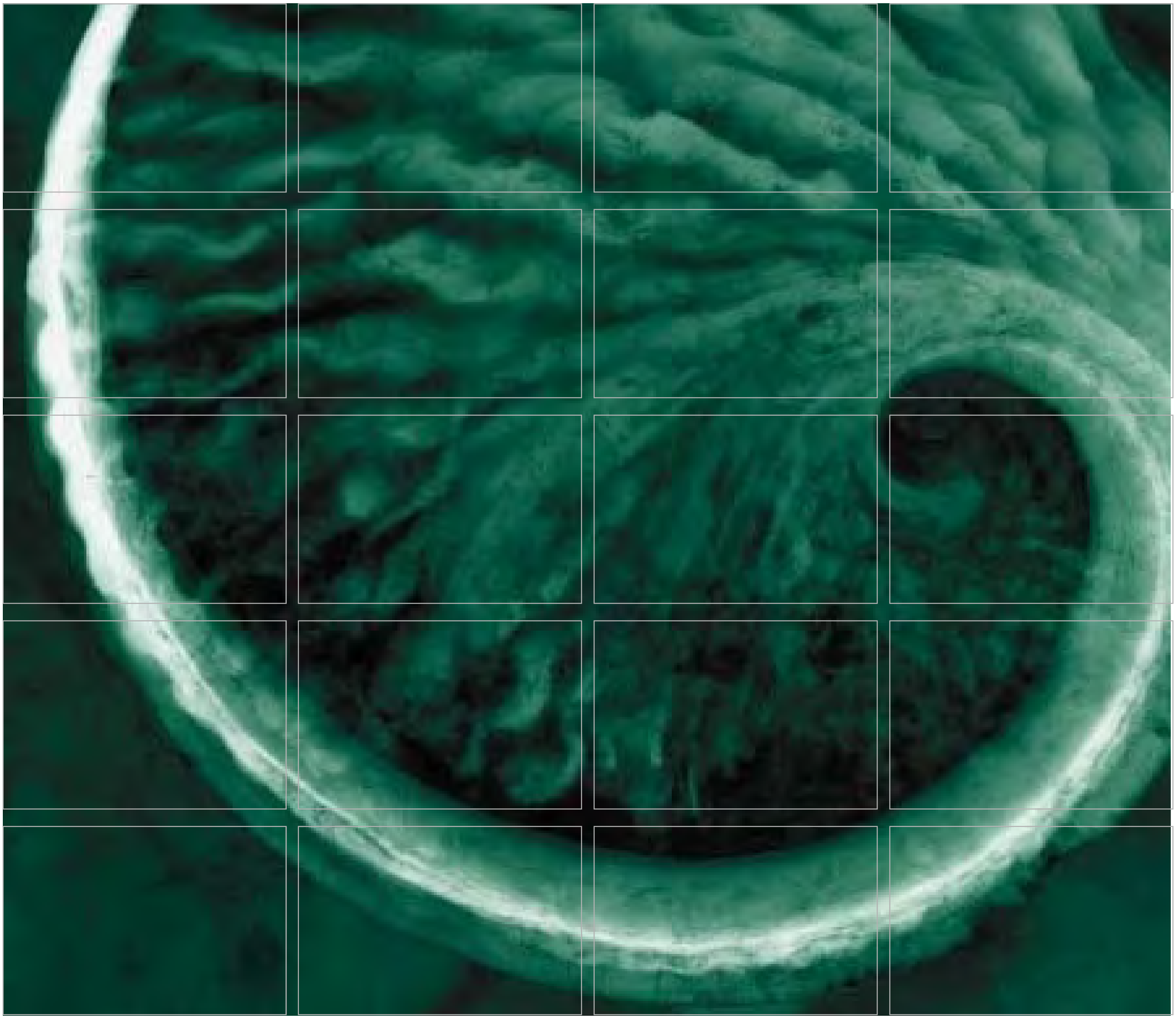

Phase 1A Remedial Investigation Sampling and Analysis Plan for Operable Unit 2 – Ambient Air

US Magnesium RI/FS
Rowley, Utah

Revision 1, July 2014

www.erm.com

Prepared for:
US Magnesium LLC
and USEPA Region 8

ERM

The world's leading sustainability consultancy

TABLE OF CONTENTS

LIST OF ACRONYMS

%R	Percent recovery
AOC	Administrative Order on Consent
BLM	Bureau of Land Management
BRA	Baseline risk assessment
CA	Corrective action
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Contaminant of potential concern
CVAA	Cold vapor atomic adsorption
D/F	Dioxins/furans
DMA	Demonstration of Method Applicability
DMP	Data Management Plan
DQI	Data quality indicator
DQO	Data quality objective
EDD	Electronic data deliverable
ERA	Ecological risk assessment
ERM	ERM-West Inc.
FS	Feasibility study
GC/MS	Gas chromatography–mass spectrometry
HCI	Hydrochloric acid
HHRA	Human health risk assessment
H&S	Health and safety
HQ	Hazard quotient
ICAL	Initial calibration
ICP/MS	Inductively coupled plasma/mass spectroscopy
IR	Infrared
LOQ	Limit of quantitation
L/h	Liter(s) per hour
MQO	Measurement quality objective
N/A	Not applicable

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PARCCS	Precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzodioxin
PCDF	Polychlorinated dibenzofuran
PFK	Perfluorokerosene
pg/m^3	Picogram(s) per cubic meter
ppm	Part(s) per million
PRI	Preliminary remedial investigation
PUF	Polyurethane foam
PWT3	Pacific Western Technologies/Tetra Tech, Inc
QA	Quality assurance
QC	Quality control
RA	Risk assessment
RBC	Risk-based concentration
RPD	Relative percent difference
RI	Remedial investigation
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SLRA	Screening-level risk assessment
SOP	Standard operating procedure
SRC	Syracuse Research Corporation
SVOC	Semi-volatile organic compound
TBD	To be determined
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TSP	Total suspended particulate

UDEQ-DERR	Utah Department of Environmental Quality – Division of Environmental Response and Remediation
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VOC	Volatile organic compound

1.0 INTRODUCTION

ERM-West, Inc. (ERM) has been retained by US Magnesium LLC (US Magnesium) to perform remedial investigation and feasibility study (RI/FS) services at the US Magnesium Site (Site) located in Tooele County, Utah (Figure 1). This Phase 1A RI Sampling and Analysis Plan (SAP) has been prepared in accordance with the requirements of the Administrative Settlement Agreement and Order on Consent (AOC), which governs the performance of the RI/FS.

US Magnesium and the United States Environmental Protection Agency (USEPA) entered into the AOC (Comprehensive Environmental Response, Compensation, and Liability Act Docket No. CERCLA-08-2011-0013), effective 4 August 2011. The AOC requires US Magnesium to complete an RI/FS for the Site.

The Site includes an active primary magnesium production facility, which has been in operation since 1972. Magnesium is refined from brine obtained from the Great Salt Lake. The facility includes employee offices and process buildings and other ancillary structures and facilities. Surrounding the process buildings are a series of waste disposal evaporation ponds, a concentrator pond, a landfill, and smut and calcium sulfate (gypsum) disposal areas. A series of earthen, open-air ditches convey liquid waste from the process facility to earthen wastewater evaporation ponds. An engineered disposal site for cast house residues containing barium sulfate and an inactive wastewater evaporation pond are located northwest and northeast of the facility, respectively.

For planning purposes, the USEPA divided the Site into 18 Preliminary Remedial Investigation (PRI) Areas, with PRI Area 18 (PRI18) being ambient air. The Site was subsequently divided in Operable Units by the USEPA, with Operable Unit 2 (OU2) being defined as PRI18 or ambient air.

The September 2013 *Phase 1A Remedial Investigation Sampling and Analysis Plan to Identify Chemicals of Potential Concern in Soils, Sediment, Solid Waste, Water and Air, and Receptor Surveys, Revision 0 for PRI Areas 2 and 8 through 17* (hereafter referred to as "the September 2013 Phase 1A RI SAP") included a description of ambient air at the Site, including the USEPA's preliminary conceptual site model for the nature and extent of air contamination and the data quality objectives for the Phase 1A Air RI. While much air-related discussion was present, the September 2013 Phase 1A RI SAP included many placeholders for the air sampling program that were to be completed or refined as a result of the Phase 1A Air Demonstration of Method Applicability (DMA) testing program (USEPA 2013; ERM 2014)

Between the publication of the September 2013 Phase 1A RI SAP and the completion of the Air DMA Testing Program, the USEPA and US Magnesium/ERM agreed that a "standalone" Phase 1A RI Air SAP would be prepared for OU2 and that ERM would take the lead for preparing the Air SAP for the USEPA's review and approval. The Phase 1A RI Air SAP was to originate from, and cross-reference where appropriate, the September 2013 Phase 1A RI SAP.

As required under Section XI, Paragraph 47 of the AOC, this SAP has been prepared following the Intergovernmental Data Quality Task Force, Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPP), Part 1: UFP-QAPP Manual (USEPA 2005). The UFP-QAPP manual suggests a 37-worksheet format to ensure adequate documentation for environmental data collection. This SAP therefore comprises 37 Worksheets, which is the same format that was followed by USEPA for the September 2013 Phase 1A RI SAP. Note that Worksheets 13, 29, and 31 through 35 from the September 2013 Phase 1A were not modified and have been included as an attachment to this SAP.

2.0 *REFERENCES*

ERM-West, Inc. (ERM). 2013. *Draft Data Management Plan*. US Magnesium RI/FS. March 2013.

ERM. 2014. *Phase 1A Draft Air Demonstration of Method Applicability Technical Memorandum*. US Magnesium RI/FS. June 2014.

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United States Environmental Protection Agency (USEPA). 1989. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Method TO-10.* Second Supplement, U. S. Environmental Protection Agency, EPA 600/4-89-018.

USEPA. 1994. *Quality Assurance Handbook for Air Pollution Measurement Systems Volume I: A Field Guide to Environmental Quality Assurance.* EPA/600/R-94/038a. http://www.epa.gov/ttnamti1/files/ambient/qaqc/r94-038a.pdf

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USEPA. 2001. *USEPA Requirements for Quality Assurance Project Plans.* EPA QA/R-5.

USEPA. 2005. *Uniform Federal Policy for Implementing Environmental Quality Systems. Evaluating, Assessing, and Documenting Environmental Data Collection/Use and Technology Programs.* Final. Version 1. Intergovernmental Data Quality Task Force. EPA-505-B-04-900A. March. (UFP-QAPP Manual).

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USEPA. 2010. *Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review.* EPA/540/R-10/011. January.

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Worksheets

SAP Worksheet #1 – Title and Approval Page

SAP Worksheet #1 – Title and Approval Page

Document Title	Phase 1A Remedial Investigation Sampling and Analysis Plan for Operable Unit 2 – Ambient Air, US Magnesium LLC, Rowley, Utah
Lead Organization	USEPA Region 8
Supported by	UDEQ, PWT3 and SRC
Preparer's Name and Organizational Affiliation	Kevin Lundmark, ERM, on behalf of US Magnesium LLC
Preparer's Address, Telephone Number, and E-mail Address	102 West 500 South, Suite 650, Salt Lake City, Utah, 84101 (801) 595-8400, kevin.lundmark@erm.com

Approvals

Ken Wangerud
USEPA Region 8
Remedial Project Manager, EPR-SR
Delegated QA Approving Officer, EPR-SR

Signature Date

For Implementation by: **ERM**

David Abranovic, PE
ERM Project Coordinator
for US Magnesium

7/30/14
Signature Date

Bob Farmer, Ph.D.
ERM Air Task Lead

Robert W Farmer 7/30/14
Signature Date

Judy Nedoff
ERM QA Manager

Judy Nedoff 7/30/14
Signature Date

SAP Worksheet #2 –
SAP Identifying Information

SAP Worksheet #2 – SAP Identifying Information

1. Identify guidance used to prepare SAP:

This Sampling and Analysis Plan (SAP) has been prepared in general accordance with the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), EPA-505-B-04-900A (United States Environmental Protection Agency [USEPA] 2005) and the USEPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (USEPA 2001).

2. Identify regulatory program:

In August 2011, USEPA Region 8 and US Magnesium LLC entered into an Administrative Order on Consent (AOC) for RI/FS under Sections 104, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 USC §§ 9604, 9607, and 9633. Under the AOC, ERM-West, Inc. (ERM) is responsible for administrations of all actions by US Magnesium LLC (Respondent) required by the AOC.

3. Identify approval entity:

The approval entity is USEPA Region 8. The USEPA has a State Superfund Memorandum of Agreement with the Utah Department of Environmental Quality (UDEQ) Division of Environmental Response and Remediation (DERR) (per National Oil and Hazardous Substances Pollution Contingency Plan [NCP] Part 300.505). The State and the USEPA agreed that USEPA Region 8 would be the lead-agency for site management and remedial response actions at the Site.

4. Indicate whether the QAPP is a generic or a project-specific QAPP:

This is a project-specific SAP.

5. List dates of scoping sessions that were held:

Scoping sessions were held between November 2011 and May 2014 and are summarized in this SAP in Worksheet 9 - Project Scoping Session Participants Sheet.

6. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
Phase 1A Remedial Investigation Sampling and Analysis Plan to Identify Chemicals of Potential Concern in Soils, Sediments, Solid Waste, Water and Air, and Receptor Surveys, Revision 0 for PRI Areas 2 and 8 through 17	September 2013
Final Air Demonstration of Methods Applicability Work Plan Preparatory to Phase 1A Remedial Investigations	March 2013

SAP Worksheet #2 – SAP Identifying Information

7. List organizational partners (stakeholders) and connection with lead organization:

USEPA maintains a close working partnership with UDEQ-DERR throughout the RI/FS planning process. The EPA has also engaged in consultations with federal and state trustees for natural resources in accordance with NCP Parts 300.600 and .615.

8. List data users:

This SAP involves sampling of air to support identification of contaminants of potential concern (COPCs). Data generated under this SAP will be for remedial decision making by risk assessors and managers. Data generated under this SAP will be managed in accordance with requirements of the AOC and the Project Data Management Plan (ERM 2013) and will become part of the Administrative Record for the Project.

