil con	isistency):	tends on weather and bill "against and provide a first state of a state of the stat		Elena Mellon ancesar antista antista formation and the second second second second second second second second	ana ang ang ang ang ang ang ang ang ang	20	19 - 20 - 20 - 20 - 20 - 20 - 20 - 20 - 2			Test Qualifier:	
Sample ID	RAFS Unit Ne	Rotomete Pump N	97, Start	er Reading Stop (L/m)	Start Count	Agita Stop Count	tor Data Cycle Time (s)	Depth (inches)	Start	me Stop	Comments	RTI Filter ID
LBMT- A310-43-01	N		13.76	C - i i i i i i i i i i i i i i i i i i	0.5	2.0	ng a ng sa san na ng ga ng san ng sa	3/8	1450	1451	(man Samph	**************************************
LBMT-A36-L3-02	NI	2	13.12	and - who are an a single of a difference of a particular	0.8	13	li da al ricense produce produce con constructione de la deserva constru	3/8	1450	1501	10 min sample	<u></u>
LBMT-A36-L3-03	NI	3	13.26	aura marti () (14) 1 (14) 10 (14) 10 (14) Dia umani amin'ny kaodim-paositra (14) 144 Dia umani amin'ny kaodim-paositra (14) 144	08	13		3/8	(4 50	[50]	10 min sumple	Talanan yang dina kata yang dina kat Talanan yang dina kata
MetOne GT 521 Filename	Start 1950 2961	Stop	Flow Rate (L/m)	anter for formation in a state of a single to be obtained a ware			Comments				Vane Anemomete	ſ
LEMT AZYO-LZ	Zatot	1501	2,9,6,2	Uni	4 0/2	lan da garan yang da sakan yang da sakan Kada dan sakan Cherologi da sakan yang da	1999 M 2007 200 200 200 200 200 200 200 200 20	na vehrani svist za doni po got korene zas	ala yan dan ana wasan kana ana ana ana ana ana ana ana ana	17 24 1927 - 1922 - 1922 - 1923 - 1924 - 272 - 222 - 222 - 222 17 24 1927 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1926 - 1	30 (feet/min	ıte
Soil Moisture Readings Reading 1 Reading 2 Reading 3 9-5 8.1 (Additional Sample Period Comme 36242 U.S.Hwy Visible Vermi cubb	1.5 1.2	21.8	<u>n 4</u>	1	Soll Sampl Split # 1 2 3 4 5	LBMT LBMT	Sample ID A36-23 - A36- 1 A36- 1 A36- 1	3-01 9 3.03	So vl		Comments	

Sampling Condition		AIR SAM RELEASAE Libby Opera	FS Datasheet PLING ANE BLE ASBESTO able Unit #4; Li RH:	DS FIELD	SAMPLE ana	전품은 소설하는	DIFECTIC	• <i>•</i>	Wind Vel:		mies/hr	Date: Tech: GPS: Altitude: Bar Press	5T N 4 W (Z	5/10 55K, NBRD 48.34709 (5.51807 238 feet inches c	
Weather Phenomena	(e.g. rain, w	ind gusts):	Sunny			-			Direction:			Dew Pt:		٥F	-
Location Description	(e.g. vegeta	tion, soil cor	nsistency):	comparison association respectively	CONCERNING COMPANY MAY NO ADDRESS	are formed as a subsequence of the second	day 5	CONTRACTOR DATE OF A DESCRIPTION OF A DE		na poma mata name a na unany kod orten a namine a od bid Na poma i Venera da Sacona y Kod Pala da na poma e kitik		ime	Test Q	ualifier: Peprol	1
Sample ID		RAFS Unit №	Rotomet Pump N	(01) · · · · ·	Start (L/m)	r Reading Stop (L/m)	Start Count	Stop Count	or Data Cycle Time (s)	Depth (inches)	Start	Stop		Comments	RTI Filter ID
LEMT A36-	1901	NI		Ľ	3.78	91.47766) 10-1865 (2-1665) 9-14700 (1655)	0.5	19 M T	1.004 1.000 Television (1.000 1.000	arana da amang manang manan	Ve	50	5.	min samply	
LEMT A36	4 02	N	2	6	5.12	Alta Jamier (1945 m.04) in (1935 m.1444)	0.5	an and sense see that is the set of the set		******		220	5	min somple	
LBMT A36	14 03	N	3		3.24	ada di mang ang mang pang kang tertingkan pang kang di	<u>6.5</u>	9 96 96 97 97 97 97 97 97 97 97 97 97 97 97 97	many from the output and the manufacture		<u> </u>	DEN	5	min scapp	
		الله عن المحمد الله مع المحمد الم معاد المحمد ال		Flov	a minina an ang ang ang ang ang ang ang ang an	1917 - Maria Mandra Maria Maria Maria Maria Maria 1917 - Maria Mandra Maria Maria Maria Maria 1919 - Maria Maria Maria Maria Maria Maria Maria Maria Maria Maria 1919 - Maria Ma	999 99 99 99 99 99 99 99 99 99 99 99 99			, 1999 - 1997					
MetOne GT 521 F	ilename	Start	Stop	Rate (I		an gu a child a corres or anno 1987 a dhi a ta cana can			Comments	2 - 201 (Vane Anemomete	9r
LBMT A36 -	24	an kantan murupa ka kana ka papa a mata wa	and an and a second	2.96	r	Unit 1	52	de nati dan 160 i 640 milin kan kan dan casa mini kan ba	₩ Λ.ΔΕΥΥΥΝΥ ^{, ο} 1550 ΦΕΥ ΡΟΛΥΓΙΟΥ ΧΟΙ ΤΟ ΤΟ ΤΟ ΙΟΝ ΙΟΝ Ι	an naga ta'n talah bila dany ang Mini Alar Galer any ang	ay File filed Baymond, paradara Ministria ana angan Kilo	113 114 115 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		feet/min	ute
Soll Moisture Reading							generale einen bei beiten for beite	le Tracking							
Reading 1 Reading 2	Reading 3	Reading 4	Reading 5				Split #	1	Sample ID	n yang ^{an} t diretik in selan ^{ka} dikin ke dir et prose		WILD IN AN A REAL OFFICE LINE OF COMPLET FROM FO	Com	imerits	ang Malanda i Sanaga Jawa Sangara ng Bara ya ng Jawa Bar
		a go e coma e a una de encolago e coma ga e coma e	2				1	1	- 436			12-(s llc	sed	
Additional Sample Pe	and a first of the second s	WPARENESS CONTRACTOR STREET	<u> </u>		in an		2	LBm	A36-	14 .02	<u>^</u>	J-1-	Cell	when	nya Shiftinga umanga ito dangan umangan ya may mar
36242 119	5 Hwy	L.	Categ	pory 7	1 - Mart I		3	an ann à sa chuir an Shiri Ann aing Eige ann. Le saine	te stade film a lang Tala stade bisa sanga piga 7000 kisa pakan a	An report to create the name to a reflect the report the reg		Million algority which is said to call a constant to apply	100 000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Na mana da ang ng n
RAS	N. 1	<u> </u>	xñx -	RA	Ke .	Drivi	4		alanda ya angi angi angi angi angi angi angi ang	ze namu za intera ze konsura intera en a a	an a martin a laine a share a share a share a share a sh	aris 1 i shi ta ƙasar I ya mar ta ƙasar ya ƙwar	11986/8108638.vj 8018.rises	Na se	11977-10000-2007-00-00-00-00-00-00-00-00-
Drok	len"	V C	s i ded				\sim	\wedge	the constant of the second	27 June 70 vier 12 vier 14 vier			nongan an ang an an an an an ang ang an		

Sampling Condition Parame Area:	AIR SAM RELEASAN Libby, Mont	BLE ASBESTO	INSTRUMENT S FIELD SAMPLE	ER (RAFS)	OLLECTIC		Wind Vel:		ph.	Date: Tech: GPS: Altitude:		
Weather Phenomena (e.g. rain, v	vind gusts):	Partially	Sume	remp.	04.0	Γ	Direction:	F T Z	- 62/ -	Dew Pt:	: 27·76 inches o ⁰F	ГПУ
Location Description (e.g. vegeta	ation, soil cor	nsistency):	Dry, los	e orgi	anic so	i)					Test Qualifier:	
Sample ID	RAFS Unit №	Rotomete Pump №	r, Start	sr Reading Stop (L/m)	Start Count	Agitat Stop Count	or Data Cycle Time (s)	Depth (inches)	T Start	ime Stop	Comments	RTI Filter ID
4mi-13-LI-EB	NI	02	13.34	1/3.34	0	0	0	0	14:40	14:50	292 ft/mix	
LBMT- AJL1-01	NI	01	13.77	K	~	-	16		15:08	15:13		
LBMT- A31 L1-02	Nel	62	13.34	$\left \right\rangle$	-	-	16		15:08	15:17	Rate Gunter Mathemation	
LBMT- A3+21-03	NI	03	13.48		-	-	16		15:08	15:13		
				Ś.								
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)		e Un	.1 03	Comments	vhón, N	, <u>co</u> llo	cation	Vane Anemomete	r
LBMT. MILLI - ac	154:40	14.45	2.70	Collo	sell -	+ Blan	k chut	L Ur	1+ 0Z		feet/min	ıte
LBMT . AJ-LI-OI	15:08	15:13	2.70		·							
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5			Soil Samp	e Tracking	Sample ID				Comments	
7.6 9.5 4.1	9.0	7.1			1					- 1 -	over looked Riters	4
Additional Sample Period Comme	ents	••••••••••••••••••••••••••••••••••••••		i Line Pour	2						Wer under ici hers	-
All samples vo.		Filters	•		3							
overband		99999-18999-99999-9999-9999-9999-9999-9			4							
912 California	Ane				5							
ARS.				E	äL	J			1		1999)]