SAP Worksheet #3 – Distribution List Table

SAP Worksheet #3 – Distribution List Table

Name of SAP Recipient	Title/Role	Organization	Telephone Number	E-mail Address
USEPA TEAM				
Ken Wangerud	Remedial Project Manager	USEPA	Office: (303) 312-6703 Mobile: (720) 951-0955	Wangerud.ken@epa.gov
Wendy O'Brien	Human-health Risk Assessment	USEPA	Office: (303) 312-6712	Obrien.wendy@epa.gov
Dan Wall	Ecological Risk Assessment	USEPA	Office: (303) 312-6560	Wall.dan@epa.gov
Charlie Partridge	Health and Safety Toxicologist	USEPA	Office: (303) 312-6094	Partridge.charles@epa.gov
Rebecca Matichuk	Air Modeling Specialist	USEPA	Office: (303) 312-6867	Matichuk.rebecca@epa.gov
Shun-Ping Chau	On-site Coordinator (OSC), Health and Safety	USEPA	Office: (303) 312-6848	Chau.shun-ping@epa.gov
Jeff Mosal	Data-Manager/ Coordinator	USEPA	Office: (303) 312-6802	Mosal.jeffrey@Epa.gov
Bill Brattin	Toxicologist & Risk Assessment	SRC (for USEPA)	Office: (303) 357-3121	brattin@srcinc.com
Chad Gilgen	Project Manager	UDEQ	Office: (801) 536-4237	Cgilgen@utah.gov
Scott Everett	Risk Assessment	UDEQ	Office: (801) 536-4117	Severett@utah.gov
Christine Cline	USFWS Representative	USFWS	Office: (801) 975-3330, x145	Chris_cline@fws.gov
Kevin Oliver	BLM Representative	BLM	Office: (801) 977-4338 Mobile: (801) 450-3134	koliver@blm.gov
Catherine LeCours	Contractor - Project Manager	PWT3 (for USEPA)	Office: (406) 457-5495 Mobile: (406) 422-6915	clecours@pwt.com

SAP Worksheet #3 – Distribution List Table

Name of SAP Recipient	Title/Role	Organization	Telephone Number	E-mail Address
Dorthea Hoyt	Contractor - QA Manager	PWT3 (for USEPA)	Office: (303) 274-5400, x54 Mobile: (303) 482-6973	dhoyt@pwt.com
Douglas Herlocker	Contractor- Air Specialist	PWT3 (for USEPA)	Office: (208) 389-1030 Mobile (208) 484-9436	douglas.herlocker@tetratech.com
ERM/US Magnesium Team				
David Abranovic	Project Coordinator, US Magnesium	ERM	Office: (480) 424-1821 Mobile: (602) 284-4917	david.abranovic@erm.com
Judy Nedoff	QA Manager / Analytical Coordinator	ERM	Office: (925) 482-8210	judy.nedoff@erm.com
Jennifer Holder	Lead Risk Assessor	ERM	Office: (805) 684-2801 Mobile: (805) 680-8484	jennifer.holder@erm.com
Bob Farmer	Air Task Lead	ERM	Office: (480) 998-2401 Mobile: (602) 499-9474	bob.farmer@erm.com
Kevin Lundmark	RI Task Lead/Field Lead	ERM	Office: (801) 595-8400 Mobile: (801) 440-8296	kevin.lundmark@erm.com
Mike Appel	Database Manager	ERM	Office: (503) 488-5282	mike.appel@erm.com
David Gibby	US Magnesium Representative	US Magnesium	Office: (801) 532-1522, x1355	dgibby@usmagnesium.com

SAP Worksheet #3 – Distribution List Table

Name of SAP Recipient	Title/Role	Organization	Telephone Number	E-mail Address
Samantha Henningsen	Laboratory Project Manager	ALS Environmental	Office: (805) 526-7161	Samantha.Henningsen@alsglobal.com
Stella Cuenco	Data Validation Operations Manager	LDC	Office: (760) 827-1100, x140	scuenco@lab-data.com

BLM = Bureau of Land Management
LDC = Laboratory Data Consultants
PWT3 = Pacific Western Technologies/Tetra Tech, Inc
QA = Quality Assurance
SAP = Sampling and Analysis Plan
SRC = SRC, Inc.
TBD = To be determined
USFWS = U.S. Fish and Wildlife Service

SAP Worksheet #4 –
Project Personnel Sign-Off Sheet

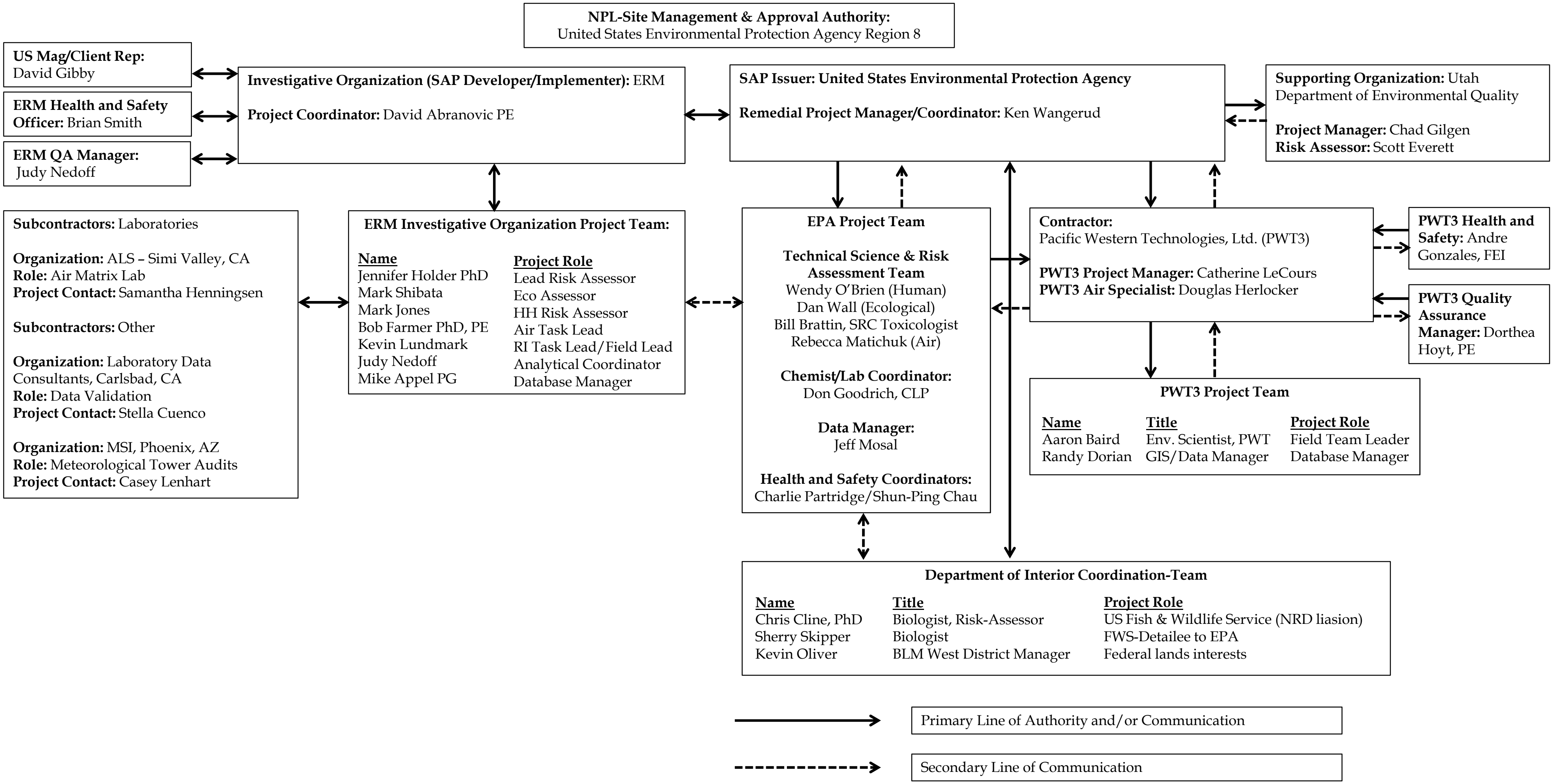
SAP Worksheet #4 – Project Personnel Sign-Off Sheet

Name	Organization/Role	Signature/ E-Mail Receipt	SAP Section(s) Reviewed	Date SAP Read
Ken Wangerud	USEPA / Remedial Project Manager			
David Abranovic	ERM / Project Coordinator			
Judy Nedoff	ERM / QA Manager & Analytical Coordinator			
Jennifer Holder	ERM / Lead Risk Assessor			
Bob Farmer	ERM / Air Task Lead			
Kevin Lundmark	ERM / RI Task Lead & Field Lead			
Mike Appel	ERM / Database Manager			
Brian Smith	ERM / Health and Safety Officer			
	ERM / Field Staff			
	ERM / Field Staff			
	ERM / Field Staff			
Samantha Henningsen	ALS / Project Manager			
	ALS / Technical Staff			
	ALS / Technical Staff			
	ALS / Technical Staff			

SAP = Sampling and Analysis Plan

SAP Worksheet #5 –
Project Organizational Chart

SAP Worksheet #5 – Project Organizational Chart



NPL-Site Management & Approval Authority:
United States Environmental Protection Agency Region 8

US Mag/Client Rep: David Gibby

ERM Health and Safety Officer: Brian Smith

ERM QA Manager: Judy Nedoff

Investigative Organization (SAP Developer/Implementer): ERM

Project Coordinator: David Abranovic PE

SAP Issuer: United States Environmental Protection Agency

Remedial Project Manager/Coordinator: Ken Wangerud

Supporting Organization: Utah Department of Environmental Quality

Project Manager: Chad Gilgen
Risk Assessor: Scott Everett

Subcontractors: Laboratories

Organization: ALS – Simi Valley, CA
Role: Air Matrix Lab
Project Contact: Samantha Henningsen

Subcontractors: Other

Organization: Laboratory Data Consultants, Carlsbad, CA
Role: Data Validation
Project Contact: Stella Cuenco

Organization: MSI, Phoenix, AZ
Role: Meteorological Tower Audits
Project Contact: Casey Lenhart

ERM Investigative Organization Project Team:

Name	Project Role
Jennifer Holder PhD	Lead Risk Assessor
Mark Shibata	Eco Assessor
Mark Jones	HH Risk Assessor
Bob Farmer PhD, PE	Air Task Lead
Kevin Lundmark	RI Task Lead/Field Lead
Judy Nedoff	Analytical Coordinator
Mike Appel PG	Database Manager

EPA Project Team

Technical Science & Risk Assessment Team
Wendy O'Brien (Human)
Dan Wall (Ecological)
Bill Brattin, SRC Toxicologist
Rebecca Matichuk (Air)

Chemist/Lab Coordinator:
Don Goodrich, CLP

Data Manager:
Jeff Mosal

Health and Safety Coordinators:
Charlie Partridge/Shun-Ping Chau

Contractor:
Pacific Western Technologies, Ltd. (PWT3)

PWT3 Project Manager: Catherine LeCours
PWT3 Air Specialist: Douglas Herlocker

PWT3 Health and Safety: Andre Gonzales, FEI

PWT3 Quality Assurance Manager: Dorthea Hoyt, PE

PWT3 Project Team

Name	Title	Project Role
Aaron Baird	Env. Scientist, PWT	Field Team Leader
Randy Dorian	GIS/Data Manager	Database Manager

Department of Interior Coordination-Team

Name	Title	Project Role
Chris Cline, PhD	Biologist, Risk-Assessor	US Fish & Wildlife Service (NRD liasion)
Sherry Skipper	Biologist	FWS-Detailee to EPA
Kevin Oliver	BLM West District Manager	Federal lands interests

Primary Line of Authority and/or Communication

Secondary Line of Communication

SAP Worksheet #6 –
Communication Pathways Table

SAP Worksheet #6 – Communication Pathways Table

Communication Drivers	**Responsible Affiliation**	**Name**	**Phone Number or E-Mail**	**Procedure**
USEPA Team				
Project Management	USEPA Remedial Project Manager (RPM)	Ken Wangerud	See Worksheet #3	The USEPA RPM will manage all USEPA and USEPA Contractor personnel and communicate directly with the ERM Project Manager.
Phase 1A RI Sampling and Analysis Plan (SAP) Amendments	USEPA RPM	Ken Wangerud	See Worksheet #3	Any changes to approved field procedures or the Phase 1A RI SAP will require documentation that must be approved by the USEPA RPM before the change is implemented. Modification forms are included as Appendix G.
Quality Control (QC) Management	Quality Assurance (QA) Manager	Ken Wangerud supported by USEPA Contractor	See Worksheet #3	The USEPA Contractor QA Manager will be the point of contact with the USEPA RPM for quality-related matters.
Technical Issues	USEPA Project Team and ERM Project Team	Various - see Worksheet #3	See Worksheet #3	When explicitly directed by the USEPA RPM and accepted by the ERM Project Manager, USEPA and/or USEPA Contractor, team members may communicate directly with their ERM technical counterparts to resolve technical issues. Recommendations for resolution shall be brought to the USEPA and ERM Project Managers for approval.

SAP Worksheet #6 – Communication Pathways Table

Communication Drivers	**Responsible Affiliation**	**Name**	**Phone Number or E-Mail**	**Procedure**
Preparation and Execution of Field-Investigation Oversight	USEPA and/or USEPA Contractor Air Specialist, or USEPA Contractor Field Team Leader	Douglas Herlocker and/or Aaron Baird	See Worksheet #3	USEPA and/or USEPA Contractor Air Specialist/Field Team Leader may communicate directly with ERM's Field Team Leader during preparation and execution of the investigation. USEPA Contractor personnel may make suggestions consistent with the Phase 1A RI SAP to the ERM Field Team Leader, but shall not direct the work or instruct ERM.
ERM Team				
Project Management	ERM Project Coordinator	David Abranovic	See Worksheet #3	The ERM Project Coordinator will serve as liaison to the USEPA and manage field personnel, project personnel, and all subcontractors. ERM Project Coordinator will report data and documents to the USEPA RPM. As necessary, the ERM Project Coordinator will bring the need/request for Phase 1A RI SAP amendments to the attention of the USEPA RPM.
QA Management	ERM QA Manager	Judy Nedoff	See Worksheet #3	The ERM QA Manager will ensure implementation of the Phase 1A RI SAP by performing on-Site field QA audits, as appropriate. The ERM QA Manager will be the point of contact with the ERM Project Coordinator for quality-related matters.

SAP Worksheet #6 – Communication Pathways Table

Communication Drivers	Responsible Affiliation	Name	Phone Number or E-Mail	Procedure
Coordination and Communication of Fieldwork Activities Related to Sampling	RI Field Team Leader[i]	Kevin Lundmark	See Worksheet #3	The ERM RI Field Team Leader will routinely (daily) communicate with the field crew during investigation and will address field implementation issues in adherence with the Phase 1A RI SAP. The ERM RI Field Team Leader will communicate relevant field information to the ERM Analytical Coordinator and Air Task Leader. The ERM RI Field Team Leader is responsible for ensuring subcontractor activities are conducted in accordance with requirements of the Phase 1A RI SAP. The ERM RI Field Team Leader, in coordination with the Air Task Leader, will report data and field documentation to the ERM Project Coordinator.
Submittal Of Samples to the Laboratory	RI Field Team Leader	Kevin Lundmark	See Worksheet #3	RI Field Team Leader will arrange for sampling personnel to package and ship samples in accordance with this Phase 1A RI SAP.
Daily Chain-Of-Custody Records and Shipping Documentation	RI Field Team Leader	Kevin Lundmark	See Worksheet #3	RI Field Team Leader will arrange for chain-of-custody records and shipping documentation to be submitted electronically to the analytical coordinator at the end of each day that samples are transmitted to the laboratory.

SAP Worksheet #6 – Communication Pathways Table

Communication Drivers	Responsible Affiliation	Name	Phone Number or E-Mail	Procedure
Field Data	RI Field Team Leader	Kevin Lundmark	See Worksheet #3	The RI Field Team Leader will routinely communicate with the Analytical Coordinator and Database Manager regarding field activities. RI Field Team Leader will coordinate with the Air Task Leader to manage field data as required by the Data Management Plan.
Deviations from Phase 1A RI SAP Procedures Identified During Field Activities	RI Field Team Leader	Kevin Lundmark	See Worksheet #3	Prepare and submit to USEPA a SAP Modification or Field Modification request, as appropriate[ii]. Forms are provided in Appendix G.
Coordination and Communication of Fieldwork Activities Related to Sampling	Air Task Leader	Bob Farmer	See Worksheet #3	The Air Task Leader will routinely communicate with the RI Field Team Leader regarding field activities and identify the need for modifications to the Phase 1A RI SAP procedures for air sampling, as appropriate. The Air Task Leader will elevate to the ERM Project Coordinator any field implementation or analytical issues associated with air sampling that may require amendments to the Phase 1A RI SAP. [Note: this responsibility may be delegated to the RI Field Team Leader.]

SAP Worksheet #6 – Communication Pathways Table

Communication Drivers	Responsible Affiliation	Name	Phone Number or E-Mail	Procedure
Reporting Laboratory Data, Quality Issues, and Issue Resolution	Laboratory Project Manager	Samantha Henningsen (ALS)	See Worksheet #3	Report documents and data to the RI Field Team Leader in an electronic format as required by the Data Management Plan and report QA and QC issues.
Coordination of Laboratory Supplies for Field Activities	Analytical Coordinator	Judy Nedoff	See Worksheet #3	The Analytical Coordinator/RI Field Team Leader will contact the laboratory to provide all necessary sample containers and appropriate shipping materials (such as coolers and bubble wrap) to be delivered on Site before field sampling begins and throughout the project.
Liaison between ERM and Analytical Laboratories	Analytical Coordinator	Judy Nedoff	See Worksheet #3	The ERM Analytical Coordinator will routinely communicate with the laboratory point of contact and will address any analytical issues to the extent possible while adhering to the Phase 1A RI SAP.

SAP Worksheet #6 – Communication Pathways Table

Communication Drivers	Responsible Affiliation	Name	Phone Number or E-Mail	Procedure
Field QC and Analytical Corrective Actions	Analytical Coordinator	Judy Nedoff	See Worksheet #3	The ERM Analytical Coordinator will immediately notify the QA Manager, RI Field Team Leader, and Project Coordinator in writing of any field QC or analytical procedures - beyond any deviations identified by the RI Field Team Leader - that were not performed in accordance with this Phase 1A RI SAP. The Analytical Coordinator, in coordination with the QA Manager and Project Coordinator, will complete documentation of the non-conformance and corrective actions to be taken. The Analytical Coordinator will verify that the corrective actions have been implemented.

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[i] The ERM Field Team Leader will coordinate with USEPA and USEPA's Contractor Field Team Leader regarding oversight activities.

[ii] Protocol for Approval of Changes Requested During Field Sampling (from September 2013 Phase 1A SAP, Worksheet 14):

> During field sampling, it is sometimes necessary to make changes in sample location and/or sampling methods compared to the specifications of the Phase 1A RI SAP. Either the USEPA or ERM may propose such changes.
>
> In cases where the change is "minor" (e.g., relocating a sampling station a short distance away from the target location), and both ERM and USEPA agree in "real time" that the change is appropriate, the change may be implemented and subsequently documented (e.g., later that day) by completion of a Field Modification Form. Note that agreement must be reached before implementing any such change. This

may be accomplished by a consultation between the field team leader and an USEPA oversight representative present at the site, or by calling an appropriate USEPA staff member by phone, as identified below:

Name	Office Phone	Cell Phone
Ken Wangerud	303-312-6703	720-951-0955
Dan Wall	303-312-6560	720-347-5520
Wendy O'Brien	303-312-6712	720-951-0970

In the event that an USEPA representative cannot be reached, or if the USEPA representative cannot issue a decision in "real time," then no change shall be implemented until authorization is granted.

In the event of a proposed "major" change in the Phase 1A RI SAP (e.g., a substantial revision to a sampling or processing method), the proposing party (either ERM or the USEPA) shall complete a Field Modification Form for review and consideration by both parties. After a decision is reached and authorization for the change is approved, then the revision may be implemented.

In the event that a change is proposed and agreement between the parties cannot be reached, then the procedure for dispute resolution defined in the AOC shall be followed.

SAP Worksheet #7 –
Personnel Responsibilities and Qualifications Table

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organization Affiliation	Phone No. or email	Responsibilities
USEPA Team				
Ken Wangerud	USEPA Remedial Project Manager (RPM)	USEPA	(303) 312-6703	Responsible for providing management and technical direction to ERM's Project Management and to the USEPA Team during data collection efforts. Actively participates in project data quality objectives (DQO) process. Review and sign-off on sampling and analysis plans (SAPs) and SAP Amendments.
Ken Wangerud	Program Quality Assurance (QA) Manager (with USEPA team consultation & advisement)	USEPA	(303) 312-6703	Responsible for overall QA and quality control (QC) of USEPA's work; develops and maintains a comprehensive QA program and is responsible for audits, reviews of work performed, and recommendations to project personnel regarding quality while independent of data generation. Provides QA and QC of technical work carried out at the Site; works closely with and reviews work carried out by the project team; and reviews deliverables to verify conformance with QA and QC procedures. QA Manager has authority to suspend affected project or Site activities if approved quality requirements are not adequately met.
Various (see WS#3)	USEPA Project Team	USEPA	See WS#3	Responsible for technical content of SAPs and SAP Amendments. Responsible for resolving technical issues that arise during implementation, and for recommending actions to the USEPA Project Manager for approval.
Catherine LeCours	USEPA Contractor Project Manager	PWT3	(406) 457-5495	Responsible for managing contractor personnel, staying briefed on field activities, briefing the USEPA RPM on field activities, ensuring contractor technical personnel are available to assist in resolution of technical issues, and participating in resolution of those technical issues.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organization Affiliation	Phone No. or email	Responsibilities
Douglas Herlocker and/or Aaron Baird	USEPA and/or USEPA Contractor Air Quality Specialist, or Field Team Leader	TetraTech/PWT3	Douglas Herlocker: Office: (208) 489-2839 Mobile: (208) 484-9436 Aaron Baird: (720) 202-2664	USEPA and/or USEPA Contractor Air Quality Specialist/Field Team Leader will collaborate with ERM's Field Team Leader during preparation and execution of the investigation. USEPA Contractor personnel may make suggestions consistent with the Phase 1A RI SAP to the ERM Field Team Leader, but shall not direct the work or instruct ERM. USEPA Contractor field personnel will provide daily briefings to the USEPA Contractor Project Manager.
ERM Team				
David Abranovic	ERM Project Coordinator	ERM	Office: (480) 998-2401 Mobile: (602) 284-4917	The ERM Project Coordinator will serve as liaison to the USEPA. Responsible for ensuring compliance with Phase 1A RI SAP requirements. As necessary, the ERM Project Coordinator will bring the need for Phase 1A RI SAP amendments to the attention of the USEPA RPM. The ERM Project Coordinator will manage project personnel, field personnel, and all subcontractors; oversee administrative and technical performance; and maintain compliance with schedules and budgets. The ERM Project Coordinator will report data and documents to the USEPA RPM.
Judy Nedoff	QA Manager	ERM	Office: (925) 482-8210	The ERM QA Manager will ensure implementation of the Phase 1A RI SAP, including performance on-Site field QC audits, as appropriate. QA Manager will be the point of contact with the ERM Project Coordinator for quality- related matters. The ERM QA Manager will remain independent of the data generation activities.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organization Affiliation	Phone No. or email	Responsibilities
Trent Hamada	Field Safety Officer	ERM	Office: (801) 595-8400 Mobile: (801) 245-9635	Responsible for implementing the health and safety plan; authority to correct and change Site control measures and the required level of health and safety protection; and primary on-site enforcement authority for the policies and provisions of the health and safety program and health and safety plan. Conducts safety briefings for Site and subcontractor personnel and Site visitors, and can suspend operations that threaten health and safety of workers and visitors. Responsible for assuring training and certification requirements identified in WS#8 are satisfied.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organization Affiliation	Phone No. or email	Responsibilities
Kevin Lundmark	RI Field Team Leader[i]	ERM	Office: (801) 595-8400 Mobile: (801) 440-8296	Directs the day-to-day field activities; verifies that field measurement and sampling procedures are conducted in accordance with the Phase 1A Air SAP. Responsible for maintaining the official, approved Phase 1A Air SAP and for providing individuals identified in Worksheet #3 the most current copy of the approved Phase 1A Air SAP. Responsible for preparing SAP and field change requests (SAP and Field Modification Approval Forms – Appendix G). These requests will be submitted to the QA Manager and ERM Project Coordinator, who will submit it to the USEPA RPM for approval before the change is initiated. Responsible for providing USEPA-approved SAP Modification Forms to all recipients identified inWorksheet #3 Responsible for communicating relevant field information to the ERM Project Coordinator, Air Task Leader, and ERM Analytical Coordinator. Reports directly to the ERM Project Coordinator on implementation issues, planning, cost and schedule control, and data management information needs. Responsible for generating and reporting data and documents as required by the Data Management Plan along with QC reports to the ERM QA Manager. Responsible for ensuring sampling personnel package and ship samples in accordance with this Phase 1A RI SAP.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organization Affiliation	Phone No. or email	Responsibilities
Bob Farmer	Air Task Leader	ERM	Office: (480) 998-2401	Directs field and analytical activities associated with air sampling under the Phase 1A RI SAP, working in coordination with the RI Field Task Leader, including active consultation regarding deviations from approved sampling procedures, including the preparation of Field Modification Approval Forms. Responsible for identifying critical field supplies and consumables, noting supply source, acceptance criteria, and procedures for tracking, storing and retrieving these materials.
Judy Nedoff	Analytical Coordinator	ERM	Office: (925) 482-8210	Coordinates analytical tests with the information required from the field activity; coordinates with laboratories to conduct required analyses; coordinates pickup and delivery schedules with laboratories; verifies that the laboratories implement the requirements of the SAP; and ensures that laboratory data are validated in accordance with the Data Management Plan and the Phase 1A RI SAP. Responsible for immediately notifying the QA Manager, RI Field Team Leader, and Project Coordinator in writing of any field QC or laboratory analytical procedures - beyond any deviations identified by the RI Field Team Leader - that were not performed in accordance with this Phase 1A RI SAP. The Analytical Coordinator, in coordination with the QA Manager and ERM Project Coordinator will complete documentation of the non-conformance and corrective actions to be taken. The Analytical Coordinator will verify that the corrective actions have been implemented.
Mike Appel	Database Manager	ERM	Office: (503) 488-5282	Responsible for developing, monitoring, and maintaining project database in accordance with the Data Management Plan, under guidance of ERM Project Coordinator, and works with Analytical Coordinator during implementation of the Phase 1A RI SAP to resolve sample identification issues.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organization Affiliation	Phone No. or email	Responsibilities
Samantha Henningsen	Laboratory Project Manager	ALS	Office: (805) 526-7161	Responsible for ensuring analyses are conducted in accordance with this Phase 1A RI SAP. Responsible for reporting QA and QC issues to the ERM Analytical Coordinator in a timely manner. Responsible for reporting documents and data to the RI Field Team Leader in an electronic format as required by the Data Management Plan. Responsible for identifying critical laboratory supplies and consumables, noting supply source, acceptance criteria, and procedures for tracking, storing and retrieving these materials.

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[i] The ERM Field Team Leader will coordinate with USEPA and USEPA’s contractor team leader per oversight activities.

SAP Worksheet #8 – Special Personnel Training Requirements Table

SAP Worksheet #8 – Special Personnel Training Requirements Table

Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/ Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Medical Clearance for Respirator Use (Pulmonary Function Tests)	WorkCare	Within last year (Annual)	All ERM staff performing field work at US Magnesium	Various / ERM	ERM Files, Project Health and Safety (H&S) File, US Magnesium
Employer Respiratory Protection Training	ERM	Within last year (Annual)	All ERM staff performing field work at US Magnesium	Various/ ERM	ERM Files
Respirator Fit Test	ERM	Within last year (Annual)	All ERM staff performing field work at US Magnesium	Various/ ERM	ERM Files, Project H&S File, US Magnesium
Occupational Safety and Health Administration (OSHA) 40-Hour Training per 29 CFR 1920.120(e)	ERM / Third Party	One time	All ERM staff performing sampling at US Magnesium	Various/ ERM	ERM Files
8-Hours of refresher training	ERM / Third Party	Within last year (Annual)	All ERM staff performing sampling at US Magnesium	Various/ ERM	ERM Files
8-Hour OSHA Supervisor Training	Third Party	One time	ERM Field Lead	Kevin Lundmark / ERM	ERM Files
First Aid / CPR	Third Party	CPR within last 2 years, First Aid within last 3 years	At least one member of each ERM field team	Various/ ERM	ERM Files
US Magnesium Contractor training	US Magnesium	Within last year (Annual), prior to field work	All ERM staff performing field work at US Magnesium	Various/ ERM	US Magnesium

SAP Worksheet #9 – Project Scoping Session Participants Sheet

SAP Worksheet #9 – Project Scoping Session Participants Sheet

Joint planning meetings, teleconferences, and document exchanges that resulted from the RI scoping process performed between November 2011 and July 2013 are documented in Worksheet 9 and Attachment 9A of the September 2013 Phase 1A Sampling and Analysis Plan (SAP). This summary of the scoping process has not been repeated in this SAP.

Scoping discussions pertinent to the Phase 1A RI for OU2 (Air) held since the publication by USEPA of the September 2013 Phase 1A SAP are summarized in the worksheet below. Relevant documentation from these scoping discussions is provided in Appendix B to this SAP.

Scoping Session Participants and Summary

Type and Date of Session: Teleconference 15 May 2014
Scoping Session Purpose: Technical Scoping of Key Issues for Phase 1A RI SAP

Name	Organization	Project Role	Phone/E-mail Address
Bob Farmer	ERM	See Worksheet 3	See Worksheet 3
David Abranovic	ERM	See Worksheet 3	See Worksheet 3
Judy Nedoff	ERM	See Worksheet 3	See Worksheet 3
Kevin Lundmark	ERM	See Worksheet 3	See Worksheet 3
Catherine LeCours	PWT3	See Worksheet 3	See Worksheet 3
Douglas Herlocker	PWT3	See Worksheet 3	See Worksheet 3
Robert Howe	PWT3	Geochemist	(303) 441-7911 / robert.howe@tetratech.com

Comments/Decisions:

Prior to the teleconference (12 May 2014), ERM provided a Technical Memorandum to USEPA identifying four technical scoping issues for the Phase 1A RI for OU2 (Air). The 12 May 2014 ERM Tech Memo is included as Appendix B-1 to this SAP. The 15 May 2014 PWT3 meeting summary included as Appendix B-2 of this SAP provides a summary of the teleconference.

Action Items:

See the 15 May 2014 PWT3 meeting summary included as Appendix B-2 of this SAP.

Consensus Decisions:

Final comments from USEPA on the technical scoping issues were provided 3 June 2014. The 3 June 2014 USEPA comments are included as Appendix B-3 of this SAP.

SAP Worksheet #9 – Project Scoping Session Participants Sheet

Type and Date of Session: Teleconference 1 July 2014
Scoping Session Purpose: USEPA Technical Comments on Phase 1A Air SAP Worksheets included in the Draft Air DMA Tech Memo

Name	Organization	Project Role	Phone/E-mail Address
Bob Farmer	ERM	See Worksheet 3	See Worksheet 3
Judy Nedoff	ERM	See Worksheet 3	See Worksheet 3
Kevin Lundmark	ERM	See Worksheet 3	See Worksheet 3
Catherine LeCours	PWT3	See Worksheet 3	See Worksheet 3
Douglas Herlocker	PWT3	See Worksheet 3	See Worksheet 3
Robert Howe	PWT3	Geochemist	(303) 441-7911 / robert.howe@tetratech.com

Comments/Decisions:

The Draft Air DMA The Memo was provided by ERM to USEPA 16 June 2014. The Draft Air DMA Tech Memo included as an appendix a set of Draft Phase 1A Air SAP Worksheets that were revised/finalized based on the Air DMA. The 1 July 2014 teleconference was held to enable the ERM and USEPA technical teams to discuss Draft SAP Worksheets Draft SAP Worksheets 12, 15, 19, 20, 21, 22, 23, 24, 25, 26, 28, and 30. PWT3 provided an agenda for the call that identified questions/discussion topics related to these worksheets. The 1 July 2014 PWT3 meeting summary included as Appendix B-4 of this SAP provides a summary of the teleconference.

Action Items:

See the 1 July 2014 PWT3 meeting summary included as Appendix B-4 of this SAP.

Consensus Decisions:

After the 1 July 2014 conference call, ERM followed-up with Project risk assessors and the analytical laboratories to ensure that the SAP Worksheets were revised appropriately. The Phase 1A Air SAP, Rev 0, July 2014 included worksheets which were updated based on the 1 July 2014 conference call. A summary of the changes made to the worksheets and an explanation for any requested changes that were not made were provided by ERM 15 July 2014 and are included as Appendix B-5 of this SAP.

SAP Worksheet #9 – Project Scoping Session Participants Sheet

Type and Date of Session: Teleconference 23 July 2014
Scoping Session Purpose: USEPA Technical Comments on Phase 1A Air SAP Rev 0

Name	Organization	Project Role	Phone/E-mail Address
Bob Farmer	ERM	See Worksheet 3	See Worksheet 3
Judy Nedoff	ERM	See Worksheet 3	See Worksheet 3
Kevin Lundmark	ERM	See Worksheet 3	See Worksheet 3
David Abranovic	ERM	See Worksheet 3	See Worksheet 3
Catherine LeCours	PWT3	See Worksheet 3	See Worksheet 3
Douglas Herlocker	PWT3	See Worksheet 3	See Worksheet 3

Comments/Decisions:

The Phase 1A Air SAP, Rev 0, was provided to USEPA 11 July 2014 and 14 July 2014. USEPA provided comments on the Rev 0 SAP on 18 July 2014; these comments are included as Appendix B-6 of this SAP. The 23 July 2014 teleconference was held to enable the ERM and USEPA technical teams to discuss the USEPA comments on the Rev 0 SAP. The 23 July 2014 PWT3 meeting summary included as Appendix B-7 of this SAP provides a summary of the teleconference.

Action Items:

See the 23 July 2014 PWT3 meeting summary included as Appendix B-7 of this SAP.

Consensus Decisions:

See the 23 July 2014 PWT3 meeting summary included as Appendix B-7 of this SAP.

SAP Worksheet #10 – Problem Definition

SAP Worksheet #10 – Problem Definition

The USEPA's preliminary conceptual site model for the nature and extent of air contamination is provided in Section 10.3.3 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP). Comments from ERM/US Magnesium on the USEPA's preliminary conceptual site model and responses to these comments from USEPA were included as Attachment 4 to the Cover Letter of the September 2013 Phase 1A SAP.