ABS: ORD

	AIR SAM	BLE ASBESTO	INSTRUMENT S FIELD SAMPLI		DLLECTIO	N FORM				Date: Tech: GPS:	08/02/10 NE/JK/JT N 48:38796 W 115.55656	
Sampling Condition Parame	eters									Altitude:	2123 feet	
Area:3Location:Weather Phenomena(e.g. rain, wLocation Description(e.g. vegeta)	Z vind gusts): ation, soil cor	RH: 40. Partially	Summe	Temp: 8		°F	Wind Vel: Direction:	4.6 5w	mles/hr	Bar Press: Dew Pt:	27.76 inches o ∘۶ Test Qualifier: Rep⊶de	
Sample ID	RAFS Unit №	Rotometer Pump №	, Rotomet	er Reading Stop (L/m)	Start Count	Agital Stop Count	tor Data Cycle Time (s)	Depth (inches)	Ti Start	me Stop	Comments	RTI Filter ID
- LBM1- A31-L2-01	NI	1	13.77	13.77		-	15	1/4	15.20	15:25	overloaded	
LBM9 131-12-02	N/	2	13.34	13-34			15	N4"	15-20	1	1	
LBMT- A31-L2-03	2	3	13.48	13.48		-	15	۲ <u>/4</u> "	15:20	15:25	1	
MetOne GT 521 Filename	Start	Stop	Flow				Comments				Vane Anemomete	
LAMT-A31-12-	151.20	15:25	Rate (L/m)				Commenta				289 fact/min	
	12	Biti	/ 0								28 feet/min	ute
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5		1	Soil Sampl	e Tracking	Sample ID		T		Commonts	
	3.6	3.6				TARI-		50+1			Comments	
Additional Sample Period Comme	ents	·				1	1-Lz -07			·····		
Reproduciba	lity S	amples.			3							
912 California	Are	-			4 5					Mittenen af all strong states		

Sampling Condition Param	AIR SAM RELEASAI Libby, Mon	FS Datasheet IPLING AND IN BLE ASBESTOS F tana RH: 36.5	IELD SAMPLE	ER (RAFS)	DLLECTIO	ON FORM		Salur	mles/hr	Date: Tech: GPS: Altitude: Bar Press:	8/2/10 NS, JT, JK N 4/8-58771 W 115.55627 Z116 feet Z7.75 inche	 s of Hg
Weather Phenomena (e.g. rain,		Paraly	cloudy	,			Direction:	I.I NW		Dew Pt:	°F	
Location Description (e.g. vege Sample ID	RAFS Unit №	Rotometer, Pump №		er Reading Stop (L/m)	Start Count	Agita Stop Count	tor Data Cycle Time (s)	Depth (inches)	Ti Start	me Stop	Test Qualifier: Comments	RTI Filter ID
Vr A31-13-61	N1	2	13.77	13.77			16	lly	19:23	16:24	Direct	1
W A31-13.02	NI	2	13.54	13.34			16	Va	14:23	16:37	10 min total	
NT A31- 63-03	NI	3	13.48	13.34			16	49	19:23	16:37	10 min tatal	
MetOne GT 521 Filename	Start	Stop F	Flow Rate (L/m)				Comments	 ;			Vane Anemom	eter
MTA31-L3-01	158.23	16:37 2	~ }0	1 min	. time,	ζ 1 0Ρ,	9 min	More			286 feet/n	ninute
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5			Soil Samp	le Tracking	Sample ID		I		Comments	
1.7 1.7 1.7	4.6	2.2				raz	- 10- 2	-			Comments	
Additional Sample Period Comm	· · · · ·						13-02.					
Pump 1 - I	rut	ten			3	1						
Pump 2, 3 - 2	Endury	+ TEM			4							
912 California					5				1			

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	AIR SAM	FS Datashee IPLING AN BLE ASBEST tana	ID INSTR			DLLECTIC	DN FORM				Date: Tech: GPS:	8/2/10 NB, JT, J N 48.387 W 1(5.55	NK 144 1646	
Sampling Condition Parame	eters										Altitude:	2044	feet	
Area: A31 Location: Weather Phenomena (e.g. rain, v Location Description (e.g. vegeta	vind gusts):	Paully		44		85.4	°F	Wind Vel: Direction:		mles/hr	Bar Press: Dew Pt:	2구 구역 Test Qualifier:	inches o °F	f Hg
Sample ID	RAFS Unit №	Rotome Pump	eter,	<u> </u>	Stop (L/m)	Start Count	Agital Stop Count	tor Data Cycle Time (s)	Depth (inches)	Ti Start	me Stop	Comme	nts	RTI Filter ID
1845 A31-L4-01	NI	1		13.77	13.77		 ,	14	1/4	6:50	16:51	Direct P.	zp	١
18MT A31-241.02	NI	2		13.34	13.34	and the second	-	14	1/4	6:50	17:02			
LAT A31. 4.03	N	3		13.45	13.48		~	14	1/4	16:50		Endirect		
EMT A31- L4- FB	-0336689			and the second secon								Field Bla	nk	
MetOne GT 521 Filename	Start	Stop		ow (L/m)				Comments	 		<u> </u>	Vane 4	nemomete	
LBMT A31-24-	16:50	17:02	2.7		I min,	stop, 9	MINICH	د۱				289	feet/mini	ute
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5				Soil Samp	le Tracking			1]		
2.2 2.2 2.2	1.2	2S						Sample ID				Comments		
Additional Sample Period Comm	ents	J					1	- 14.2		1				
Pumpt: D.	incle Pr	a				3								
Pump 2,3 :-			1	-		4						*****		
912 Californio	A	<u> </u>				5								

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		AIR SAM	BLE ASBES	ID INST		DATA CC R (RAFS)	OLLECTIO	N FORM				Date: Tech: 57 GPS: Altitude:	8/2/10 22, 5 N 48-35 W US.5 1996		
Sampling Condition						_	1				ç dr		A		
Area: ASI	Location:		RH: 4	4.7	%	Temp: 🕇	4.6	°F	Wind Vel: Direction:	Satur .	mles/hr /	Bar Press: Dew Pt:	27.74	inches o ⁰F	f Hg
Weather Phenomena Location Description			Sunny nsistency):	ጽዮፍል	wie Soil	, lada	Pine &	talk a			,	Dew FL	Test Qualifier		
	(0.9. 1090.					r Reading			or Data		Т	ime			RTI
Sample ID		RAFS Unit №	Rotom Pump		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth finches)	Start	Stop	Comr	nents	Filter ID
LBMT A31	15.01	NI	1		13.72	13.77	(16	Styn Vz	17117	1715	1 min)	Direct Them	T
LBAT A31	15 02	NI	ι		1334	1334	-	~	14	1/2	17:17	17:29	taster.	10 min	
LEMT AS	1 15 03	NI	3		13.48	13.48	-	-	16	1/2	17:17	171.24	10 m	n Š	
	•														(
MetOne GT 521 F	ilename	Start	Stop		Flow te (L/m)				Commente	5			Van	e Anemomete	r
LBMT A31	-15	1378	17:29		70	1 min	5:00	+ 9	ñ				220	feet/min	ute
								· · · · · · · · · · · · · · · · · · ·							
Soil Moisture Readin	as						Soil Samn	le Tracking							
Reading 1 Reading 2		Reading 4	Reading 5				Split #		Sample ID	1			Comments		
366.1	5.1	2.7	1.7				.1	LBAT	A51.2	4-01-5	al				
Additional Sample Pe	eriod Comm	ents					2		A31-L4						******
RD - least			atist-	16	812		3			<u> </u>			et effective densered a 19 generation		
unall min, a	overheald	L.D.	rus Ti	EM			4								
Pump 213	10 min	, In	direct	TAN			5								
	. .									-					

Rake Counter Broken Ane 912 California Ane

Sampling Condition Parame Area: Ast Location:	AIR SAM RELEASAE Libby, Mont	RH: 45	D INST		R (RAFS)		DN FORM	Wind Vel:	.A.	mles/hr	Date: Tech: GPS: Altitude: Bar Press:	8/2/10 RD N 48.38 W 185.55 Z086 Z2.74	feet inches o	f Hg
Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta		Swwy nsistency):		, Smisz	6 / 9 m	ا معد ت ،		Direction:	\sim		Dew Pt:	Test Qualifier:	°F	
Sample ID	RAFS Unit №	Rotome Pump	iter,		er Reading Stop (L/m)	Start Count		tor Data Cycle Time (s)	Depth (inches)	Ti Start	me Stop	Comme	ents	RTI Filter ID
LBMT A31 L6 01	NI	1		13.72	13.72		_	15	1/2 /8	17:39	17:40	1~~~		(
LBMT A31 402	NI	z		1234	13.39		~	15	M/ Ky	17:39	17:51	10 min tol	М	
LEMT A31 46 03	N,	3		12.48	13.55		-	15	or'L 1/8	17:39	17:51	10 min to		
LOMT ASI LG LB	~~~~	~			~				8/2		-	Closed	blank)
												l		
MetOne GT 521 Filename	Start	Stop		low e (L/m)				Comments				Vane	Anemomete	ľ
LBMT A31- KG	17:29	17:51	1.7		Unte	<u>,)</u>	nin whe,	gadz				268	feet/min	Jte
Soil Moisture Readings Reading 1 Reading 2 Reading 3	1	1			1	Split #	le Tracking	Sample ID				Comments		
4.6 3.6 4.6	3.6	3.6				1		AY LL						
Additional Sample Period Comme]	2	1	A'S1 46						
Bamona Derling		end				4	1	A31 L(1				
Baki Counter Bro		- *				5	LEMT	M31 2	<u>le 04</u>	5016				
Pump 1 - 1 v		÷				L	<u> </u>			<u> </u>				