Air at the Site may be impacted by releases of gases, aerosols, and/or particulates from the facility stacks, as well as other on-site sources. Previous investigations, coupled with an understanding of plant operations and processes, indicate that chemicals released to air are likely to include Cl_2, HCl, VOCs, SVOCs, PCBs, PCDDs/PCDFs, metals, and/or particulate material less than 10 micrometers in diameter (PM_{10}). Concentrations of Site-related contaminants in air are expected to vary as a function of both distance and direction from the Site, and also as a function of time, depending on short-term and long-term (seasonal) variations in meteorological conditions, as well as variations in release rates from plant operations and maintenance activities. Under the RI/FS framework prescribed by the Administrative Order on Consent (AOC), a Baseline Risk Assessment (BRA) will be performed to evaluate risks to human health and ecological receptors. Prior to performing the BRA, a Screening-Level Risk Assessment (SLRA) will be performed to select the contaminants of potential concern (COPCs) to be carried through the risk assessment. Based on existing data, the acute toxicants, Cl_2 and HCl, are assumed to be COPCs and will be evaluated in the BRA. However, it is unknown whether any of the chronic toxicants are released at concentrations great enough to require further evaluation in the BRA. Therefore, the Phase 1A RI ambient air sampling program will provide data to support the SLRA for selection of COPCs.

Project decision conditions will be evaluated during the Data Usability Assessment (see Worksheet 37) and during the SLRA for Site-wide Ambient Air as defined by the Data Quality Objectives for Phase 1A (see Worksheet 11).

SAP Worksheet #11 – Project Quality Objectives/ Systematic Planning Process Statements

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

Based on the problem statement provided in Worksheet #10, this worksheet presents data quality objectives (DQOs) and associated sampling strategies and rationale for the Phase 1A RI for OU2 (Air).

11.1 OBJECTIVE OF THE PHASE 1A RI FOR OU2

The objective of Phase 1A RI for OU2 (Air) is to obtain sufficient data to support identification of contaminants of potential concern (COPCs) for human and ecological receptors. This Phase1A RI Sampling and Analysis Plan (SAP) involves sampling of air to support identification of COPCs for human and ecological receptors. Data obtained via implementation of this SAP will be used for remedial decision-making, and, as such, must meet requirements for "definitive" data as outlined in USEPA quality guidance (USEPA 1989; USEPA 1997).

After COPCs are identified for completing assessments of risk to human and ecological receptors, a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) will be conducted for the Site. In accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and USEPA guidance, USEPA will use the risk assessments (RAs) along with other information to determine whether risks are unacceptable and whether remedial alternatives must be evaluated in an FS.

11.2 PRINCIPAL DATA QUALITY OBJECTIVES FOR COPC SELECTION FOR AIR

DQOs specify the type, quality, quantity, purpose, and intended uses of data to be obtained (USEPA 2006). The design of a study is closely tied to its DQOs, which serve as the basis for important decisions regarding key design features such as numbers and locations of samples to be collected and analyses to be performed. The DQO process typically follows a seven-step procedure intended to help ensure that the project plan is carefully thought out and that the data obtained will provide sufficient information to support key decisions. This section presents the information used in the seven-step DQO process associated with Phase 1A OU2 RI to identify COPCs for air for human and ecological receptors at the US Magnesium Site.

11.3 DQOS FOR COPC SELECTION FOR AIR

The DQOs for COPC selection for air were originally presented in Section 11.3.3 of the September 2013 Phase 1A RI SAP for PRI Areas 2 and 8 through 17 (USEPA 2013). This section has been copied verbatim into this SAP with the exception of limited modifications that were agreed to by USEPA and ERM during scoping and Post-Air DMA discussions held after September 2013 (see Worksheet 9) or to improve the transparency and description of the sampling design. All modifications to the September 2013 Phase 1A SAP are highlighted.

11.3.1 Step 1: State the Problem

Air at the Site may be impacted by releases of gases, aerosols, and/or particulates from the facility stacks, as well as other on-site sources. Previous investigations, coupled with an understanding of plant operations and processes, indicate that chemicals released to air are likely to include Cl2, HCl, HCB, PCBs, PCDDs/PCDFs, metals, and/or other VOCs. Concentrations of Site-related contaminants in air are expected to vary substantially as a function of both distance and direction from the Site, and also as a function of time, depending on short-term and long-term (seasonal) variations in meteorological conditions, as well as variations in release rates from plant operations and maintenance activities. Available data are not sufficient to characterize either spatial or temporal patterns of concentrations in air, so additional data are needed to support a reliable COPC selection process.

11.3.2 Step 2: Identify the Goal of the Study

The goal of the study is to obtain sufficient data on the concentrations of Site-related contaminants in air to reliably select human and ecological COPCs that require further quantitative evaluation in the risk assessment process.

11.3.3 Step 3: Identify Information Inputs

The most important type of information needed to support COPC selection for air is an adequate and reliable dataset to characterize the range of concentration values that occur in air at various times and locations across the Site.

For most airborne contaminants (the "chronic toxicants"), risk is related to the long-term average exposure concentration, where the average is calculated over the exposure duration of the receptor of concern (often on the time scale of years). Although current sampling techniques are not available to collect air samples spanning time intervals of this magnitude, the COPC selection procedure for chronic toxicants is facilitated by collection of samples over a relatively long time span (e.g., 3-6 days, depending on methodological considerations), because this tends to average out the effect of short-term fluctuations in concentration.

Information which is critical to achieving the DQOs includes analytical results for chronic toxicants and meteorological station data (see Section 11.3.7.2). Data to be collected for informational purposes include continuous monitoring for the acute toxicants, Cl_2 and HCl.

[*Note:* the information inputs description for acute toxicant COPC selection from the September 2013 Phase 1A SAP has been deleted because the two identified acute toxicants, Cl_2 and HCl, will be carried forward as COPCs after Phase 1A]

11.3.4 Step 4: Define the Boundaries of the Study

11.3.4.1 Spatial Boundary

The spatial boundary for the Phase 1A investigation of air is a circle with a radius of 5 miles that is centered on the Magnesium Plant. This Study Area may be expanded in the future if data indicate that risks to human or ecological receptors from airborne contaminants may still be significant beyond the 5- mile radius.

11.3.4.2 Temporal Boundaries

Because concentrations of contaminants in air at any specified location within the Study Area are expected to vary substantially as a function of time, it is important that that sampling be sufficient to capture the range of values that occur over time, with special emphasis on characterizing the high end of the range.

To achieve the overall objective in Section 11.3.2, the timeframe for Phase 1A air sampling was selected to increase the probability of obtaining samples with concentrations that are high-biased compared to long-term averages. As discussed below, refined dispersion modeling using a 3-year data set was used to select optimum sampling times and locations. The results indicate that late summer months (i.e., July – September) experience a higher-occurrence of high-biased concentrations at selected sampling locations within the west to southeast directions from the Magnesium Plant.

11.3.5 Step 5: Develop the Analytic Approach

Although several factors may be considered in selecting COPCs, the usual first step is to compare the Cmax to an appropriate RBC, where Cmax is defined as the highest detected concentration in the dataset.

For human receptors, the RBC is the concentration that corresponds to an excess cancer risk of 1E-06, or to a non-cancer HQ of 0.1 for the population of concern, whichever is lower. For ecological receptors, the RBC generally corresponds to the environmental concentration that yields an HQ of 1. If the value of Cmax for an analyte in air does not exceed the RBC, that analyte may be excluded as a COPC. Otherwise, if the value of Cmax exceeds the RBC, the analyte is retained as a COPC.

In general, the COPC selection process may be performed either on a site-wide basis or on an area-by-area basis. Because air is a highly mobile medium, flowing at widely variable rates and patterns across areas, a site-wide selection process is best. That is, if an analyte exceeds the RBC in any sample at any location, the analyte is identified as a COPC at all locations.

11.3.6 Step 6: Specify Performance or Acceptance Criteria

In identifying a list of COPCs for air, two types of error are possible:

- Type I error: A chemical is excluded as a COPC when it should have been retained.
- Type II error: A chemical is retained as a COPC when it could have been excluded.

USEPA is primarily concerned with minimization of the chances for a Type I error because an error of this type could result in an underestimation of total risk. In order to minimize the probability of a Type I error, it is necessary to be confident that the observed Cmax value in a dataset will have a high probability of exceeding the RBC when the chemical is truly of potential concern. This, in turn, is related to the number of samples that have been collected, and to the methods that will be used to evaluate risk for chemicals that are retained.

For chronic toxicants in air, risk is proportional to the true long-term average concentration over time within an exposure area. The COPC selection procedure described in Step 5 is founded on the concept that, given a dataset of adequate size, the maximum concentration value in that dataset will exceed the true long-term mean concentration within the exposure area. If the observed maximum concentration does not exceed the RBC, there is confidence the true mean will not exceed the RBC, and hence the chemical will not contribute significant risk and may be excluded as a COPC. However, if the dataset is not large enough, the observed Cmax value may not exceed the true mean across the exposure area.

For acute toxicants, risk is related mainly to the location, magnitude, and frequency of short-term concentrations that may result in inhalation exposures above the RBC. This type of exposure is not relevant to COPC selection for the OU2 evaluation. The two identified acute toxicants, Cl_2 and HCl, will be carried forward as COPCs after Phase 1A. However, electrochemical monitoring for these toxicants will be performed during Phase 1A to potentially provide additional information during evaluation of the discrete air sample set for chronic toxicants, as described in Section 11.3.7.1.

Based on these considerations for COPC selection, the goal for chronic toxicants is to have at least a 95 percent probability that the observed Cmax value in a dataset of long-term (e.g., 3-6 day) samples will exceed the highest true long-term average concentration anywhere on site ($\bar{C}_{max}$). If this accepted Cmax value is below the RBC for a given analyte then that compound may be excluded as a COPC with low likelihood of a Type I error. This is in contrast to a goal of having 95 percent probability that the observed Cmax value in a dataset will exceed the highest true long-term average concentration in the area of the sampler. This approach is needed because exposure areas for air are not yet defined, and because COPC selection for air is on a site-wide basis rather than on a PRI-by-PRI area basis.

[*Note:* the goal for acute toxicant COPC selection has been deleted because the two identified acute toxicants, Cl_2 and HCl, will be carried forward as COPCs after Phase 1A]

Type II errors are of lesser concern for COPC selection because this only results in retention of contaminants not likely to contribute significant risk. However, inclusion of analytes not of authentic concern does add time and cost to the RI investigations, so reasonable efforts are needed to minimize inclusion of analytes not likely to contribute significant risk.

11.3.7 Step 7: Develop the Plan for Obtaining the Data

In the absence of any knowledge of spatial and temporal variability in air concentrations within the Study Area, collection of an adequate dataset for COPC selection would require sampling over a long time period (many months) at many different stations (e.g., 15-20) distributed across the Site, thereby ensuring both spatial and temporal representativeness of the data. However, such an approach would be quite costly, both for acute and chronic toxicants.

An alternative strategy that will be adopted for Phase 1A air sampling is to place monitors at a limited sub-set of stations during a specific seasonal timeframe at locations shown by refined

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

modeling to have high likelihood of being impacted by airborne releases from the Site's sources. Because COPC selection is based only on the highest measured value in a dataset (Cmax), the sampling design will focus on timeframes and locations most likely to offer high-biased ambient air concentrations. Further, refined modeling evaluations based on meteorological conditions during the sampling events will be performed to assess data adequacy. Should the modeling show that the selected stations did sample high-biased pollutant concentrations, then the resulting data set of 30 samples for each method will be considered sufficient (refer to Section 11.3.7.2.2). If this modeling indicates that high-biased concentrations were likely not obtained, then the number of samples and Phase 1A sampling period will be extended until the DQO criteria, as specified in this SAP, have been achieved..

Importantly, this approach (taking measurements at a limited set of stations and over a narrow time window so the data are likely to be at the high end of the exposure spectrum) is not an appropriate design for obtaining data for use in exposure assessment and RA. That effort (to be planned and implemented in the future) will require placement of monitoring stations within selected areas where human or ecological exposures may occur, and acquisition of data over a relatively long time span in order to develop accurate and unbiased estimates of chronic exposure levels.

11.3.7.1 Plan for Cl_2 and HCl

Even though available data on Cl_2 and HCl in air are not sufficient to derive reliable quantitative estimates of short-term or long-term average exposure levels, both of these analytes are released from plant operations in sufficient quantities (tons per day) to warrant quantitative evaluation for both acute and chronic exposures. US Magnesium/ERM has agreed that these air analytes are COPCs, and, accordingly, Phase 1A does not include a sampling design for Cl_2 and HCl for identification as COPCs. Rather, a Phase 1B study will be designed subsequently to obtain sufficient data to support a reliable HHRA and ERA for these contaminants.

While the Phase 1A OU2 RI sampling design does not include sampling for acute toxicants for COPC selection, US Magnesium/ERM recognizes that there is value in obtaining continuous monitoring data during the Phase 1A event. Specifically, such data can serve as indicators of the frequency and duration of periods when plume transport is in the direction of a given monitoring station. However, the data from the continuous monitors for acute toxicants are for qualitative purposes only and will not be considered sufficient to alter the conclusions of the data adequacy assessment. In this manner continuous monitoring of Cl_2 and HCl in the Phase 1A mobilization may offer supporting information in assessment of the chronic sampling results; therefore, co-located continuous monitoring for the acute toxicants will be performed during Phase 1A. Electrochemical continuous monitors for both Cl_2 and HCl (Industrial Scientific Model BM25) will be deployed at each Phase 1A sampling station. Daily calibration checks will be conducted to maintain monitor accuracy. A co-located pair of BM25 samplers will be operated at one of the stations to provide an indication of monitoring precision.

11.3.7.2 Plan for Chronic Toxicants

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

11.3.7.2.1 Identification of Optimal Sampling Times and Locations for Chronic Toxicants

Even though available measurements of contaminants in air are not sufficient to identify locations and times of maximum impact, such times and areas can be predicted using an air dispersion model (AERMOD) coupled with site-specific meteorological data obtained from the nearby ATI Titanium facility's meteorological station. In these calculations, release of contaminants from Site sources is assigned an arbitrary value. That is, modeled concentration values as a function of time and space are not expected to be correct on an absolute basis, but are anticipated to provide information on relative concentration values that allows identification of seasonal patterns and high-impact areas.

USEPA used AERMOD calculations to identify optimum locations for sampling stations as follows:

1. A grid pattern was established using 250-meter spacing.
2. At each grid location, the average relative concentration was calculated for each day of all 3 years for which meteorological data are available from the ATI meteorological station.
3. The average long-term relative average concentration (i.e., the average across all 3 years) was calculated for each grid location that fell outside the boundary of the Magnesium Plant. The highest long-term average value was identified as modeled $\bar{C}_{max}$ ("C-bar max").
4. For each grid location, the data were grouped into consecutive 3-day sets (to simulate the expected sampling duration), and the mean for each sequential 3-day sample was computed. Thus, for each location, there were approximately 10 per month x 12 months x 3 years = 360 values.
5. The data were grouped into "rolling" 3-month sets (e.g., January-February-March, February-March-April, March-April-May, etc.). This corresponds to about 90 samples per grid location per set. For each grid location, the fraction of 3-day values within each 3-month time window that exceeded $\bar{C}_{max}$ was calculated (e.g., 9 of 90 = 0.10). This fraction is an estimate of the probability that a random 3-day sample collected at that grid location within the 3-month time frame would exceed modeled $\bar{C}_{max}$.
6. For each 3-month time window, all grid locations were rank-ordered (from high to low) based on the fraction (probability) of modeled $\bar{C}_{max}$ exceedences, in order to identify the times and locations of highest probabilities for samples to exceed the modeled $\bar{C}_{max}$.

AERMOD calculations were performed using the same methods and input files as had been developed previously by US Magnesium/ERM (see Section 10.3.3 of the September 2013 Phase 1A RI SAP). The USEPA implemented this set of calculations in two steps, as follows:

1. Assuming all releases come from the stack only (no fugitive emissions).
2. Assuming all releases come from ground-level fugitive sources (no stack releases).