912 Califonia Are.

BARTI INTERNATIONAL	AIR SAM	BLE ASBEST	t D INSTRUMEN OS FIELD SAMPL		DLLECTIC	DN FORM		•		Date: Tech: GPS: Altitude:	8/3/10 NB/JK/JT N 48.38323 W 115.54990 2100 feet	- - -
Sampling Condition Parame	eters											
Area: 32 Location: Weather Phenomena (e.g. rain, v	(wind austs):	RH:	2 %	Temp:	69.9	°F	Wind Vel: Direction:	1.0	mles/hr	Bar Press: Dew Pt:	27. 9° inches o ⁰F	f Hg
Location Description (e.g. veget	ation, soil cor	nsistency):	Dry Soil, d	m to mil	a sneez	L.	Direction.	N		Dew Pl.	Test Qualifier:	
Sample	RAFS	Rotome	Rotomet	er Reading		7	tor Data	-	Ti	me		RTI
ID	Unit №	Pump	N₂ Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter ID
LBMT-A32-L1-E8	NI	2	13.19	13.64	0	0	0	We me	9:02	9:12	312 fpm	
LBMT- A32-L1-01	N	с. 	13.49	13.52		the enveropment of the enveropment of the	16	Y8		1		_
LBMT- 132-L1-02	N	2	13.19	13.64			16	1/8	9:32			
LSMT-A32-4-03	NI	3	13-34		 Constant of the 		16	1/8	9:32		10 min Inderest	
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)				Comments				Vape Anemomete	ər
LBMT A32-21- QC	8:41	9:05	3.026	Unit	4.2						B 345 feet/min	& ute
16MT A32-4-	9:32	٩ :44	3.026			lminrs	slop, to	inin			JI 6/3	and a second
Soil Moisture Readings					Soil Samp							
Reading 1 Reading 2 Reading 3	,				Split #		Sample ID		ļ		Comments	
2.7 2.7 2.2	4.1	27			1	LBMT	A32 U -	01 5.1				
Additional Sample Period Comm	ents				2	LBMT	A32 LI-	02 501				
1222 Dakota. F.	Zake Co	unter S	Broken		3							
Pumpli Dirat	ten				4							
Pump 2,3: In	tic at	TRA			5							
ABS = ORD 1												

	AIR SAM	^E S Datashed PLING AN BLE ASBES tana	ID INST			DLLECTIC	N FORM				Date: Tech: GPS: Altitude:		- RD 8313 54987	
Sampling Condition Parame														
Area: A32 Location:		RH: ¢		%	Temp: 69	5.4	°F	Wind Vel:		mles/hr	Bar Press:	27.89	inches o	f Hg
Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta		Sunny nsistency):		L	ru, bar	10-61	1.07	Direction:	И		Dew Pt:	Test Qualifier:	°F	
The second se	[<u>, , , , , , , , , , , , , , , , , , , </u>			r Reading	<u>c , 100°C</u>		tor Data	<u></u>	Ti	me			RTI
Sample ID	RAFS Unit №	Rotom Pump		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comm	ents	Filter
2BMT A32 42 01	NI	1		13.49	13.52			-46°1	5	9:56	9:57	Direct	TEM	-
LEMT A32 12 02	N1	2		13.19	13.64			15		9:56	10:08	10 min, In	ndiveet	_
LBM A31 1203	24	3	•	13.34	1376	_ 		15	-14-	9:56		10 min, 5		<u> </u>
MetOne GT 521 Filename	Start	Stop	Contraction of the second	low (L/m)				Comments	•			Vane	Anemomete	n
LBMT AS2 L2	9:56	10:08	3.01	4	Umi	102,	, 1 min	stop +	9 mi	<u>n</u>		329	feet/min	ute
·														
Soil Moisture Readings						Soil Samp	le Tracking							
Reading 1 Reading 2 Reading 3		Reading 5				Split #		Sample ID				Comments		
4.6 5.1 6.6	6.6	7.1				1	LAMJ.	-A32-L	2-015	x) ·				
Additional Sample Period Comme	ents					2	LBMJ	-A32-	L2-028	ioi)				
1222 Dakota, Rol	a Com	ster B	ro kin			3								
Louhin an ABS					Alter State	4								
Samp1 - Direct TEM				diject		5								· · ·
Some observation P	imp 21	4												
ARC = Mars 1	up Soil													

	AIR SAM RELEASAE Libby, Mont	ILE ASBEST	D INS1	FRUMENT		DLLECTIC	ON FORM				Date: Tech: GPS: Altitude:	8/3/10 MB, 5K, N 48.31 W 115.4 1910212	<u>8314</u> 54990	
rea: 432 Location: /eather Phenomena (e.g. rain, wi		RH: 5 Sunny	8.5	%	Temp: 7	14.6	°F	Wind Vel: Direction:	41		Bar Press: Dew Pt:	27.89	inches of Hg °F	
ocation Description (e.g. vegeta			Unde	r pine	trea	(North	of 12),		hose so			Test Qualifier:	Reproduce	bole ;
Sample ID	RAFS Unit №	Rotome Pump		Rotomete Start (L/m)	r Reading Stop (L/m)	Start Count	Agital Stop Count	Cycle Time (s)	Depth (inches)	Tii Start	me Stop	Commer	nts F	RTI filter ID
LIBMT-A32-63-01	21	1		13-49	13.52			16	1/4	to:17	10:22	5min Skapl		<u></u> 1
LBMJ- A32-13-02	N \	2		13-19	13.64			16	1/4	10:17	10:22	1		1
LBMT- A32-13-03	N 1	3		13.34				16	1/4	10:17	10:22	~		1
MetOne GT 521 Filename	Chad			Flow										
	Start	Stop		e (L/m)	10			Comments	4			390	nemometer	
-BMT-A32-L3	10:17	10:22	<u>>`</u>	026	Unit	02	5 m	in 54	nple			378 390	feet/minute	
oil Moisture Readings						Soll Sama	le Tracking							
eading 1 Reading 2 Reading 3						Son Samp		Sample ID				Comments		
7.6 8.1 9.0	10.5	10.4				1	LIBMI	- A32-	-63-01	si1				
ditional Sample Period Comme	nts					2	LBMT.	- A32-1	-3-02	50:1				
1222 Dakota, Rai	re low	nter b	ro kie	n		3	ļ							
Location on ABS (m						4								
5 min Sam	ple l	for 1	,28	43		5								
5 min Samp ABS= 6RD 1	Reger	odned	<i>silit</i> ,	r		L	1			<u>I</u>				

Sampling Condition Parame	Ampling Condition Parameters													
		-		%	Temp: 7	51	°F		Calm	mles/hr	Bar Press:	29.88	inches o	f Hg
Weather Phenomena (e.g. rain, v Location Description (e.g. vegeta		nsistency):		actul	log soil,	ban.	1.005.00	Direction:	wr R	ale.	Dew Pt:	Test Qualifier:	°F	
Sample	RAFS			<u> </u>	er Reading			or Data			me			RTI
ID	Unit №	Rotomo		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Commei		Filter ID
LBART ASI LH OI	101	1		13.49	13.52					10:37	10:44	Stope Go	Dwest 7 see	En_
LEMT AZZ LA OZ	NI	r		13.19	13.64		an and a state of the state of			10:37	10:52	Start agen	e 1043	
LOMT ARE LUOJ	N	3		13.34	13-76					10.37	12:52	Start again	C 1045	
LBMT A32 L4-FB	NI	ditage			-	and the second s	~	-	-	5 -		Field Blam		
										-				
MetOne GT 521 Filename	Start	Stop		Flow e (L/m)				Comments				Vane A	nemomete	ər
LBMJ A32 LA	FC:01	10:52	7.0	u	Step	e Gosu	, 7 1 m	un sàng	+ 9	Mui		SETE MB	feet/min	ute
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5				Soll Samp	e Tracking	Comple ID				2		
9.2 8.2 7.9	8.9	rteading 0				<u></u> 1	10	Sample ID				Comments		
Additional Sample Period Comm	onto					2		Azz UA						
-		3	LISMT	A32 6	102									
	Comprested SOIL Stopped test & 90 see. Lipp curch soil we rate													
ABS = 6RD 1			4											
A 1			L	1			<u> </u>							
1) Total Time . 2 3) Total time "	the min		570	Tex	it. No	f anon	de							
3) tobal time "	1212 0	we v			0	mortiles	dence	2 holds	w ind	priet .	tem i	in 10 me	N •	