The calculations were performed in two steps because sensitivity calculations showed that if the two sources (stack, fugitive) were combined in the AERMOD run, the location and magnitude of $\bar{C}_{max}$ would depend strongly on the assumed relative ratio of the release rates from each source. Because the true ratio of these release rates is not known (and may vary substantially as a function of time), the USEPA concluded that evaluating each source category independently was likely to be more helpful for sampling site selection than setting the proportion at an assumed constant ratio. Section 11.3.3, Step 7, of the September 2013 Phase 1A RI SAP provides further explanation of USEPA's evaluation.

Detailed input and output files, along with plots of probability for all stations for each time window for both stack only and fugitive only releases, are presented in Attachment 11J of the September 2013 Phase 1A RI SAP.

Figure 11-2 of the September 2013 Phase 1A RI SAP summarizes the results of the "stack-only" release scenario. In Panel A, the blue line represents the mean probability across the top three stations (regardless of location). As seen, the highest overall probabilities of samples exceeding the modeled $\bar{C}_{max}$ occurs in the late summer (July-August-September time frame). The green line shows the mean probability for the July-August-September time frame at three stations southwest of the stack, at a distance of about 500-1000 meters. As shown by the red line in Panel A, if sampling would occur in the winter rather than the summer, the optimum location for sampling would be in the foothills of the Lakeside Mountains, at locations similar to those indicated by pink and red symbols in Panel C.

Figure 11-3 of the September 2013 Phase 1A RI SAP shows analogous results for the "fugitive-only" release scenario. In Panel A, the blue line represents the mean probability as a function of time across the top two stations (regardless of location). As seen, for this source, the highest overall probabilities of samples exceeding the modeled $\bar{C}_{max}$ occurs in the winter rather than the summer. Panel B shows the optimum location for sampling in winter (November-December-January), and Panel C shows optimum sampling locations in summer (July-August-September).

The USEPA considers it likely that the stack is the predominant source of releases to air at the Site. Based on this, the USEPA concluded that the optimum time for sampling is in the summer (approximately the July-August-September time frame), because this is when the probability of collecting samples that exceed the modeled $\bar{C}_{max}$ due to stack releases is highest. Although this time window does not appear to be optimal for capturing the impacts of fugitive releases, nevertheless the overall probabilities of samples exceeding the modeled $\bar{C}_{max}$ for fugitive sources is sufficiently high in this time window (about 20%) that the sampling in this time frame is judged acceptable for both sources.

Given this time specification, the choice of exact sampling locations depends on a consideration of several factors, including: (1) estimated probability of a sample exceeding $Cmax$, (2) spatial representativeness of the sampling stations within the area of expected high probability, and (3) other factors such as presence of local structures that would modify wind patterns, ease of access to the Site, security of equipment placed at the Site, and proximity to potentially interfering features (e.g., automobile exhaust from passing vehicles). Based on a consideration of all of these factors, the USEPA identified four target sampling stations judged optimal for air sampling for chronic toxicants in Phase 1A. Locations of these four stations are shown on Figure 14-15 of the September 2013 Phase 1A RI SAP, along with the rationale for each. The exact locations of these stations were to be revised before implementation of Phase 1A air sampling based on field inspection of the target sites or due to considerations of the factors identified above, as appropriate.

Members of the project teams from ERM and USEPA performed a field reconnaissance of the four proposed monitoring sites on September 24, 2013. This survey considered the accepted ambient air sampling site selection criteria (40 CFR Part 53, and Appendices). In general, these specifications address distance between the sampler and surrounding vegetation, adjacent sources on emissions (e.g., unpaved roads or industrial activity), obstacles to ambient wind, personnel access, and practical logistics (e.g., access to power or remote power source, weather exposure, and equipment security). Based on this reconnaissance, Stations 2 and 4 were relocated about 100 meters away from the modeled receptor points.

ERM evaluated the four candidate locations in the context of accepted ambient air sampling practice and concluded that 2013 SAP Station 1 could provide results that may be redundant with the Adjusted 2013 SAP Station 2. As shown in Figure 1 of Appendix B-1, the two locations are approximately 400 meters apart, compared with the AERMOD model grid resolution of 250 meters. In light of the uncertainty of the dispersion model's ability to predict differences in future concentrations at closely spaced locations, it is not certain that 2013 SAP Stations 1 and 2 would have significantly different concentrations during Phase 1A. In addition, 2013 SAP Stations 1 and 2 are aligned in the same compass direction from known plant sources, which suggests that both will have similar likelihood of plume contact when the wind direction is toward the west. In the 2013 SAP Station 2 was shown by modeling to be sensitive to both Main Stack emissions and to near-ground level fugitive emissions, so the Adjusted Station 2 monitoring location has been retained and the 2013 SAP Station 1 has been eliminated from the Phase 1A SAP for OU2 (Air). The three planned air monitoring locations are shown in Figure 3 and listed in Worksheet 18.

11.3.7.2.2 Estimation of the Number of Samples Needed for Identification of Chronic COPCs

The results of the AERMOD calculations provide an estimate of the probability that a random 3-day sample collected within the specified time window will exceed the modeled $\bar{C}_{max}$ at each of the selected stations. Based on the mean probability value (p) at a station, the probability that at least one sample will exceed the modeled $\bar{C}_{max}$ as a function of sample size (N) is given by:

Probability (1 or more samples exceed the modeled $\bar{C}_{max}$) = 1 – (1-p)N

Solving for N yields:

$N \geq \ln(0.05) / \ln(1-p)$

Results are shown in the table below for a range of differing values of p.

Number of Samples Required for 95% Confidence $C_{max} > \bar{C}_{max}$

p	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65
N	59	29	19	14	11	9	7	6	6	5	4	4	3

Based on the AERMOD results, it appears that the value of p for the July-August-September time frame is likely relatively high for stack releases (see September 2013 Phase 1A RI SAP Figure 11-2, Panel B), but might be as low as 0.1 for one of the stations intended to monitor fugitive releases (see September 2013 Phase 1A RI SAP Figure 11-3, Panel C). Based on this, the number of samples needed to ensure that fugitive releases are adequately sampled is a minimum of 29. To achieve this, a total of 10 samples (each approximately 3 days in duration) will be collected from each station (a total of 30 samples within the specified time window). Based on the results of the AERMOD modeling calculations, this data set is expected to have a high probability of providing one or more samples that exceed the modeled $\bar{C}_{max}$ values for both stack-only and fugitive-only releases, which in turn will provide an adequate basis for COPC selection.

11.3.7.2.3 Evaluation of Data Adequacy

Despite expectations, it is plausible that the data set acquired during Phase 1A might have limitations that could reduce confidence in COPC selection. The key factors that influence the level of confidence include:

- Whether the plant was operating in typical mode (e.g., >90% of typical production rates).
- Whether or not the wind patterns during the time of acquisition of the Phase 1A data were sufficient to ensure that at least one sample in the data set contained a concentration equal to or exceeding the modeled $\bar{C}_{max}$.
- If an analyte was never detected, whether the analytical detection limit for that analyte was sufficient to detect it if it was present at a level of potential concern.

After the Phase 1A sampling program is complete, each of these key considerations will be assessed as described below.

Plant Operating Conditions

Advance interactions with US Magnesium will be conducted to ensure that plant operations during the Phase 1A sampling period will reflect normal operating conditions (e.g., stack release rates, production rates, shut-downs, malfunctions, fugitive releases, etc.). If operations reflect conditions substantially different from normal production rates, the Phase 1A data set might not be reliable for COPC selection. ERM will evaluate US Magnesium daily production records (e.g., material throughput summaries) to characterize plant operating level during the Phase 1A sampling event.

Assessing if One or More Samples Are Expected to Exceed the Modeled $\bar{C}_{max}$

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

As detailed above, Phase 1A locations for monitoring stack releases and/or fugitive releases were selected using AERMOD calculations where the probability of a sample exceeding the modeled $\bar{C}_{max}$ was expected to be high based on typical wind patterns for July-August-September. Whether or not any of the concentration values actually measured during Phase 1A are likely to exceed the modeled $\bar{C}_{max}$ may be estimated using AERMOD as follows:

1. At each Phase 1A sampling station, use AERMOD to calculate the average relative concentration due to stack-only releases during each sampling interval during Phase 1A using the concurrent meteorological data from the ATI meteorological station. At each station, count the number of samples in which the relative concentration value exceeded the value of the modeled $\bar{C}_{max}$ for stack-only release, derived as described above.
2. At each Phase 1A sampling station, use AERMOD to calculate the average relative concentration due to fugitive-only releases during each sampling interval during Phase 1A using the concurrent meteorological data from the ATI meteorological station. At each station, count the number of samples in which the relative concentration value exceeded the value of the modeled $\bar{C}_{max}$ for fugitive-only release, derived as described above.

The general procedures for collecting meteorological data, using those data to perform AERMOD calculations, and assessing Phase 1A RI data quality based on AERMOD results is included as Appendix F. It is anticipated that the process of conducting the AERMOD calculations and developing the receptor ranking results will be performed on approximately a weekly basis during Phase 1A, to assess the sampling conditions of the prior week.

In principle, if at least one sample out of the combined data set (30 total samples) has a relative concentration that exceeds the modeled $\bar{C}_{max}$ for stack-only releases, the data set should be adequate for COPC selection for stack emissions. Likewise, if at least one sample out of the combined data set (30 total samples) has a relative concentration that exceeds the modeled $\bar{C}_{max}$ for fugitive-only releases, the data set should be adequate for COPC selection for fugitive sources. However, because AERMOD calculations of relative concentration may not be entirely accurate, and because AERMOD does not take random fluctuations in release rates into account, confidence in the adequacy of the data set increases with increases in the frequency and magnitude of AERMOD exceedances of the modeled $\bar{C}_{max}$.

In addition to the AERMOD calculations described above, comparisons between measured concentrations of different analytes at a single monitoring location can provide key supporting information for data evaluation, beyond the measurements of each analyte alone. The continuous monitoring of Cl_2 and HCl during the Phase 1A sampling event serves this purpose. Since Cl_2 and HCl are known to be present in the facility stack plume, the detection of these gases would serve as an indicator of plume contact at a given location and time. In particular, the continuous trace of acute toxicants (which are anticipated to be detectable in downwind plumes) will provide a physical indicator that, for at least some portion of a sampling period, the facility emissions impacted the sampler. This approach will provide a reasonable ability to detect the occurrence of plume contact at a given location, to corroborate the AERMOD assessments of relative concentration during the Phase 1A sampling period.

Assessing Detection Limit Adequacy

In general, the detection limit for an analyte in air is expected to be approximately constant among samples. Assuming this is the case, the data for each analyte obtained during Phase 1A may apply to one of three situations:

1. The chemical was detected one or more times, and the maximum detected value exceeded the RBC. Because the chemical was detected above the RBC, the detection limit is adequate for COPC selection (even if the detection limit exceeds the RBC).
2. The chemical was detected one or more times, and the maximum detected concentration did not exceed the RBC. This implies that the detection limit is lower than the RBC, so it may be concluded the detection limit was adequate. (Note, however, that if detection limits for an analyte vary widely among samples, with some non-detect samples having detection limits higher than the RBC, this conclusion may not be valid).
3. The analyte was never detected. In this case, if the detection limit is approximately constant among samples, and if the detection limit is equal to or less than the RBC, it may be concluded with reasonable certainty that the analyte is unlikely to contribute significant risk and may be excluded as a COPC. If the detection limit in some or all non-detect samples is higher than the RBC, the chemical cannot be reliably excluded as a COPC without further rationale or assessment.

11.3.7.2.4 Sampling and Analysis Methods

Sampling for chronic toxicants (including VOCs, SVOCs including PAHs, HCB, PCBs, dioxins and furans, PM_{10}, and particulate-borne toxic metals) requires several different sample collection techniques, depending on the physical-chemical properties of the contaminants. Final decisions on the most appropriate methods were based on the results of the DMA study for air, as described in the Air DMA Tech Memo (ERM 2014). The sampling and analytical methods include the following:

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

Sampling and Analysis Methods for Chronic Air Toxicants

Toxicant Class	USEPA Method Reference(s)	Sampling Method/Media (see Worksheet #19)	Analytical Technique (see Worksheet #15, #23, and #30)
VOCs	TO-15	Summa Canisters	GC/MS
PCBs and Dioxins/Furans	TO-4A and TO-9A	Quartz filter and PUF-XAD resin layered cartridge	High-resolution GC/MS
SVOCs	TO-13A	Quartz filter and PUF-XAD resin layered cartridge	GC/MS
PM10s	IO 2.1/3.1 /3.5	8- x 10-inch quartz filter, high-volume sampler	Gravimetric
Particulate-bound Metals	IO-2.1, IO-3.5	8- x 10-inch quartz filter, high- volume sampler	ICP-MS (CVAA for mercury)

Explanation: GC/MS = gas chromatography/mass spectrometry; ICP-MS = inductively coupled plasma – mass spectrometry; PM10 = particulate material less than 10 micrometer; PCBs = polychlorinated biphenyls; PUF = polyurethane foam; SVOCs = semi-volatile organic compounds; VOCs = volatile organic compounds

For the OU2 Phase 1A sampling the suite of sampling methods will be deployed at three selected monitoring locations, as shown in Figure 3 of this SAP document. Field duplicate QC samples will be collected at one of these locations during the Phase 1A program, as described in Section 11.3.7.2.5. The duplicate samples will not be included in the sample count for statistical evaluation purposes.

11.3.7.2.5 QC Samples

To provide sufficient data to adequately characterize the quality of the air data collected, the Phase 1A sampling plan for air will include the following QC samples:

- One field blank will be collected per 10 samples for each sampling method except VOCs by Method TO-15; and
- Duplicate samples to assess overall precision will be collected at a frequency of 10 percent at a single location during Phase 1A. Duplicate samples will be collected using a

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

second set of co-located duplicate samplers at monitoring location PRI18-001, shown in Figure 3.

- Field spikes will be spiked to the PUF plugs for PCBs, Dioxins/Furans, and SVOCs at the laboratory prior to shipping the PUF plugs to the field. Field spike recoveries measured during PUF sample analysis are used to monitor for target compound losses during sampling. Field spikes will not be added to backup PUF media field QC samples used to assess breakthrough.
- Backup sampling media will be used at a frequency of 10 percent for PCBs, Dioxins/Furans, and SVOCs. Backup sampling media will be analyzed to assess breakthrough of organic contaminants.

Field QC sample requirements and measurement performance criteria are provided in Worksheets 12 and 20.

Laboratory analysis will accord with the SOPs for the specified methods, and appropriate method QA/QC, including method blanks, spikes, calibrations, and dilutions as specified in the SOPs and associated work instructions.