	AIR SAM RELEASAE Libby, Mont	BLE ASBESTO	INSTRUMENT S FIELD SAMPLE		Date: Tech: GPS: Altitude:								
Sampling Condition Parame													
Area: // 32 Location:		RH: 60.	2- %	Temp: 🖌	9.5	°F	Wind Vel: Direction:	-	mles/hr	Bar Press:	27.88	inches o °F	f Hg
Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta	ation, soil cor	sistency): G.	madred Top	sout to	seed a	il w/R		Jonate	est	Dew Pt:	Test Qualifier		
		and the second second second	Rotomete		· rotia »		or Data		Ti	me		•	RTI
Sample ID	RAFS Unit №	Rotomete Pump №	Start	Stop	Start	Stop	Cycle	Depth	Start	Stop	Comr	nents	Filter
48MT-A32-45-01	1	1	(L/m) 13.49	(L/m) 13.52	Count	Count	Time (s)	(inches) ((4	11.08	11:09	Direct	TEM	
LBMJ-A32-45-02	1	2	13.19	13.64			16	44	11.08	11:19	10 mm	Endirell	
LBMT- A32-15-03	1	3	13.34	13,76			1.	Yu	11:08	11:19			
LBMT-A32-15-LB	_			10	×						t d	ozed.	
								3894*	(CER-		held ?	slank	
					L	I		L		l	L		
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)				Comments				Van	e Anemomete	r
4BMJ-A32-45	11:08	11:19	3.026	Unit o	12, 1 m	wn Slop	, + 9 r	min			312	feet/mini	ute
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Pooding 4	Booding 5			Soil Sampl	e Tracking					-		
	1				Split #		Sample ID	r al			Comments		
	7.6 8.2 1 LBMJ-A32-45-01 Goil												
Additional Sample Period Comm	ents				2	LBMJ.	- A32- L	5-02	Soi				
1222 Dakota				3									
Samp 1 - Direct TE	EM			4									
Samp 223-Indire	t TEM				5								
ABS: ORD 1													

	AIR SAM RELEASAE Libby, Mont	FS Datashee PLING AN BLE ASBEST Cana	D INST	Date: Tech: GPS: Altitude:	8/3/10 N3, JK, N 48.3 W ((3.55 2(17	75324 5008								
Sampling Condition Param			a									2		
Area: A32 Location: Weather Phenomena (e.g. rain, v		RH: 5		%	Temp: ٦	3.6	°F	Wind Vel: Direction:	Calm	mles/hr	Bar Press: Dew Pt:	27.89	inches o °F	f Hg
Location Description (e.g. veget	~ ·	Survey nsistency):	Bar	r, loose	521 5	one gra	ú	Direction:	~		Dew Pt:	Test Qualifier:	۲ ۲	
	Philade and a second	er Reading			or Data		T	ime			RTI			
Sample ID	RAFS Unit №	Rotome Pump		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comm	ents	Filter ID
LEMT A32 Ha OI	N	1		13.49	3.52	A LONG BOOM		16	44	1130	11:31	Direct		~~
LBMT AZZ LG 02	2	2		13.19	13-64	estatestates		14	1/4	1130	1142	~	10 mm	
LBur Azz Le 03	N	3		13.34		-		le -	44	(130	1(42	Induce		
MetOne GT 521 Filename	Start	Stop		Flow e (L/m)				Comments				Vane	Anemomete)r
LEMT A32 LL	1130	1112	3.02		Unit 0	2, 1~	un, ste	, + 9	An			295	feet/min	ute
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5			1	Soll Sampl	e Tracking	Sample ID		1		Comments		
3.3 24 27	3.3	43				.1	LBMT	ASZ LG	01 61					
Additional Sample Period Comm	4				1	2		A32 46						
1222 Dakota		3												
Pump 1: D	icut T	Kr.				4								
Pump 213 : 7	indicut			5										

ABS : ORD 1

	AIR SAM RELEASAE Libby, Mont	BLE ASBES	ID INS	Date: Tech: GPS: Altitude:	8/3/10 NB/JK, N 48:38 W 115.59 2126	/5T/#D 708	- - -							
Sampling Condition Parame Area: A33 Location:		RH: 3	46	0/	Tamai Ot	~ 0	°F	Wind Val-	0.7	mlaa/br	Der Dress	200 800	inches	- f / m
Weather Phenomena (e.g. rain, w			1.7	70	Temp: 8	5.2	- r	Wind Vel: Direction:	,	mles/hr	Dew Pt:	27.82	inches o °F	л п д
Location Description (e.g. vegeta			Do	Soil, Dr.	y gras	\$			/ #		~~~~~	Test Qualifier	,	r v
Sample ID	RAFS Unit №	Rotom Pump		Rotomete Start (L/m)	r Reading Stop (L/m)	Start Count	Agitat Stop Count	tor Data Cycle Time (s)	Depth (inches)	T Start	Stop	Comn	nents	RTI Filter ID
LBMT A35.41- EB	NI	2		13.31	13.75		0			2:55	3:05	305	frm	
LBMT A33-21-01	M	1		13.64	13.97	0	20 1/4		1/8	3:19	15:24	*		-
LBAT A33-21-02	N1	2		13.31	13,73	0	201/4		1/2	3:19	15:24		<u></u>	-
LBMT A33-4-03	M	3		13.45	13.70	0	20 1/4		Y8	3:19	15:2A			
				4.			<u> </u>							+
MetOne GT 521 Filename	Start	Stop		Flow te (L/m)				Comments)			Van	e Anemomet	er
LBART A33-LI-QC	14:41	14:51	3.0		Unto	L						258,264,20	Z74 C feet/mir	nute
18MT A33-L1	15:19	15:29	3.6											
Soil Moisture Readings			1				le Tracking							
Reading 1 Reading 2 Reading 3 5, 9 6, 9 3, 6	4.9	S.9				Split # 1	1 12	Sample ID		. 1		Comments		
<u> </u>	A					2		-A33-L						
Additional Sample Period Comme			2				LEM)	- 433-LI	-12 20	<u>}</u>				
1004 Mineral Am	e j u	regory	د			3								
Non-ETY Aru						4						~		
						5						······		
	Eld	(m)	1											

(m) 20/30

INTERNATIONAL Sampling Condition Parame	ampling Condition Parameters مرتجانی محری rea: A33 Location: المطلح RH: 37.7 % Temp: 85.9 % Wind Vel: 7.4 mles/hr													
Area: A33 Location:	12 12	RH: 3	7.7	%	Temp:	85.9	°F		1	mles/hr	Bar Press:	27.8		'Hg
Location Description (e.g. vegeta	na gusts): ition: soil cor	isistency):	- Da	Gil	Dru Br	M		Direction:	NNE		Dew Pt:	Test Qualifier:	°F	
	100		<u> </u>		er Reading		Agita	tor Data		Ti	me	rest quanner.		RTI
Sample ID	RAFS Unit №	Rotome Pump		Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comm	ents	Filter
LOMT A33 12 01	N\)		13.64	1397	104	2148		k	15:12	15:52	5min S	mple	~
LBART A33 12 02	N	2		1331	13,73	120 14	21/48		18	15:47	1		Direct	
LBMT A53 1203	•	3		13.45		¥6 1/4	211/4		1/8	15:47	15:59		1	
MetOne GT 521 Filename	Start	Stop		ilow e (L/m)				Comments				Vane	Anemomete	r
LSMT A33 L2 ON	15:47	15:59	3.02	-1	5 min	n Stop	+ 5,	nin pr	2 4 3			289	feet/min.	ıte
Soil Moisture Readings Reading 1 Reading 2 Reading 3 2.6 3.9 2.6 Additional Sample Period Comme 1004 Muneral Av Samp 1-5 min;	33	Reading 5 1.9 (arteso 83-10 m	iy I in P	I- Sirect		Soil Samp Split # 1 2 3 4 5	1	Sample ID A33 L2 A33 L2		1		Comments		

Sampling Condition Pa	ampling Condition Parameters rea: A33 Location: L3 RH: 38-6 % Temp: 64+1 % Wind Vel: 3.4 mles/hr B													
	· ,	Mos	Xly C	roudy				Direction:	3		Dew Pt:		°F	
ocation Description (e.g. vegetation, soil consistency): Dry greas wer dry organic suil												Test Qualifier:		
Sample ID	RAFS Unit №	Rotomo Pump	eter, –	Start (L/m)	Stop (L/m)	Start Count	Agitat Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	R1 Filt IC	
LBMT . 433- 43.0	IN 10	(3.64	13.97	21 4	27 1/2		48	6:08	16:13	Overloaded	?	
LBMT A33 - L3.07	2 11	2		13.31	13.73	21 1/4	27 1/2		48	6:08	16:13	Overloaded ?		
LBAR A33- 13.	03 NI	3		3.45	13.70	2(1/4	27 42		48	16:08	16:13	overloaded	2	
MetOne GT 521 Filenar	ne Start	Stop	Flo Rate					Comments				Vane Ane	mometer	
LBMT A33 43	16:08	16:13	3.021		Unit	52			·····			299	feet/minute	
3.6 Prov A	Comments	5.6				Soil Samp Split # 1 2 3		Sample ID A33 L3 A33 L3	-015			Comments		
1004 Minurel L	tn. (s	tagery .	3			4								
1						5								