SAP Worksheet #12 - Measurement Performance Criteria Table

SAP Worksheet #12 - Measurement Performance Criteria Table

Quality Control (QC) Sample	Analytical Group	Minimum Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [a]	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Ambient Air – PUF Media Sampling Methods (TO-4A, TO-9A, and TO-13A)					
Co-located Field Duplicates	PCB, PCDD/PCDF, SVOC	10%	Precision-Overall	RPD ≤ 50 if results > 5 x QL ±2 x QL if results < 5 x QL	S & A
Backup Media – Unspiked second cartridge in series to evaluate breakthrough from primary media	PCB, PCDD/PCDF, SVOC	10%	Accuracy	Breakthrough < 10% of total mass for individual chemical constituents	S
Field Blank – Cartridge/Filter transported to field and passively exposed	PCB, PCDD/PCDF, SVOC	1 per 10 field samples, for each method	Accuracy/ Contamination	PCB, PCDD;/PCDF: <10 ng per sample for single analytes, < 100 ng/sample for multiple analyte groups SVOC: < QL or < 1/10 amount measured in any sample	S
Field Spike — Surrogates and/or isotopically tagged compounds spiked to PUF prior to shipping the cartridges to the field	PCB	All field samples and field blanks	Accuracy	40% - 120%	S & A

SAP Worksheet #12 - Measurement Performance Criteria Table

Quality Control (QC) Sample	Analytical Group	Minimum Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [a]	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Field Spike — Surrogates and/or isotopically tagged compounds spiked to PUF prior to shipping the cartridges to the field	PCDD/PCDF	All field samples and field blanks	Accuracy	37Cl4-2,3,7,8-TCDD, 13C12-1,2,3,4,7,8-HxCDD, 13C12-2,3,4,7,8-PeCDF, 13C12-1,2,3,4,7,8-HxCDF: 50% - 120%; 13C12-1,2,3,4,7,8,9-HpCDF: 40% - 120%	S & A
Field Spike — Surrogates and/or isotopically tagged compounds spiked to PUF prior to shipping the cartridges to the field	SVOC	All field samples and field blanks	Accuracy	40% - 120%	S & A
Laboratory Control Sample (Blank Spike)	PCB, PCDD/PCDF, SVOC	1 per analytical batch of 20 or fewer samples, for each method	Accuracy	PCDD/PCDF: 70% - 130% PCB: 65% - 135% SVOC: 40% - 120%	S & A
Laboratory Method Blank (also termed Process Blank)	PCB, PCDD/PCDF, SVOC	1 per analytical batch of 20 or fewer samples, for each method	Accuracy/ Contamination	PCB, PCDD;/PCDF: <10 ng per sample for single analytes, < 100 ng/sample for multiple analyte groups SVOC: < QL or < 1/10 amount measured in any sample	A

SAP Worksheet #12 - Measurement Performance Criteria Table

Quality Control (QC) Sample	**Analytical Group**	**Minimum Frequency**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria** [a]	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
Ambient Air – Particulate Filter Sampling Methods (IO-2.1, IO-3.1, and IO-3.5)					
Field Duplicate	PM10, Metals	Co-located field duplicates will be collected at a minimum of 10% frequency during the Phase 1A RI	Precision-Overall	RPD ≤ 35 if results > 5 x QL ±2 x QL if results < 5 x QL	S & A
Matrix Spike	Metals	1 per batch of 20 or fewer samples, for each method	Accuracy	75% - 125% recovery for all analytes	S & A
Matrix Spike Duplicate	Metals	1 per batch of 20 or fewer samples, for each method	Accuracy/ Precision	RPD < 20 between MS and MSD for all analytes	S & A
Laboratory (Filter) Duplicate – Second filter cutting from a single sample	PM10, Metals	1 per batch of 20 or fewer samples, for each method	Precision	RPD < 20 for all analytes	S & A
Lab Control Spike – Blank filter spiked with same concentrations as Matrix Spike	Metals	1 per batch of 20 or fewer samples, for each method	Accuracy	80% - 120% Recovery	A

SAP Worksheet #12 - Measurement Performance Criteria Table

Quality Control (QC) Sample	Analytical Group	Minimum Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [a]	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Field Blank – Filter transported to field and passively exposed	PM10, Metals	1 per 10 field samples, for each method	Accuracy/ Contamination	PM10: Repeat tare weight within 5% Metals: No Analyte ≥ QL	S
Laboratory Method Blank – Unexposed filter is re-tared and analyzed for metals	PM10, Metals	1 per batch of 20 or fewer samples, for each method	Accuracy/ Contamination	PM10: Repeat tare weight within 5% Metals: No Analyte ≥ QL	A
Ambient Air – Summa Canister Method (TO-15)					
Field Duplicate	VOC	Co-located field duplicates will be collected at a minimum of 10% frequency during the Phase 1A RI	Precision-Overall	RPD ≤ 50 if results > 5 x QL ±2 x QL if results < 5 x QL	S & A
Laboratory Control Sample (Blank Spike)	VOC	1 per batch of 20 or fewer samples	Accuracy	Laboratory-Generated Limits [b]	A
Laboratory Duplicate	VOC	1 per batch of 20 or fewer samples	Precision	RPD < 25	A

SAP Worksheet #12 - Measurement Performance Criteria Table

Quality Control (QC) Sample	Analytical Group	Minimum Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria [a]	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Laboratory Method Blank - Unused, certified canister pressurized with humidified, ultra-pure zero air.	VOC	One per day	Accuracy/ Contamination	No Analyte ≥ QL	A
Ambient Air – Near-continuous Monitoring					
Co-located Duplicate Analyzers	Chlorine and HCl	A co-located pair of BM25 samplers will be operated at one Phase 1A Air sampling location	Precision	Paired sample set agree within 20% at a 95% confidence (t-test)	S & A
Calibration verification check (span gas)	Chlorine and HCl	Daily	Accuracy	85% - 115% of certified concentration (See Worksheet 22)	A

Notes:

a. When available, measurement performance criteria from USEPA Compendium Methods (both Inorganic and Organic) will be used. These Methods are included as attachments to the field sampling SOPs included in Appendix D of this SAP. When established criteria are not available (e.g., RPD for field duplicates for PUF method analyses), the proposed criteria were selected based on default validation criteria.

b. Current limits are included with the analytical data report. Laboratory control limits are updated annually.

Field Blank—This sample consists of a sample cartridge, filter, and/or tube that is shipped to the field, installed on the sampler, and passively exposed at the sampling area (the sampler is not operated). It is then sealed and returned to the laboratory for extraction, cleanup, and analysis, as

SAP Worksheet #12 - Measurement Performance Criteria Table

appropriate for the analytical group and method. It is treated in exactly the same manner as a test sample. A field blank is processed with each sampling episode. The field blank represents the background contributions from passive exposure to ambient air, sampling media, sampling equipment, glassware, and solvents. Field blanks are not applicable for VOC sampling by Summa canisters (Method TO-15) or for near-continuous monitoring methods, but are used for all the remaining sampling procedures. The procedures for preparing field blank QC samples for PUF and particulate sampling methods are provided in the respective field sampling SOPs listed is Worksheet 21 and included as Appendix D of this SAP.

Field Spike —For PCDD/PCDF, PCB, and SVOC sampling using PUF plugs. A field spike is a solution containing surrogates and/or isotopically-tagged compounds that is spiked to the PUF plugs at the laboratory prior to shipping the PUF plugs, including the field blank, to the field. Field spike recoveries measured during PUF sample analysis are used to monitor for target compound losses during sampling. Field spikes will not be added to backup PUF media field QC samples used to assess breakthrough. Field spike solutions for Dioxins/Furans and PCB PUF plugs include $^{37}Cl_4$-2,3,7,8-TeCDD, $^{13}C_{12}$-1,2,3,4,7,8-HxCDD, $^{13}C_{12}$-2,3,4,7,8-PeCDF, $^{13}C_{12}$-1,2,3,4,7,8-HxCDF, $^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF, $^{13}C_{12}$ PCB 31, $^{13}C_{12}$ PCB 95, and $^{13}C_{12}$ PCB 153 spiked at 6 ng per plug. For SVOC analysis, PUF plugs are spiked with fluoranthene-d10, benzo(a)pyrene-d12, 2,6-dichloro-4-fluorophenol, and 1-bromo-2,3-dichlorobenzene at 10 µg per plug. The Field Spike levels are at approximately the middle of instrument calibration ranges.

Laboratory Method Blank – The purpose of the Laboratory Method Blank (LMB) is to monitor for possible laboratory contamination.

> For SVOC,PCB, and PCDD/PCDF: An LMB is an unused, certified filter/cartridge assembly which is carried though the same extraction procedure as a field sample. The LMB extract must contain the same amount of surrogate compounds and internal standards that is added to each sample.
>
> For Metals: The LMB contains all the reagents in the same volumes as used in processing the samples. The LMB is carried through the entire sample digestion and preparation scheme. If the direct addition procedure is being used, internal standards are added to the solution after preparation is complete.
>
> For VOC by Summa canister / TO-15: A LMB is an unused, certified canister that has not left the laboratory. The blank canister is pressurized with humidified, ultra-pure zero air and carried through the same analytical procedure as a field sample. The injected aliquot of the blank must contain the same amount of internal standards that are added to each sample.

Laboratory Control Sample - A laboratory control sample is an analyte-free matrix to which a known quantity of analyte(s) is (are) added. The LCS is subjected to the same processing as field samples and is carried through the entire analytical process. The percent recovery of the analyte(s) in the LCS is used to assess method performance.

SAP Worksheet #13 – Secondary Data Criteria and Limitations Table

SAP Worksheet #13 – Secondary Data Criteria and Limitations Table

Secondary data and information that were used for developing this Sampling and Analysis Plan (SAP) are identified in Worksheet 13 of the September 2013 Phase 1A SAP, which is included in Appendix E of this SAP.

SAP Worksheet #14 –
Summary of Project Tasks

SAP Worksheet #14 – Summary of Project Tasks

Sampling Tasks

Air sampling will be performed at three stations shown in Figure 3 and listed in Worksheet #18. A minimum of 10 back-to-back, 3-day air samples will be collected at each station. In addition to discrete air sampling, each station will include equipment for near-continuous monitoring of Cl_2 and HCl. Field sampling Standard Operating Procedures (SOPs) are listed in Worksheet #21 and included as Appendix D of this Sampling and Analysis Plan (SAP). As described in Worksheet #11, the sampling design is based on meteorological conditions expected during the season extending July through September; therefore, the sampling should be completed before the end of September. However, as required by USEPA, the sampling program will not be demobilized until USEPA concurs with ERM's post-sampling AERMOD calculations and a finding of data adequacy, as described in Worksheet #37.

Analysis Tasks

Air samples will be analyzed for SVOCs, PCBs, PCDD/PCDF, VOCs, PM_{10}, and TSP-metals. Analytical laboratories are listed in Worksheet #30. Analytical SOPs are listed in Worksheet #23 and included as Appendix C of this SAP. Analytes and laboratory detection limits/quantitation limits are provided in Worksheet #15.

Quality Control Tasks

Field quality control (QC) tasks include field documentation, field QC samples, and sample management /chain-of-custody procedures. Field QC samples are listed in Worksheet #12 and #20 and include co-located field duplicate samples (to be collected at station PRI18-001) and field blanks. Field duplicate and field blank samples will be collected at a frequency of one per ten samples. In addition, one in ten samples collected using PUF/XAD-2 media will have unspiked, replicate backup media added to the sampling train to assess the possibility for target analyte or spike compound breakthrough. Assessment of air sampler flow consistency is by single-point flow rate audits at the end of each high-volume air sample. Daily functional checks for each chronic toxicant sampler and a calibration check of the acute toxicant instrumental monitors will be conducted at each of the Phase 1A sampling locations. Performance criteria for field QC samples are provided in Worksheet #12. Field documentation and sample management procedures are provided in SOPs USM-04, SAMPLE MANAGEMENT, and USM-06, FIELD DOCUMENTATION (see Worksheet #21 and Appendix D of this SAP).

SAP Worksheet #14 – Summary of Project Tasks

Analytical QC tasks include the analytical QC samples listed in Worksheet #28 and method-specific QC procedures listed in the analytical SOPs (see Worksheet #23 and Appendix C of this SAP). Performance criteria for laboratory QC samples are provided in Worksheet #12 and #28.

SAP Worksheet #14 – Summary of Project Tasks

Secondary Data

Meteorological data from the ATI meteorological station will be used during the Phase 1A sampling program to perform AERMOD calculations for each 3-day sample interval at each sampling station. AERMOD calculations for assessing Phase 1A sample adequacy are described in Worksheet #11 and #37. The step-wise procedure for collecting meteorological data, using those data to perform AERMOD calculations, and assessing Phase 1A RI data quality based on AERMOD results is included as Appendix F of this SAP.

Data Management Tasks

All data generated during the Phase 1A Air RI will be managed in accordance with the Draft Data Management Plan (ERM March 2013). Meteorological data and AERMOD input and output files will be prepared and exchanged with USEPA as described in Appendix F of this SAP.

Documentation and Records

Documentation and records will be managed as described in Worksheet #29 and in the Draft Data Management Plan (ERM 2013). Deviations from this SAP or the attached SOPs will be documented following the Protocol for Approval of Changes Requested During Field Sampling (from September 2013 Phase 1A SAP, Worksheet #14):

> During field sampling, it is sometimes necessary to make changes in sample location and/or sampling methods compared to the specifications of the Phase 1A RI SAP. Either the USEPA or ERM may propose such changes.
>
> In cases where the change is “minor” (e.g., relocating a sampling station a short distance away from the target location), and both ERM and USEPA agree in “real time” that the change is appropriate, the change may be implemented and subsequently documented (e.g., later that day) by completion of a Field Modification Form. Note that agreement must be reached before implementing any such change. This may be accomplished by a consultation between the field team leader and an USEPA oversight representative present at the site, or by calling an appropriate USEPA staff member by phone, as identified below:

SAP Worksheet #14 – Summary of Project Tasks

Name	Office Phone	Cell Phone
Ken Wangerud	303-312-6703	720-951-0955
Dan Wall	303-312-6560	720-347-5520
Wendy O'Brien	303-312-6712	720-951-0970

In the event that an USEPA representative cannot be reached, or if the USEPA representative cannot issue a decision in "real time," then no change shall be implemented until authorization is granted.

In the event of a proposed "major" change in the Phase 1A RI SAP (e.g., a substantial revision to a sampling or processing method), the proposing party (either ERM or the USEPA) shall complete a Field Modification Form for review and consideration by both parties. After a decision is reached and authorization for the change is approved, then the revision may be implemented.

In the event that a change is proposed and agreement between the parties cannot be reached, then the procedure for dispute resolution defined in the Administrative Order on Consent (AOC) shall be followed.

SAP Modification and Field Modification Request Forms are included as Appendix G of this SAP.

Assessment/Audit Tasks

Assessment and audit tasks include field readiness reviews, field sampling surveillance, laboratory surveillance, and the evaluation of data adequacy.

- A field readiness review will be completed by ERM prior to initiation of Phase 1A Air Sampling (see Worksheet #31 and #32)
- Field sampling surveillance will be performed by ERM and USEPA (or their contractor) at least twice, or as needed, during the Phase 1A Air Sampling (see Worksheet #31 and #32)
- Laboratory surveillance will be performed by ERM and USEPA (or their contractor) once, or as needed based on laboratory performance or other data quality issues, during the laboratory program (see Worksheet #31 and #32)
- The evaluation of data adequacy will be performed as described in Worksheet #11 and #37. Data adequacy evaluations will include an assessment of whether sampling locations and intervals satisfied the sample design criteria, and whether the

analytical data achieved project quality objectives for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS).

Data Review Tasks

All analytical results will be validated by a third-party independent validation contractor. All data will undergo a cursory data review. In addition, a full data validation (Stage 4) will be performed on 10 percent of the data packages for the Phase 1A Air RI. Data verification and validation are described in Worksheet#35 and #36.

SAP Worksheet #15 - Reference Limits and Evaluation Table

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory:	ALS Houston
Matrix:	Air
Analytical Group:	PCBs (EPA TO-4/1668C)
Concentration Level:	Low

Analyte	**CAS Number**	**Target Quantitation Limit [1] ($\mu g/m^3$)**	**Laboratory-specific Quantitation Limit [2] (μg/sample)**	**Laboratory-specific Detection Limit [2] (μg/sample)**	**Air Quantitation Limit [3] ($\mu g/m^3$)**	**Air Detection Limit [3,4] ($\mu g/m^3$)**
Total PCBs [4]	1336-36-3	2.1E-02	4.0E-04	n/a	8.0E-07	n/a
PCB-77	32598-13-3	3.2E-03	4.0E-05	1.0E-05	8.0E-08	2.08E-08
PCB-81	70362-50-4	1.1E-03	4.0E-05	8.5E-06	8.0E-08	1.69E-08
PCB-105	32598-14-4	1.1E-02	4.0E-05	7.4E-06	8.0E-08	1.48E-08
PCB-114	74472-37-0	1.1E-02	4.0E-05	6.9E-06	8.0E-08	1.38E-08
PCB-118	31508-00-6	1.1E-02	4.0E-05	6.9E-06	8.0E-08	1.38E-08
PCB-123	65510-44-3	1.1E-02	4.0E-05	8.6E-06	8.0E-08	1.72E-08
PCB-126	57465-28-8	3.2E-06	4.0E-05	7.2E-06	8.0E-08	1.43E-08
PCB-156	38380-08-4	1.1E-02	8.0E-05	6.1E-06	1.6E-07	1.21E-08
PCB-157	69782-90-7	1.1E-02	8.0E-05	6.1E-06	1.6E-07	1.21E-08
PCB-167	52663-72-6	1.1E-02	4.0E-05	4.6E-06	8.0E-08	9.28E-09
PCB-169	32774-16-6	1.1E-05	4.0E-05	5.0E-06	8.0E-08	9.96E-09
PCB-189	39635-31-9	1.1E-02	4.0E-05	1.1E-05	8.0E-08	2.12E-08

Notes

[1] Target Quantitation Limit (TQL) value is the USEPA RSL for Industrial Air. The RSL value used is the lesser of the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1. The TQL for total PCBs equals the RSL for total PCBs, high risk, CAS 1336-36-3.

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be presented to the results will be reported to the estimated DL (EDL), which is DL calculated for each congener in each sample during each HRMS analytical run.

[3] Assuming a 500 m^3 sample volume.

[4] Total PCB concentration will be calculated as the sum of the detected 209 PCB congener concentrations; non-detected congeners will be assigned a value of 0. The detection limit will be the lowest of the individual congener EDLs for the sample.

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory:	ALS Houston
Matrix:	Air
Analytical Group:	Dioxins and Furans (TO-9A)
Concentration Level:	Low

Analyte	CAS Number	Target Quantitation Limit [1] (pg/m^3)	WHO 2005 Toxicity Equivalency Factor	Laboratory-specific Quantitation Limit [2] (pg/sample)	Laboratory-specific Detection Limit [2] (pg/sample)	Air Quantitation Limit [3] (pg/m^3)	Air Detection Limit [3] (pg/m^3)
2,3,7,8-TCDD	1746-01-6	1.9E-02	1	1.0E+01	1.5E+00	2.0E-02	2.9E-03
1,2,3,7,8-PeCDD	40321-76-4	1.9E-02	1	5.0E+01	8.8E-01	1.0E-01	1.8E-03
1,2,3,4,7,8-HxCDD	39227-28-6	1.9E-01	0.1	5.0E+01	1.2E+00	1.0E-01	2.3E-03
1,2,3,6,7,8-HxCDD	57653-85-7	1.9E-01	0.1	5.0E+01	7.8E-01	1.0E-01	1.6E-03
1,2,3,7,8,9,-HxCDD	19408-74-3	1.9E-01	0.1	5.0E+01	1.2E+00	1.0E-01	2.4E-03
1,2,3,4,6,7,8-HpCDD	35822-46-9	1.9E+00	0.01	5.0E+01	1.4E+00	1.0E-01	2.8E-03
OCDD	3268-87-9	6.3E+01	0.0003	1.0E+02	1.7E+00	2.0E-01	3.5E-03
2,3,7,8-TCDF	51207-31-9	1.9E-01	0.1	1.0E+01	1.6E+00	2.0E-02	3.2E-03
1,2,3,7,8-PeCDF	57117-41-6	6.3E-01	0.03	5.0E+01	1.3E+00	1.0E-01	2.5E-03
2,3,4,7,8-PeCDF	57117-31-4	6.3E-02	0.3	5.0E+01	8.2E-01	1.0E-01	1.6E-03
1,2,3,4,7,8-HxCDF	70648-26-9	1.9E-01	0.1	5.0E+01	9.4E-01	1.0E-01	1.9E-03
1,2,3,6,7,8,-HxCDF	57117-44-9	1.9E-01	0.1	5.0E+01	8.2E-01	1.0E-01	1.6E-03
1,2,3,7,8,9,-HxCDF	72918-21-9	1.9E-01	0.1	5.0E+01	1.2E+00	1.0E-01	2.3E-03
2,3,4,6,7,8,-HxCDF	60851-34-5	1.9E-01	0.1	5.0E+01	8.6E-01	1.0E-01	1.7E-03
1,2,3,4,6,7,8-HpCDF	6756-39-4	1.9E+00	0.01	5.0E+01	1.1E+00	1.0E-01	2.3E-03
1,2,3,4,7,8,9-HpCDF	55673-89-7	1.9E+00	0.01	5.0E+01	1.5E+00	1.0E-01	2.9E-03
OCDF	39001-02-0	6.3E+01	0.0003	1.0E+02	1.9E+00	2.0E-01	3.9E-03

Notes

[1] Target Quantitation Limit (TQL) value is the USEPA RSL for Industrial Air for 2,3,7,8-TCDD. The RSL value used is the lesser of the the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1. TQLs for PCDD/PCDF are calculated by dividing the 2,3,7,8-TCDD TQL by the WHO Toxicity Equivalency Factor (TEF) and by the number of WHO PCDD/PCDF compounds (17).

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be reported to the estimated DL (EDL), which is DL calculated for each congener in each sample during each HRMS analytical run.

[3] Assuming a 500 m^3 sample volume.

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory:	ALS-Simi Valley
Matrix:	Air
Analytical Group:	SVOCs (TO-13A)
Concentration Level:	Low

Analyte	**CAS Number**	**Target Quantitation Limit [1] (μg/m³)**	**Laboratory-specific Quantitation Limit [2] (μg/sample)**	**Laboratory-specific Detection Limit [2] (μg/sample)**	**Air Quantitation Limit [3] (μg/m³)**	**Air Detection Limit [3] (μg/m³)**	**Air Sample Volume required for QL to achieve TQL (m³)**
2,4,6-Trichlorophenol	88-06-2	4.0E+00	2.5E+00	1.6E+00	5.0E-03	3.1E-03	6.3E-01
2,4-Dichlorophenol	120-83-2	--	2.5E+00	1.3E+00	5.0E-03	2.6E-03	--
2,4-Dimethylphenol	105-67-9	--	2.5E+00	1.8E+00	5.0E-03	3.6E-03	--
2,4-Dinitrophenol	51-28-5	--	5.0E+00	7.0E-01	1.0E-02	1.4E-03	--
2,4-Dinitrotoluene	121-14-2	1.4E-01	2.5E+00	1.2E+00	5.0E-03	2.5E-03	1.8E+01
2,6-Dinitrotoluene	606-20-2	--	2.5E+00	1.5E+00	5.0E-03	3.0E-03	--
2-Chloronaphthalene	91-58-7	--	2.5E+00	1.4E+00	5.0E-03	2.9E-03	--
2-Chlorophenol	95-57-8	--	2.5E+00	1.1E+00	5.0E-03	2.1E-03	--
2-Nitrophenol	88-75-5	--	2.5E+00	1.0E+00	5.0E-03	2.0E-03	--
3,3'-Dichlorobenzidine	91-94-1	3.6E-02	5.0E+00	2.6E+00	1.0E-02	5.2E-03	1.4E+02
4,6-Dinitro-2-methylphenol	534-52-1	--	5.0E+00	1.0E+00	1.0E-02	2.1E-03	--
4-Bromophenyl-phenylether	101-55-3	--	2.5E+00	1.5E+00	5.0E-03	3.0E-03	--
4-Chloro-3-methylphenol	59-50-7	--	2.5E+00	1.5E+00	5.0E-03	3.1E-03	--
4-Chlorophenyl-phenylether	7005-72-3	--	2.5E+00	1.5E+00	5.0E-03	3.0E-03	--
4-Nitrophenol	100-02-7	--	5.0E+00	1.1E+00	1.0E-02	2.2E-03	--
Acenaphthene	83-32-9	--	2.5E+00	1.5E+00	5.0E-03	3.0E-03	--
Acenaphthylene	208-96-8	--	2.5E+00	1.4E+00	5.0E-03	2.8E-03	--
Anthracene	120-12-7	--	2.5E+00	1.1E+00	5.0E-03	2.2E-03	--
Benzo[a]anthracene	56-55-3	1.1E-01	2.5E+00	1.0E+00	5.0E-03	2.0E-03	2.3E+01
Benzo[a]pyrene	50-32-8	1.1E-02	2.5E+00	1.7E+00	5.0E-03	3.3E-03	2.3E+02
Benzo[b]fluoranthene	205-99-2	1.1E-01	2.5E+00	1.4E+00	5.0E-03	2.7E-03	2.3E+01
Benzo[g,h,i]perylene	191-24-2	--	2.5E+00	2.1E+00	5.0E-03	4.1E-03	--
Benzo[k]fluoranthene	207-08-9	1.1E-01	2.5E+00	7.7E-01	5.0E-03	1.5E-03	2.3E+01
Bis(2-Chloroethoxy)methane	111-91-1	--	2.5E+00	1.1E+00	5.0E-03	2.3E-03	--
Bis(2-Chloroethyl) ether	111-44-4	3.7E-02	2.5E+00	1.0E+00	5.0E-03	2.1E-03	6.8E+01
Bis(2-Chloroisopropyl)ether	108-60-1	1.2E+00	2.5E+00	1.0E+00	5.0E-03	2.0E-03	2.1E+00
Bis(2-Ethylhexyl)phthalate	117-81-7	5.1E+00	2.5E+00	2.1E+00	5.0E-03	4.2E-03	4.9E-01
Butylbenzylphthalate	85-68-7	--	2.5E+00	1.7E+00	5.0E-03	3.4E-03	--
Chrysene	218-01-9	1.1E+00	2.5E+00	1.1E+00	5.0E-03	2.1E-03	2.3E+00
Dibenz[a,h]anthracene	53-70-3	1.0E-02	2.5E+00	1.7E+00	5.0E-03	3.5E-03	2.5E+02
Diethylphthalate	84-66-2	--	2.5E+00	1.7E+00	5.0E-03	3.4E-03	--
Dimethylphthalate	131-11-3	--	2.5E+00	1.5E+00	5.0E-03	3.1E-03	--
Di-n-butylphthalate	84-74-2	--	2.5E+00	1.2E+00	5.0E-03	2.4E-03	--
Di-n-octylphthalate	117-84-0	--	5.0E+00	3.1E+00	1.0E-02	6.2E-03	--
Fluoranthene	206-44-0	--	2.5E+00	9.9E-01	5.0E-03	2.0E-03	--
Fluorene	86-73-7	--	2.5E+00	1.5E+00	5.0E-03	3.0E-03	--
Hexachlorobenzene	118-74-1	2.7E-02	2.5E+00	1.4E+00	5.0E-03	2.9E-03	9.3E+01
Hexachlorobutadiene	87-68-3	5.6E-01	2.5E+00	9.4E-01	5.0E-03	1.9E-03	4.5E+00
Hexachlorocyclopentadiene	77-47-4	8.8E-02	2.5E+00	1.1E+00	5.0E-03	2.3E-03	2.8E+01
Hexachloroethane	67-72-1	1.1E+00	2.5E+00	1.0E+00	5.0E-03	2.0E-03	2.3E+00
Indeno[1,2,3-cd]pyrene	193-39-5	1.1E-01	2.5E+00	1.2E+00	5.0E-03	2.3E-03	2.3E+01
Isophorone	78-59-1	8.8E+02	2.5E+00	1.3E+00	5.0E-03	2.6E-03	2.8E-03
Naphthalene	91-20-3	3.6E-01	2.5E+00	1.1E+00	5.0E-03	2.2E-03	6.9E+00
Nitrobenzene	98-95-3	3.1E-01	2.5E+00	9.6E-01	5.0E-03	1.9E-03	8.1E+00
n-Nitrosodi-n-propylamine	621-64-7	6.1E-03	2.5E+00	1.4E+00	5.0E-03	2.7E-03	4.1E+02
n-Nitrosodiphenylamine	86-30-6	4.7E+00	2.5E+00	1.3E+00	5.0E-03	2.6E-03	5.3E-01
Pentachlorophenol	87-86-5	2.4E+00	2.5E+00	1.0E+00	5.0E-03	2.0E-03	1.0E+00
Phenanthrene	85-01-8	--	2.5E+00	1.2E+00	5.0E-03	2.3E-03	--
Phenol	108-95-2	8.8E+01	2.5E+00	1.8E+00	5.0E-03	3.7E-03	1.0E+00
Pyrene	129-00-0	--	2.5E+00	1.1E+00	5.0E-03	2.1E-03	--

Notes:

-- = No screening value available.

[1] Target Quantitation Limit (TQL) value is the USEPA RSL for Industrial Air. The RSL value used is the lesser of the the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1.

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be reported to the detection limit.

[3] Assuming a 500 m³ sample volume.

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory: ALS Simi Valley
Matrix: Air
Analytical Group: VOC (EPA Method TO-15)
Concentration Level: Trace

Analyte	CAS Number	Target Quantitation Limit [1] (μg/m^3), Compared to TO-15 DL and QL	TO 15 Laboratory-specific Quantitation Limit [2,3] (μg/m^3)	TO 15 Laboratory-specific Detection Limit [2,3] (μg/m^3)	TO 15 Analysis Mode [4]
1,1,1-Trichloroethane	71-55-6	2.2E+03	5.0E-01	1.6E-01	Scan
1,1,2,2-Tetrachloroethane	79-34-5	2.1E-01	2.5E-02	4.7E-03	SIM
1,1,2-Trichloroethane	79-00-5	8.8E-02	1.0E-01	3.4E-03	SIM
1,1-Dichloroethane	75-34-3	7.7E+00	5.0E-01	1.7E-01	Scan
1,1-Dichloroethene	75-35-4	8.8E+01	5.0E-01	1.7E-01	Scan
1,2,4-Trichlorobenzene	120-82-1	8.8E-01	2.5E-02	1.9E-02	SIM
1,2-Dibromo-3-chloropropane	96-12-8	2.0E-03	5.0E-01	1.4E-01	Low Level
1,2-Dibromoethane	106-93-4	2.0E-02	2.5E-02	1.3E-02	SIM
1,2-Dichlorobenzene	95-50-1	8.8E+01	5.0E-01	1.7E-01	Scan
1,2-Dichloroethane	107-06-2	4.7E-01	2.5E-02	8.7E-03	SIM
1,2-Dichloropropane	78-87-5	1.2E+00	2.5E-02	2.1E-03	SIM
1,3-Dichlorobenzene	541-73-1	--	5.0E-01	1.7E-01	Scan
1,4-Dichlorobenzene	106-46-7	1.1E+00	2.5E-02	1.2E-02	SIM
1,4-Dioxane	123-91-1	2.5E+00	5.0E-01	1.7E-01	Scan
2-Butanone (MEK)	78-93-3	2.2E+03	5.0E-01	2.3E-01	Scan
2-Hexanone	591-78-6	1.3E+01	5.0E-01	1.8E-01	Scan
4-Methyl-2-pentanone (MIBK)	108-10-1	1.3E+03	5.0E-01	1.4E-01	Scan
Acetone	67-64-1	1.4E+04	5.0E+00	8.8E-01	Scan
Benzene	71-43-2	1.6E+00	5.0E-01	1.4E-01	Scan
Bromodichloromethane	75-27-4	3.3E-01	2.5E-02	3.6E-03	SIM
Bromoform	75-25-2	1.1E+01	5.0E-01	1.4E-01	Scan
Bromomethane	74-83-9	2.2E+00	5.0E-01	1.9E-01	Scan
Carbon Disulfide	75-15-0	3.1E+02	5.0E+00	1.5E-01	Scan
Carbon Tetrachloride	56-23-5	2.0E+00	5.0E-01	1.6E-01	Scan
Chlorobenzene	108-90-7	2.2E+01	5.0E-01	1.6E-01	Scan
Chloroethane	75-00-3	4.4E+03	5.0E-01	1.9E-01	Scan
Chloroform	67-66-3	5.3E-01	1.0E-01	3.1E-03	SIM
Chloromethane	74-87-3	3.9E+01	5.0E-01	1.9E-01	Scan
cis-1,2-Dichloroethene	156-59-2	--	5.0E-01	1.8E-01	Scan
cis-1,3-Dichloropropene	10061-01-5	--	5.0E-01	1.4E-01	Scan
Cumene (Isopropyl Benzene)	98-82-8	1.8E+02	5.0E-01	1.5E-01	Scan
Cyclohexane	110-82-7	2.6E+03	1.0E+00	3.3E-01	Scan
Dibromochloromethane	124-48-1	4.5E-01	1.0E-01	8.5E-02	Low Level
Dichlorodifluoromethane (CFC 12)	75-71-8	4.4E+01	5.0E-01	1.8E-01	Scan
Ethylbenzene	100-41-4	4.9E+00	5.0E-01	1.5E-01	Scan
m,p-Xylenes	179601-23-1	--	1.0E+00	2.9E-01	Scan
Methyl tert-Butyl Ether	1634-04-4	4.7E+01	5.0E-01	1.5E-01	Scan
Methylene Chloride	75-09-2	2.6E+02	5.0E-01	1.5E-01	Scan
o-Xylene	95-47-6	4.4E+01	5.0E-01	1.4E-01	Scan
Styrene	100-42-5	4.4E+02	5.0E-01	1.5E-01	Scan
Tetrachloroethene	127-18-4	1.8E+01	5.0E-01	1.4E-01	Scan
Toluene	108-88-3	2.2E+03	5.0E-01	1.6E-01	Scan
trans-1,2-Dichloroethene	156-60-5	--	5.0E-01	1.7E-01	Scan
trans-1,3-Dichloropropene	10061-02-6	--	5.0E-01	1.6E-01	Scan
Trichloroethene	79-01-6	8.8E-01	2.5E-02	5.8E-03	SIM
Trichlorofluoromethane (Freon 11)	75-69-4	3.1E+02	5.0E-01	1.6E-01	Scan
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	1.3E+04	5.0E-01	1.6E-01	Scan
Vinyl Chloride	75-01-4	2.8E+00	5.0E-01	1.9E-01	Scan

Notes

-- = No screening value available.