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Sampling Condition Parame	AIR SAN RELEASA Libby Oper	BLE ASBES able Unit #4;	ID INSTRUM TOS FIELD SA Libby, Montana	ENT DATA C	OLLECTI	ON FORM					W 1(S. Z1Z7	55/2 10137 58748 feet	ອ
Area: A3 4 Location: Weather Phenomena (e.g. rain, v Location Description (e.g. vegeta)	vind gusts):	Sann		Temp:	76.2	of More ech	Wind Vel: Direction:	1.6 East	mles/hr ►	Bar Press: Dew Pt:	Z7.96 Test Qualifier	°F	of Hg
Sample	RAFS	Rotom	eter,	art Stop	Start	Agita	tor Data	Denth		lime .			RTI
ID	Unit №	Pump	N2 (L/		Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comn	nents	Filter
LBMT-A34-LI-EB	N1	2_	- 13:	31	ميند المركزين		-		935	945	268-67	 Mesori	
1-BMT- A34-11-01	2	1	13.	60	1/4	10 1/2		1/4	1038	10:147		-	
LBMT-A34_L1-02	NI	2	13-	3)	1/4	211/2		1/8	1038	10:53	1	Sample	
LBMT- A34-4-02	NI	3	13.	41	1/4	421/2		1/8	1033	11:05	20 min	and the second	
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m	, I.	<u> </u>		Comments	<u> </u>	<u> </u>		Vane	e Anemomete	
LBMT A34-LI-QC	938	9:43	3.134	(ln.+	-2,\$						308	feet/mini	uto.
LBMg A34-LI	1038	11:05	3.134	1		nin Stop	+4min i	for Samp!	1			loophink	<u>ло</u>
Soil Moisture Readings						ole Tracking							
Reading 1 Reading 2 Reading 3	T	1			Split #		Sample ID				Comments		
7.1 7.1 3.5	8.	5.6			1	LBMT	A34-4-	01 Sal					
Additional Sample Period Comme	ents				2	LEAT	A34. L1-	02 Sal					
60 Conster (a heyer	14			3								
samp)-5min;s	any 2-	10 min	15am 3-2	min	4			****					74 MARKAN BARANA (1977)
	4				5			00000000000000000000000000000000000000		*****			****

Sampling Condition Parame	AIR SAM RELEASAI Libby Opera	FS Datasheel IPLING AN BLE ASBEST able Unit #4; [D INSTR	SAMPLE		OLLECTIC	ON FORM				Date: Tech: GPS: Altitude:	N 4	8.4	57/KJ 0169 8781	>
Area: A34 Location:	L2	RH: 3	9.8 %		Temp: S	34.9	°F	Wind Vel:		mles/hr	Bar Press:	27	.96	inches of	f Hg
Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta	rind gusts): ation, soil cor	Sunny nsistency):	man 1	oman	ic soi	1. Trin	med n	Direction:	NBE		Dew Pt:	Test Qu	alifier	٥F	
Sample	RAFS	Rotome			r Reading	<u> </u>	WAS TRANSPORTED IN CONTRACTOR INCOMENDATION	or Data		Ti	me				RTI
ID	Unit №	Pump	N⁰	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop		Comme	nts	Filter
4BMJ-A34-12-DI	12)	4	13.50		421/2	52 1/4		1/8	11:12	11:19	5	min	Samle	-
48mT-A34-L2-02	1 .	2		13.31		421/2	60 1/4		1/6	11:12	11:24	10	min.	Sample	
LBMT-A34-12-03	<u>N</u> 1	3		13.41		1	81 3/4		1/8	11:12	11:36	20	min	Sample	
MetOne GT 521 Filename	Start	Stop	Flo Rate (Comments					Vane A	nemomete	
LBNT-A34-L2	11:12	11:36	3.13	<u>+</u>	Um.	+ 02,	Imin.	Stop + 4	tamin fo	r Samp 1		5092	63	feet/minu	ite
Soil Moisture Readings	Deedler						le Tracking]			
Reading 1 Reading 2 Reading 3	1	1				Split #		Sample ID				Comr	nents		
Additional Sample Period Comme	22.3	19.3				2	LBMJ-	A34-42 A34-42	-					*****	
bo comifer, C.		4 TV				3		- - 1	1						
Sampt-5 min; San			- 5 mp 3 -	-20 min		4		***********				*****		<u></u>	
						5									

Sampling Condition Parame	AIR SAM RELEASAE Libby Opera		INSTRUMENT S FIELD SAMPLE by, Montana		OLLECTIC	DN FORM				Date: Tech: GPS: Altitude:	8/4/10 MB/5K/JT/ RD N 48.40174 W 115.58770 2083 feet
Area: 334 Location: Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta	L3 ind gusts):	RH: 42. Sunny Isistency): 9n	and the second se		80.2 1, třím	of med gr	Wind Vel: Direction:	2.7 E	mles/hr	Bar Press: Dew Pt:	27-9/3 inches of Hg °F Test Qualifier: Reproduction
Sample	RAFS	Rotometer	Rotomete	er Reading	<u> </u>	Agital	or Data		Ti	ime	RTI
D	Unit №	Pump №	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments Filter
LBMJ-A34-L3-01	NI	1	13.60			87 1/2		44	11:45	11:56	Reshart 11:51
LBMT- A34- L3-02	NI	2	13 31			871/2		1/4	11:45	1	
LBMT-A34. 13-03	NI	3	13.41		81 3/4	1		1/4	11:45	1	Ray 47 second -
											Subtract 3 cycle Told Time 3 Sund 47 For
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)				Comments				Vane Anemometer
LBMT-A34-L3	11:45	11:56	3-134	Un	1202						329,324 feet/minute
Soil Moisture Readings Reading 1 Preading 2 Reading 3	Peoding A	Deeding 5				le Tracking			T		
2812 30 1 14.4	15.9	19.9			Split #1	LEMT	Sample ID	2 61 6			Comments
20.8 14-> Additional Sample Period Comme	1	<u> </u>			2		434 L				
1 .	Cq jego	M IV			3					99.99.119.9.6.99.00.00.00.00.00.00.00.00.00.00.00.00.	
Fixed soil under	RAB	, pour C	on boch		4			1992 - A. C. Stater, and C. S. Stater, and S. Stater,		annen missennen monarce containe	
Counter melleune		/			5						

		RELEASA8		NSTRUMENT FIELD SAMPLI Dy, Montana		DLLECTI	ON FORM				Date: Tech: GPS: Altitude:	<u>9-14-2010</u> N W	
Sampling Condition	Parame	lers	RH:	%	Temp:	auf a harren de fan Anderen yn ar	op	Wind Vel:		mles/hr	Bar Press:	inches c	of Ha
Weather Phenomena		- /	isistency):					Direction			Dew Pt:	°⊬ Test Qualifier:	
		RAFS	Rotometer	Rotomete	r Reading	andre an Alle Carlon andre Standard and an andre and a standard Gel and Carlon and a standard the standard and an andre and a standard	Agita	tor Data		1	lime		RTI
Sample ID		Unit Ne	Pump N2	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter ID
		1		13.98									
		1	2	13.61	anna ann bar agus a rann a cashao agus ga ga	1111-1111-1111-1111-111-111-111-111-11	4 pm 1 1111 m 1 pm p 11 m 11 pm p 10 m 11 m 12 m 12 m 12 m 12 m 12 m 12 m		rinning and the state and the later				
	ang ang pangang ang ang ang ang ang ang ang ang a	1	3	13,40	an sa mati na mati na mati naomini na mati na	*****# 105,0117.466,035.7464,935.7464,936.7464	une and interior deficit and easy to make a grad	taa maara yo hara baba aa ka	2014 6/1014 510 000 11014 61 000 1101	na (1 ¹ mile Rosson), Protonia a contra a caso de l	11.000 pp-1-000 pr-1-000 pp-1-000 pp-		
			, which is the descent of the second	1999 (1997) (1990) (199		1914 - 1914 -	110 Martin 2010 - Color Color Color Color Color	1993 (1994) 1997 (1994 (1995) 1997) 1997 (1995) 1997 (1994 (1994) 1997) 1997 (1994) 1997 (1994) 1997 (1994) 19	1000 814 700 814 000 814 000 814 000 814 000 1000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 814 000 8				
MetOne GT 521 File	ename	Start	Stop.	Flow Rate (I./m)	yan di Sangal Cang di Kang da Cang da Cang da C	NATION COM CALL IN THE REPORT OF CALL	2900-0000 (1969-000 21) ¹⁹ (1969-0000 (1969-0000)	Comments		na janga y diatang KCAng (KCAng (KCAng))	1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -	Vane Anemomete	57
Unit OI	Alabana an Alabana (Alabana) (Alabana) (Alabana) (Alabana) (Alabana) (Alabana) (Alabana) (Alabana) (Alabana) (A	3.49	5	างการการการทำงานหมู่สาวที่ได้มีการทุกทางให้มีการทุก	10	Meq	SURUM	RMAS	eniar quyen tine in nives, que inc		anna ta sina a sum é se para sa ta da ata ana sa an	feet/min	ute
Soil Moisture Readings Reading 1 Reading 2 I Additional Sample Peri	Reading 3		Reading 5			Soil Samp Split # 1 2 3 4 5	ile Tracking	Sample ID				Comments	

		AIR SAM RELEASAU Libby Opera	TS Datasheet PLING AND INS BLE ASBESTOS FIE able Unit #4, Libby, Iv	LD SAMPLI		OLLECTIO	n form				Tech: GPS:	<u>9-14-2018</u> N W feet	-
Sampling Condition	Location:		RH:	%	Temp:		٥F	Wind Vel:		mles/hr	Bar Press:	inches c	of Ha
Weather Phenomena		vind gusts):						Direction			Dew Pt:	٥٢	
Location Description	(e.g. vegeta	ation, soil cor	nsistency):	nagalin di kadala ng Vinish da kadapa di mangapa da	nadara 19.5000 waxaya 140 kala kuji 1000 kuli kuli kuji 1000	anna ka 1911 é 16 anns	Mile a Concepte Nel Vien de La Datajo Vien datajo de Alda	in Le Lang II (Faller na 1990 i Andraig, Af 1994 Dis Lang e	de south a constraint a second a second data for the second second second second second second second second s	an a shallan a shallan a shallan a shallan a shallan a shallan a		Test Qualifier:	
Sample		RAFS	Rotometer,	Ballometer Birthing Brandyer In	er Reading		aneren entre auferen berrangen eine berrange	or Data	in and the paper of the first me to specify the second second second second second second second second second		lime	General Hall and Charles and Provide a second strange of an excerned strange of the second strange and	RTI
ID		Unit Ne	Pump N2	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	Filter ID
	1111111111111111111111111111111111111	2		13.68	19 des 20 70 / 10 10 10 10 10 10 10 10 10 10 10 10 10	pan kan manjah kan penjang didapi kan panga badi mang sa	5-1-4 4201-0-751-0-51-0-171 (0-1751-0) (0-176)	154 1544 147 (1995) 154 140 149 149 149 149 149 149 149 149 149 149	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				
		2	à	13.56	1. 10 × 1993 V × 1994 V × 1996 V × 1900	1170-11-11-11-11-11-11-11-11-11-11-11-11-11	979299966989979296599990899999999999999999	11 C 1401 540 1211 540 1211 1211 1211 1211 1211 1211				9409 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	and the second secon	2	2014 - 20	13.34	n para je taktorija i nalaza in kadita kuzi nago teo koka kuzi	946 317 #19707/05/2010/95/33 046/4/#1488/34	at the state of th	18 - 1945 - 19 - 19 - 19 - 19 - 19 - 19 - 19 - 1	Languages, Particle Science of P	11.7mm = 21.7mm = 21.71.7mm		anan ang manang man	
MetOne GT 521 F	ilename	Start	1 Stan 1	Flow			99 107 108 104 104 105 107 10 108 105 107 107 107 107 107 107 107 107 107 107	Comments				Vane Anemomete	
Unit 02	2014 - 100 -	3,031	In the second	te (L./m)	10	Meas	Surcm	en X				feet/min	uto
Soil Moisture Reading Reading 1 Reading 2	js		Reading 5			Soil Sampl Split #	an 14 - 14 - 14 - 14 - 14 - 14 - 14 - 14	1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1				Comments	
Additional Sample Pe	l) Ante				1 2	na a fir fill an suit read fill reine par fille b se cead	ab kan de parte de la santa	n yang bar yana terrina an terrina an terrina an terrina	-	917999 - 1994 - PARAMAN AND MARINA MARINA I LANK	анаану цанау нациялациялары и куличали и колоника колоника куличание колоника колоника куличание куличание кул	ng managana ng manganang manganang mangan
			ning so nation taken so an to the nation of the nation]	3	M () TO PROVERSING & TO PROVE TO THE PROVENTION	NTRAFICU CANA LI SMALLO CONTRATANA 234 MILLO	21944-1912-1942-124 - Million 2012-1942-1247-1247-1247-1247-1247-1247-1247-12		94999999999999999999999999999999999999	a Manaka manaka kana kana kana kana kana ka	nagyanakan canana ta kangan panggan sa gita
			underse versellen staatsdef in het als en versel in gestaar van die versel verselen verselen en staatsde verse In seeling verselen v			4	1999 La, F 701 F 26 Sang Sila Ang Sila	n de Andre Tale alban fra y Shing ta Vinger kan vinger kan berekan Na de Andre Kan de Andre Andre Kan de Andre Kan	الله المراجع ال من المراجع المر من المراجع المر	and for any the state payment in a map the state of	na antar da fan ange a far fann a sa anna ange a Mars e ca ang a fan anna An gan a		
	and the second secon	and water in the state of the s	namery volument from the analysis of a logicity of more than the state of the meter takes to be same at	ning and only on the state scale biological scale for many and		5	11/100 11/11/11/11/11/11/11/11/11/11/11/11/11/		1. Nile 11. augusta (11. aug				

1.000

Sampling Conditio		AIR SAMI RELEASAB Libby Opera	S Datasheet PLING AND INS LE ASBESTOS FI ble Unit #4: Libby, I	ELD SAMPLE		DLLECTIC	on form						15/10 5, JK, RD 	-
Area: Weather Phenomena Location Description			RH: sistency):	%	Temp:		of:	Wind Vel: Direction:		mles/hr	Bar Press: Dew Pt:	Test Qua	inches c ⁰F alifier:	of Hg
Camala		RAFS	The second se	Rotomete	r Reading		Agita	tor Data		T T	ime	ry Charles a Marine Contact Landary VII Bergenerge of Palls of party a, Cont Log		RTI
Sample ID		Unit Ne	Rotometer, Pump №	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop		Comments	Filter ID
モナレ・イト	- 2.63	2	2	13.61	13.61	0	20		CHER	6	10 Au	EB	281 fpm	
ETV . TI		2		13.56	13.56	6	20	n da a ^d adria el meno de la mante de la mante de la conset Mante de la mante	9,569,507,507,507,507,507,507,507,507,507,507	0	10 min	EB	250 fpm	
MetOne GT 521 Fil	ename	Start	Stop. R	Flow ate (L/m)				Comments					Vane Anemomete	Ĩ
10 40 ml		8:01	n o gan an an a tha ann an an an ann an an ann an ann an a	for American of Schönigen and Schönigen and School of School of S	184	badch.	· Collo	rahen_	224	: B1		in den (g., yw. en sûne gin gin gin gin den gener in s	feet/min	ute
Undoz		8.01	nen frederikte zuget ein eine stellen ein der sinder an der sinder andere sinder an einen sonalten eine sinder Mehr frederikte zuget ein stelle sinder sinder sinder sinder an eine sinder an einen sonalten eine sinder sinder	1797 1963 1953 1954 1969 196 1964 196 1965 1965 1965 1965 1963 1963 1965 1965 1965 1965 1965 1965 1965 1965	181 -		10 cúba			: Bhi				
Soil Moisture Reading Reading 1 Reading 2	5	Reading 4	Reading 5				le Tracking					Comme	ents	
Additional Sample Per	iod Comme	inte	91 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			2	na series de la constante de la	n song song a ng mang ka song an song ang kang kang kang kang kang kang kan	2 1994 - BEL DAY & MILL CARE AND COME SEA - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994		anna ta sa kata a sa kata ta kata na kata na kata na kata kat	**************************************	99. La	
		nen zurfödere over er mende e oberau remer ver	ndocument one (a suboruma License Provinsio), same in una second	En værd in samp i kvært proping kærindet og søde ær		3		n the week for even the obey statistic courses, whet is	1 111111111111111111111111111111111111					
1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -	a Marin Santa Marina a Marina a Marina ya Kata Mari	мбалар стятого и разво у сало с торого с средо с	nen savallet om engligt juggeten i konsteller som engen at samt der av i det som en en en	A 10 TOPMENT TO MEAN TO BE THE ADDRESS AND ADDRESS ADDRESS ADDRESS ADDRESS ADDRESS ADDRESS ADDRESS ADDRESS ADDR		4	ng gant 10.44 Matter ang	17 1 1 204 (17 17 11 14 (10 14 1 14 1 14 1 14 1 14 1 14						
						5								L &

ØRII	AIR SAM RELEASA8 Libby Opera ters ind gusts):	ILE ASBESTO: Ible Unit #4; Lib RH:		R (RAFS) Temp:		>N FORM ⁰F ≫ो\	Wind Vel: Direction:		mies/hr	Date: Tech: GPS: Altitude: Bar Press: Dew Pt:	of	Hg
	ner fornalde in solde soldelig and der solden av die solden. ner of en als Mitself in solde for als formente solder en anderer g	ISISICIIGY).	Rotomete	and the second sec	-114	na sana na mangana na m Mangana na mangana na mangana na mangang na mangana na mangana na mangana na mangana na mangana na mangana na ma	or Data	a finite a la companya finite a d'Arang a Companya Companya Companya Companya Companya Companya Companya Compa	1	ime	Test Qualifier:	105 206 2
Sample ID	RAFS Unit NP	Rotometer Pump №	Clark	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	RTI Filter ID
RATS 1. LOW-LI		1,2,3	Sac	l shak	0	15		1/2	\cap	8 mil	Risht, restored	MANY MANY MANY MANY MANY MANY
RAFS 2 . Low - LZ	191 AN	1,23	5.6		0	15	n angara, ang	V(1	0	8 Mary	Left Verhick	999 13 21 19 23 23 19 24 24 19 24 24 19 24 24 19 24 24 19 24 24 19 24 24 19 24 24 19 24 24 19 24 24 19 24 24 19
MetOne GT 521 Filename	Start	Stop	Flow Rate (L/m)				Comments				Vane Anemometer	
(n.to)	ne i na sugar dan sugar na nagar na galan ng sugar na galan ng sugar pang	With a milita dra. Gagia aga Ababa un babargan kan a nga n a ungga da	الم	RA		540	p due	y <u>ru</u>	<u>n C</u>	5 rin	RZ-34 feet/minu	te
Soil Moisture Readings Reading 1 Reading 2 Reading 3 1 9.0 9.5 Idditional Sample Period Comme	9.0 10.0 Stop	10.5 10.5 C 5min	31 22 <u>chur</u> i chur	parte i			Sample ID - Le W - 7 - COI	1946 999 CANE PET LINE PAC HINE BACK LINE BACK CONT			Comments	
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10:30 may start

		P. D. San Contraction	AIR SAM RELEASAE Libby Opera	S Datasheet PLING AND IM ILE ASBESTOS FI Ible Unit #4, Libby	elo sample		DLLECTK)n form				Date: Tech: GPS: Altitude:	9/15 TT 7 N W	k feet	•
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Weather Phenome Location Descript	ma	(e.g. rain, w	-34	Artistical	log	• • (Direction:			Dew Pt:	Test Qualifier:	of	
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			Unit Ne	Pump Na	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comme	nts	Filter ID
RAFSI-H	-uh	<u>~~ ~ </u>	A	SAN IS 10 TO 10 MILLS HAR A TO POSSIBLE OF SHALL & CANADA	89. 8	13.89	0	LS	and contact and a interpreting the state of the set	Y2	0	8 min	checke	Sher	Period and a second
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MetOne GT 5	21 Fil	ename	LStart	Stop F	Flow Rate (L/m)	and the first product of the second s	na posta na sen sen a constante en esta	isa una kan jawa ka na kana ka kana ka	Comments	La di Marino antar e Juga Lon Marino Italiane di	na jecina erazo jeden za stala st		Vane	Anemomete	
Kigh . Le	- (nagalang ng pang ng pan		an er pennen fan en fan it de skrieder fan en de skrieder fan en de skrieder fan en de skrieder fan en de skrie En skrieder fan en de skrieder fan e	an ka side versitet spicele ob 1960-er fölston baseret 1860 og sigenet saget progesom sade for men sigeneter	Uaste	9 <u>1</u> ,S	19.000 10.000 10.000 10.000 10.000 10.000 Hereita antisia antisia Antisia antisia	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	5		91179 20100000 00000000000000000000000000000	345	feet/min	ute
Soil Moisture Rea	1g 2	Reading 3	Reading 4	loures and a summer spans a summer a			Split #	le Tracking	Sample ID	e la bases or rend a ris double prosent provedende			Comments		
15.4 13.	5	12.9	14.9	15.4			1	KAFS	·1 - 14.71	<u>(~L(</u>	<u>l</u> e	o muc	h Soil	Collect	KJ
Additional Sampl	e Per	lod Comme	mts	1999 - 1997 - 19	adar moninal product a salar superiod ca	•	2	or all independent production of the state o	in the second	821 Vyuny () vijeliju toolikiju vyunydoustkojatik	10 Participan (1990) (1990) (1990)	00000000000000000000000000000000000000	tohatoyyyyyytaataa ayay katottoo maagaa ayay kooninaa aasaa	ni elejentosonan ola ilan Alejanonan ele	hogaay menopary naga ang bistan dari masanga ye nagat
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	hum	<u> </u>	2	., 5,	6 (8)	and a second	-p		nnya mangangkan nagalan p <u>any</u> (Krokikiki ping					4	ann ann 200 Stàitean Anna Stàitean Stàitean Stàitean Stàitean Stàitean Stàitean Stàitean Stàitean Stàitean Stài
		Do	٥٢												

ØKIL	AIR SAMI RELEASAD Libby Opera	S Datasheet PLING AND INS LE ASBESTOS FI ble Unit #4; Libby, I RH:	ELD SAMPLI Nontana %	EE (RAFS) Temp:		N FORM	Wind Vei: Direction:		mies/hr	4	9/15/10 <u>ST/JK/RD</u> N W feet inches of of:	Hg
Location Description (e.g. vegetat		sistercy):	1- bilio	willy L	order	Soul	1100-04-0410-0412-040-040-040-040-040-040-040-040-040-04	1995) 1000-111 1000-121-1200-1211 100-1215 100-1216	80 x 2014 M 2014 ON 2015 ON 2015 ON 2014 TO 1 1 10 1 2014 ON 2010	anay when the support of the same state over the state of the same state of the same state over the	Test Qualifier:	nin) keup problem serieksi seriettiin in viedaa
Sample ID	RAFS Unit Ne	Rolomater. Pump Na	Rotorrieta Stat (L/m)	sr Reading Stop (L/m)	Start Court	Agital Stop Count	or Data Cycle Time (s)	Depth (inches)	Start	line Stop	Comments	RTI Filter 10
RAFS1-Low-1.2~	1	an all taat an ing ang ang ang ang ang ang ang ang ang a	13.98	13.98	6	15	aline many many analysis and	ante do may marina especialmente da constante en constante en constante especialmente especialmente de constant		8 ma	Stop c 5 mm	_{le} -medicipism <u>e</u> rcis _i becnețis; renim
RAFS -Low. L2-2	2	1	136(13-61	6	١5	n na han an a	a na ngu ngun ya da da na gana dhugan na gana agana	6	8	C C C C C C C C C C C C C C C C C C C	64479899819799999999999999999999999999999
RAFS-LOW-12-3	L	anno-sean ann an tartha ann an 3	1340	13.40	0	15	, ' ,	(1,1,2,2,2) , $(1,1,2,2,2)$, $(1,1,2,2,2)$, $(1,1,2,2)$, (1,1,2,2) , $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, $(1,1,2,2)$, (1,1,2,2) , $(1,1,2,2)$, (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) , (1,1,2,2) ,	0	- 8	La	uu-soogilaa oogulda oo golda oo waxaa ahaa oo dha
					ar sportsense soka stale in daga seri seri se saka seri seri seri seri seri seri seri seri							g. generale wy hold warm of characters - share
MetOne GT 521 Filename	Sfart	na aniora ani	Flow ate (Lim)	n offender en filmen over effer melle bere-sonaler en en ander en	, i , i , i , i , i , i , i , i , i , i	n jaj gen na gen nag gen na Gen en jegen som gel	Comments	ар ин должно мисси должни алсон алсон Ал			Vane Anemometer	n o e e e e e e e e e e e e e e e e e e
Robots 1- Low . LZ			אר אנים איז אינער איז	e forme or source and the source of the sour	185 185 195 195 195 195 195 195 195 195 195 19	546	standard and a second	en en de la companya de la companya La companya de la comp	a deserves against a service and		355 feet/minu	lle
Soil Moisture Readings Reading 1 Reading 2 Reading 3 12.5 12.0 V2.5 Additional Sample Period Comme	IF O				Soll Sampl Split # 1 2 3 4 5						Comments	

ØRIL	AIR SAMI RELEASAB .bby Opera .ers .nd gusts):	S Datasheet PLING AND IN ILE ASBESTOS F Ible Uhit #4: Libby RH: sistency):	TELID SAMPLIE , Montana	R (RAFS) Temp:		olt.	Wind Vei: Direction:		m/es/hr	Altitude: Bar Press: Dew Pt:	9/15/10 JTT/3K/AD N W Feet inches of of Test Qualifier:	1943 – S. 64 – Balt Spectrump - Julia Station One J. A. (* 1161 – 2017 July gene i Angel San La La (* 1161 – 1161 – 1161 – 1161 – 1161 – 1161 – 1161 – 1161 – 1161 – 1161 – 1161
Sample	RAFS	Rotometer.	Rotomete	eneranterioren de la service de la companya de la c	nan natara mana sana sa	LEPTRA STORY OF A CONTRACT OF A CONTRACT OF A	tor Data	Depth	en fan samme op hen en oar yn gener i ster gener.	ine.	Comments	RT) Filter
ID	Unit Ne	Pump Na	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	(inches)	Start	Stop	ann 1971 an costan Social Robert I (1978) 20 C (Fr. 4 & G. Ant.	: 11:553 [D]
PATS-Les-Le=1	2_	2016 - 589 - 102 - 102 - 102 - 102 - 102 - 103 - 10 - 102 - 102 - 102 - 102 - 102 - 102 - 102 - 102 - 102 - 102	1368	13.08	0	15	room chook er oon alloodi to chin an oon alloodi	Marilla and a second	0	8mm	Stoc Smin	one a grageth 2002 for card Percelor (p) . 45 B
RA352. LOW-LZ-2	2	. L.	13.56-	(3.56		15	na na se	100001-00-00-00-00-00-00-00-00-00-00-00-	6	8	u.	944 saids guilling and 1000 data are 1000
RAFS 2- 2010 - 62-3	n de la constante de la constan La constante de la constante de La constante de la constante de	an a	(3.34				1970 to 200 and an east (provid) (provid) and an east of the second second second second second second second s		0	8 ***		teen valaagite alsoopi aanteent koortani oo s
MetOne GT 521 Filename RAFS2 Law L2	easterney, o transmission of the second easterney of the second of the second second of the second of the second of the Second of the second of the second of the second of the Second of the second of the second of the second of the Second of the second of the second of the second of the Second of the second of the second of the second of the Second of the second of the second of the second of the Second of the second of the second of the second of the second of the Second of the second of the second of the second of the second of the Second of the second of the s	Stop 8 min	Flow Flate (L/m)				Comments	an ann ann a multic ann ann an ann an ann ann an ann ann a	rondroge razvenyn mystogen regalatif raussiga senar 1979: Die antere anteringen senar de senar de senar de senar 1989: Die antere en transformation en senar de s	ris arten Saat (1996), isaa kata (1996), isaa Kata (1996) isaa (1996), isaa (1996), isaa (1996), isaa Managara (1996), isaa	Vane Anemomete 312 feet/min	inglin ganziji i trinktin naveliški spina 17. str
Soil Moisture Readings	Reading 4				Soll Samp Split #	ter a fel yes destante concesso con tel de la concesso	ear water and a growth of the second of the stand of the second of the second of the second of the second of the				Comments	ning tanag) akti sosta ur. (1) ang tang tang tang tang tang tang tang t
Additional Sample Period Comme	inta		nijeviniji i stavljiva na osljivi stavanja na osljivanja na osljivanja stava stava stava stava stava stava stav		2	1000 - 100 -	w insegujaçon dalakê n 0.50 ministro 20.50 ye.	nden and the Capital and a state of a state of a	ga. maa ay 1 mil a waa oo ga dhigo oo ah 12 mil	n, det 2002 per nak-100-100 nater 7 (2 / 4 p. 1) (1984 Std. 198	nayada kon koja nim koja regular zaježkaj zaražita zila net netnoka netnokrana su ca stano stano stano stano st	el alto antivitto cui estis far alto recordo de la compañía de la compañía de la compañía de la compañía de la
					3	1991 - Frieder Fell Frieder auf der Genarmang 1995 - Frieder aus der Genarmangen auf der Friederaus der Frieder 1995 - Frieder aus der Frieder aus der Friederaus der Frieder aus der Friederaus der Friederaus der Friederaus		n van eens der Trajensjefold da vappiger ander Anne Generale Fangelauf I strifte is bekender Prog. Edeland Trajense van eine dat Galense Pana		er ben versten sin der verste dies der sociale sitz sociale Kingen versten sitz ander verste die verste sitz mehren Kinge versten Parlamenten Statione sitz sitz	یا میکند. ماه میکند به موجود میکند و میکند از این ماه میکند و این میکند و این میکند و این میکند و این میکند و م میکند و میکند و با موجود و با موجود و این میکند و ا	age die sond aus die gesten ein eine eine eine eine eine Son eine sond aus aus aus eine eine eine eine eine eine eine ein

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BARTI INTERNATIONAL	AIR SAM	FS Datasheet IPLING ANI BLE ASBEST tana) INSTR			DLLECTIC	N FORM				Date: Tech: GPS:	9/15/10 5T/34 N W	
Sampling Condition Parame	oters										Altitude:	ieel	A. S. Carlo
Area: Location: Weather Phenomena (e.g. rain, w Location Description (e.g. vegeta)		RH:	%	r His	Temp:	raded S	°F 58-{	Wind Vel: Direction:	- 18 	mles/hr	[©] Bar Press: Dew Pt:	<i>≨ inches o</i> <i>°F</i> Test Qualifier:	of Hg
Sample ID	RAFS Unit №	Rotomet Pump I	er,	Rotomete Start (L/m)	r Reading Stop (L/m)	Start Count	Agitat Stop Count	tor Data Cycle Time (s)	Depth (inches)	1 Start	ime Stop	Comments	RTI Filter ID
RAFS1-LAW-13-1	1	2		3.98	13.98	0	15			Ð	8 mm	Sto C BALA	
RAFS 1 - LOW- 13-7	<u> </u>	2	٢	361	13-61	0	15			0	8 mm	er.	
RAKS1-LOW- 63-3	1	3	0	3.40	13.40	0	15			0	ð m-	V	
RRFS-643- FB-0													
RAFS-LAB-FB-C													
MetOne GT 521 Filename	Start	Stop	Flo Rate (I					Comments				Vane Anemomet	er
RAPS1- 606-63	0	8 mm		× "	Um.	401.	Sto	e 5 m	×	.12		324 316 feet/min	ute
									- 3 m	*		ST alm	
Soil Moisture Readings Reading 1 Reading 2 Reading 3	Reading 4	Reading 5	5T-4	હ્ર		Soil Sampl Split # 1	~	Sample ID				Comments	
Additional Sample Period Comme	9-5 nts	10.0				2				·			
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	AIR SAM	FS Datashee PLING AN BLE ASBES ^T tana	ID INSTI			DLLECTIO	N FORM					9/15/10 <u>JT/JK</u> N W	
Sampling Condition Param	eters						N				L'Annuade.) .	61
Area: Location:		RH:	0	%	Temp:		°F	Wind Vel:		mles/hr	Bar Press:		ches of Hg
Weather Phenomena (e.g. rain,		o into nov du		5	1 5.0.	(1.)	11-	Direction:			Dew Pt:	of	-
Location Description (e.g. vege	1	Isistency):			r Reading	ally Loc		tor Data			ime	Test Qualifier:	
Sample ID	RAFS Unit №	Rotome Pump	Contraction of the second s	Start (L/m)	Stop (L/m)	Start Count	Stop Count	Cycle Time (s)	Depth (inches)	Start	Stop	Comments	RTI Filter ID
RATS-LOW- L3-1	2	1	1	13.68	13.68	N/S	- 30			0	Bun	Stop @ 5 a	
Law - 12-2	2	2		13.56	13.56	A 15		1		$\overline{\Lambda}$	8 mi	y hope	
(AR32 Low - 63-3	2	3		13.34	13.34	en an	26				8 ac	ta .	
				ow									
MetOne GT 521 Filename	Start	Stop		(L/m)				Comments				Vane Anem	ometer
RAFS-LOW-43	0	Ban			Uni	dr,	Stop	<u>e</u> 5 %	A. 192			371 fe	et/minute
						·	v						
Soil Moisture Readings						Soil Sampl	e Tracking						
Reading 1 Reading 2 Reading 3						Split #		Sample ID		<u> </u>		Comments	
8. 10.5 9.5	9.0	12.0				1	RABL	<u> Low ·</u>	4	+			
Additional Sample Period Comm	ents	~			1	2							
			L	3		3							
			122.	41		4				<u> </u>			
L						5							
			<u> </u>										

	· · · · · · · · · · · · · · · · · · ·	Date: Tech: GPS: Altitude:	9/15/10 JT/JK N W feet												
Sampling Con	dition Parame	Annual	7001												
Area: Location: Weather Phenomena (e.g. rain, wind gusts):			RH:	%	Temp:		°F	Wind Vel:		mles/hr	Bar Press		f Hg		
Location Descript	A	rhficy		paded	Direction:			Dew Pt:	<i>∘⊱</i> Test Qualifier:						
	No.								'ime	RTI					
Samı ID	Contraction of the Contraction o	RAFS Unit №	Rotometer, Pump №	Start	Stop	Start	Stop	Cycle	Depth	Start	Stop	Comments	Filter		
RAFS 1	Kish L2-1	1	((L/m) 13.98	(L/m) \3.98	Count	Count 15	Time (s)	(inches) 3(4	0	8 min		D		
RUSESI	High Lanz	1	2	13.61	F 13.61	0	45		3/4	6	23 man	Stop C 8 min 13	18		
RAKS (Wigh 12-3	2	2	15-0	13.40		45		3/4	0	23~	Stoge & ALM	-18		
						<u> </u>					<u> </u>	Utog C & Mun			
							- 								
MetOne GT 52 R&F5 [Umb	0 1	510	Comments	Vane Anemometer										
		0	23 m			1201 540p @ Emin 13/8						st 9155			
Soil Moisture Rea Reading 1 Readin	dings Ig 2 Reading 3	Reading 4	Reading 5			Soll Sample Tracking Split # Sample ID					Comments				
20.8 17.6 19.3 18.4 16.9						1 RAFSI-High: LZ Soil						anly collected from			
Additional Sample		2													
1 KN		3				Pile	, af	CAAN CHAI							
TRIA						4				1			2		
	1			······		5									
	<u></u>								·				- 184		

Door

RAFS Datasheet AIR SAMPLING AND INSTRUMENT DATA COLLECTION FORM RELEASABLE ASBESTOS FIELD SAMPLER (RAFS) Libby, Montana										Date: Tech: GPS: Altitude:		1 5 //0]5K feet	 	
Sampling Condition Parameters							0=		all of the second					
Area:Location:RH:Weather Phenomena(e.g. rain, wind gusts):Location Description(e.g. vegetation, soil consistency):				% Ardif	Temp:	Looded	°F Wind Vel: Direction: ১ জিন্ব			mles/hr	Bar Press: Dew Pt:	s: inches of Hg °F Test Qualifier:		of Hg
Sample ID	RAFS Unit №			Rotomete Start (L/m)	Stop (L/m)	Start Count	Agitat Stop Count	or Data Cycle Time (s)	Depth (inches)	T Start	ime Stop	C	omments	RTI Filter ID
RATS1-411/23-1	1	١		13.98	13.9%	0				0	8 m.			
Roffs1 High 13-2	1	Z,		15-61	13.61	0				Ø	23	Stor	e 8 m	
ROBI 441613-3	1	3		13-40	13.40	0				0	23mm	Stop	e 8 mm	
MetOne GT 521 Filename Start		Stop		ow (L/m)	Comments						Vane Anemometer			ter
Raps1-Hill 13 0 7		23 n.m			Unit	Ø1, <	Shop (n 8 m	×	317 feet/minute			nute	
Soil Moisture Readings Reading 1 Reading 2 Reading 3 Readin 16.9 14.4 20.8 \8.4 Additional Sample Period Comments		Reading 5 57 0/15 57 0/15 57 0/15				Soll Sampl Split # 1 2	RARI-High-L3				Comments			
					3					······				
TREED						5			· · · · · · · · · · · · · · · · · · ·					

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