[1] Target Quantitation Limit (TQL) value is the USEPA RSL for Industrial Air. The RSL value used is the lesser of the the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1.

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be reported to the detection limit.

[3] TO-15 QLs assume a 1 L sample analysis volume (from 6L canister). Actual QLs will be higher depending on the canister pressurization dilution factor and/or sample matrix effects. Typical canister pressurization dilution factors for 6L cans are between 1.5-2.0.

[4] VOC analysis by TO-15 will be performed using a combination of standard Scan, Low-Level Scan, and Selective Ion Monitoring (SIM) modes to provide QLs / DLs sensitive enough to meet project TQLs or to provide the lowest possible QLs / DLs.

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory: ALS Burlington
Matrix: Air
Analytical Group: Inorganics (EPA IO 2.1/3.1 Modified/3.5)

Analyte	CAS Number	Target Quantitation Limit[1] (µg/m^3)	Laboratory-specific quantitation limit[2] (µg/sample)	Laboratory-specific detection limit[2] (µg/sample)	Air Quantitation Limit [3] (µg/m^3)	Air Detection Limit [3] (µg/m^3)	Sample Volume required for QL to achieve TQL (m^3)
Antimony	7440-36-0	--	2.3E+00	7.6E-01	7.6E-04	2.5E-04	--
Arsenic	7440-38-2	2.9E-03	9.3E+00	3.1E+00	3.1E-03	1.0E-03	3.2E+03
Beryllium	7440-41-7	5.1E-03	3.0E+00	1.0E+00	1.0E-03	3.3E-04	5.9E+02
Cadmium	7440-43-9	4.4E-03	1.7E+00	5.8E-01	5.8E-04	1.9E-04	2.6E+02
Chromium[4]	7440-47-3	1.5E-04	7.2E+00	2.4E+00	2.4E-03	8.0E-04	-- [4]
Cobalt	7440-48-4	1.4E-03	3.0E+00	1.0E+00	1.0E-03	3.3E-04	2.1E+03
Lead	7439-92-1	--	7.8E+00	2.6E+00	2.6E-03	8.7E-04	--
Magnesium	7439-95-4	--	1.6E+02	5.2E+01	5.2E-02	1.7E-02	--
Manganese	7439-96-5	2.2E-02	6.6E+00	2.2E+00	2.2E-03	7.3E-04	3.0E+02
Mercury	7439-97-6	1.3E-01	7.2E-02	2.4E-02	2.4E-05	8.0E-06	5.5E-01
Molybdenum	7439-98-7	--	2.3E+00	7.5E-01	7.5E-04	2.5E-04	--
Nickel	7440-02-0	3.9E-02	2.9E+00	9.5E-01	9.5E-04	3.2E-04	7.3E+01
Selenium	7782-49-2	8.8E+00	2.1E+01	7.0E+00	7.0E-03	2.3E-03	2.4E+00
Silver	7440-22-4	--	2.3E+00	7.6E-01	7.6E-04	2.5E-04	--
Thallium	7440-28-0	--	3.3E+00	1.1E+00	1.1E-03	3.7E-04	--
Vanadium	7440-62-2	4.4E-02	9.6E+00	3.2E+00	3.2E-03	1.1E-03	2.4E+00
Zinc	7440-66-6	--	2.3E+01	7.5E+00	7.5E-03	2.5E-03	--

Notes

-- = No screening value available

[1] Target Quantitation Limit (TQL) value is the USEPA RSL for Industrial Air. The RSL value used is the lesser of the the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1.

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be reported to the detection limit.

[3] Assuming a 3,000 m^3 sample volume.

[4] An Air RSL for total chromium is not available. The TQL shown is the Industrial Air RSL for hexavalent chromium. The proportion of chromium present in the hexavalent form, if any, is not known and is not quantified by method EPA IO 2.1/3.1 Modified/3.5

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

SAP Worksheet #16 –
Project Schedule/Timeline Table

SAP Worksheet #16 – Project Schedule/Timeline Table

Activities	**Organization**	**Date**
Final Phase 1A Air Sampling and Analysis Plan (SAP) (OU-2) – Approval by USEPA	USEPA	1 August 2014
Access Agreement for installing/operating air sampling equipment at ATI	ATI / USM / ERM	1 August 2014
Mobilization of equipment to Site, air sampling station preparation	ERM	1 July to 6 August 2014
Readiness Review	ERM	6 August 2014
Phase 1A Air Sampling Program	ERM	11 August to 15 September 2014, or as extended based on evaluation of data adequacy
Sample Location / Interval Adequacy Evaluation (see Worksheet #11 and #37)	ERM / USEPA	August – September 2014
Demobilization of air sampling equipment	ERM	Upon notification by USEPA of sample location/interval adequacy
Field data and laboratory analytical data uploads to Project Database	ERM	Per Data Management Plan
Data uploads to USEPA Scribe Database	ERM	Per Data Management Plan
Submit Draft Phase 1A RI Air (OU-2) Data Report to USEPA	ERM	30 days after receipt of validated analytical data

SAP Worksheet #17 –
Sampling Design and Rationale

SAP Worksheet #17 – Sampling Design and Rationale

Rationale for Selecting Sampling Approach

As described in Worksheet #11, the accepted refined model for air dispersion (AERMOD) coupled with site-specific meteorological data obtained from the nearby ATI Titanium facility's meteorological station was used to determine the location for the Phase 1A Air sampling sites. AERMOD is the USEPA-approved model for use in a variety of air quality permitting and compliance evaluations. USEPA used AERMOD calculations to identify optimal locations for sampling stations based on calculated estimates of the probability that a random 3-day sample collected at a grid location (250 meter spacing) within a 3-month time frame would exceed the highest true long-term average concentration anywhere on site ($\bar{C}_{max}$).

The USEPA identified four target sampling stations judged optimal for air sampling for chronic toxicants in the Phase 1A RI (see Figure 14-15 of the September 2013 Phase 1A RI SAP). However, the locations of the proposed stations were adjusted, based on site reconnaissance, and their number reduced from four to three, as described in Worksheet #11, Section 11.3.7.2.2. The three planned air monitoring locations are shown in Figure 3 and listed in Worksheet #18.

Sampling Design

Ambient air sampling using accepted USEPA Compendium Methods will be performed at each Phase 1A sampling location. Target analyte groups include PCBs, PDD/PCDFs, SVOCs, VOCs, TSP metals, and PM_{10}. Risk based concentration levels for these analytes are discussed in Worksheet #15. Samples will be of 3-day (nominally 72-hour) duration, and collected as near as is practical in an uninterrupted back-to-back sequence. Near-continuous monitoring of acute toxicants Cl2 and HCl will also be performed at each sampling location using electrochemical instrumental monitors. Sampling for acute toxicants will not affect their selection as Contaminants of Potential Concern (COPCs), but may provide corroborative information to interpret discrete air sampling results.

Sampling Locations

Air sampling and near-continuous air monitoring will be performed at three sampling locations shown in Figure 3. The location coordinates and rationale for each sampling location are listed in Worksheet #18. The sampling station equipment layout is shown in Figure 4. Sampling locations west of the Plant (location PRI18-001) and south of Hill Brothers (PRI18-003) will be enclosed by a security fence to house the sampling equipment.

SAP Worksheet #17 – Sampling Design and Rationale

Number of Samples

As described in Worksheet #11, a minimum of 29 discrete air samples must be collected to meet statistical criteria for the Phase 1A data quality objectives (DQO) of COPC selection. Ten discrete samples will be collected at each Phase 1A sample location for a total of 30 samples (see Worksheet #18). Based on the results of the AERMOD modeling calculations, this data set is expected to have a high probability of providing one or more samples that exceed the $\bar{C}_{max}$ values for both stack-only and fugitive-only releases, which in turn will provide an adequate basis for COPC selection. Based on the data evaluation criteria described in Worksheet #11 and #37, the sampling event and number of samples may be extended if AERMOD simulations indicate that due to actual meteorological conditions the monitoring locations have likely not encountered high-biased sample concentration(s). Field blanks will be collected at a rate of one per ten primary samples, as appropriate for the sampling method (Worksheet #12 and #20). Field duplicate/co-located samples to assess method precision will be collected at location PRI18-001 (Figure 3) at a minimum frequency of 10percent (see Worksheet #11, #12, and #20).

Sampling Frequency

Each Phase 1A sample will be collected over a 3-day duration (on a three day rotating schedule), addressing one sampling location per day. However, all sampling locations will be visited daily to perform equipment functional checks and calibrations of the continuous monitors (see Worksheet #22).

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sample Location ID and Coordinates [1]	Analytical Group [2]	Number of Samples	Sampling SOP Reference [3]	Rationale for Sampling Location [4]
PRI18-001 4530775 m N 353400 m E	PCBs PCDDs/PCDFs SVOCs Metals PM_{10} VOCs	10	USM-Air-PUF USM-Air-TSP USM-Air-PM10 USM-Air-TO15	Optimum location for main stack and near-ground fugitive emissions
PRI18-002 4530125 m N 353425 m E	PCBs PCDDs/PCDFs SVOCs Metals PM_{10} VOCs	10	USM-Air-PUF USM-Air-TSP USM-Air-PM10 USM-Air-TO15	Optimum location for main stack emissions
PRI18-003 4530414 m N 354188 m E	PCBs PCDDs/PCDFs SVOCs Metals PM_{10} VOCs	10	USM-Air-PUF USM-Air-TSP USM-Air-PM10 USM-Air-TO15	Optimum location for fugitive emissions

Notes:
SOP = Standard Operating Procedure
1 Sampling locations are shown in Figure 3 (Appendix A). Northing (N) and Easting (E) are coordinates UTM, Meters, Zone 12N, NAD 83 Projection
2 In addition to sampling for the analytical groups listed, each sample location will be equipped with near-continuous monitoring equipment for Cl_2 and HCl. The Cl_2 and HCl monitors will be operated as described in Field Sampling SOP USM-Air-Cont-EC (see Worksheet #21).
3 See Worksheet #21 for Sampling SOP details.
4 See Worksheet #11 for the detailed rationale for each sampling location.

SAP Worksheet #19 – Analytical SOP Requirements Table

SAP Worksheet #19 – Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method (Standard Operating Procedure Reference)	Ambient Air Volume per Sample [1]	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Air	PM$_{10}$ High Volume	USEPA IO 2.3 (BU-TP-2002-v05)	Approximately 4,000 m^3	envelope for 8" x 10" quartz hi-vol filter	None	None
Air	Metals High Volume	USEPA IO 3.1/3.5/CVAA (BU-TP-2003-v01, BU-TM-1002-v13, and BU-TM-1001-v05)	Approximately 4,000 m^3	envelope for 8" x 10" quartz hi-vol filter	None	180 days
Air	Dioxins/Furans	USEPA Method TO-9A/ (HE-EXT002, HE-HMS001)	Approximately 600 m^3	1 Quartz filter + PUF/XAD-2 Cartridge [2, 3]	Media must be stored cold/shipped cold (≤4°C) before sampling. Store cold/ship cold (≤4°C) after sampling.	7 days until extraction/45 days from extraction to analysis
Air	Semi-volatile Organic Compounds	USEPA Method TO-13A (SVO-13A – v15 and SVP-TO13A – v12)	Approximately 600 m^3	1 Quartz Filter + PUF/XAD-2 Cartridge [3]	Media must be stored cold/shipped cold (≤4°C) before sampling. Store cold/ship cold (≤4°C) after sampling.	7 days until extraction/40 days from extraction to analysis
Air	Polychlorinated Biphenyls (High Res)	USEPA Method TO-4A/ 1668C Modified (HE-EXT002, HMS-1668C)	Approximately 600 m^3	1 Quartz filter + PUF/XAD-2 Cartridge [2, 3]	Media must be stored cold/shipped cold (≤4°C) before sampling. Store cold/ship cold (≤4°C) after sampling.	7 days until extraction/40 days from extraction to analysis
Air	Volatile Organic Compounds	USEPA Method TO-15 (VOA-TO15 v19)	6 liters standard	1 Summa canister	None	30 days

Notes:

[1] Approximate target sample volumes are shown for three-day sample durations; the actual sample volumes will vary due to operating parameters and atmospheric conditions during sampling. PUF method samples found to have total volumes significantly above the target level (e.g., 10 percent higher) will be further evaluated, through examination of spike recoveries, to assess whether the higher air flow may have caused analyte breakthrough.

[2] PCBs and Dioxins/Furans will be analyzed from a single Quartz filter + PUF/XAD-2 Cartridge.

[3] For 10 percent of the Phase 1A samples (see Worksheet #20), the PUF samples will include unspiked back-up media that will be analyzed as a quality control measure to verify absence of significant breakthrough of spike compounds and/or target analytes.

SAP Worksheet #20 – Field Quality Control Sample Summary Table

SAP Worksheet #20 – Field Quality Control Sample Summary Table

Air Sampling Media	Analytical Group	No. of Sampling Locations	No. of Discrete Samples[1]	No. of Co-located Field Duplicates [2]	No. of Field Blanks [3]	No. of Backup Media Samples [4]	Total No. of Samples to Lab
Quartz Filter	PM_{10}	3	30	3	3	0	36
Quartz Filter	Metals	3	30	3	3	0	36
Quartz Filter and PUF/XAD-2 cartridge [5]	PCDD/ PCDF [5]	3	30	3	3	3	39
Quartz Filter and PUF/XAD-2 cartridge	SVOCs	3	30	3	3	3	39
Quartz Filter and PUF/XAD-2 cartridge [5]	PCBs [5]	3	30	3	3	3	39
Summa Canisters	VOCs	3	30	3	0	0	33
N/A - Near continuous monitoring	Chlorine/ HCl	3	N/A	A co-located pair of BM25 samplers will be operated at one Phase 1A Air sampling location	N/A	N/A	N/A

Notes:

N/A = Not applicable

1. Ten samples will be collected at each sampling location for a total of 30 Phase 1A Air samples.
2. Field duplicates will be collected from a single sampling station and will be spread across the duration of the Phase 1A sampling program; one field duplicate will be collected at random during the first ten days, the second field duplicate will be collected at random during days 11 through 20, and the third field duplicate will be collected at random during days 21 through 30.
3. Field blanks will consist of unexposed media (filters, PUFs) that have been transported to the monitoring location, briefly opened and installed in the sample apparatus and removed from the apparatus without exposure to air flow, capped then transported from the monitoring location to the laboratory for analysis. Field blanks will be collected at a frequency of one per ten samples (Worksheet #12).
4. Backup or stacked sampling media will be used at a frequency of 10percent for methods using PUF/XAD-2 sorbent media. Backup or stacked

SAP Worksheet #20 – Field Quality Control Sample Summary Table

sampling media will be analyzed to assess breakthrough of organic contaminants, and will be accomplished using series of two PUF/XAD-2 cartridges (one primary plus one backup). Backup media samples will be collected at different sampling stations and covering the duration of the Phase 1A air sampling program. One backup media sample will be collected at random every ten days from a different sampling station.

5. PCBs and PCDD/PCDF will be analyzed from a single Quartz filter + PUF/XAD-2 Cartridge.

SAP Worksheet #21 – Project Sampling SOP References Table

SAP Worksheet #21 – Project Sampling SOP References Table

SOP Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work?	Comments
USM-Air-TO15	AMBIENT AIR SAMPLING FOR VOLATILE ORGANIC COMPOUNDS USING SUMMA CANISTERS, Rev 1, June 2014	ERM	Summa Canister	Yes	Based on USEPA Compendium Method TO-15
USM-Air-PUF	AMBIENT AIR SAMPLING FOR SEMI-VOLATILE ORGANIC COMPOUNDS, POLYCHLORINATED BIPHENYLS, AND DIOXINS/ FURANS, Rev 1, June 2014	ERM	High-volume Air Sampler	Yes	Based on USEPA Compendium Methods TO-4, TO-9, and TO-13
USM-Air-PM_{10}	AMBIENT AIR SAMPLING FOR PM_{10} USING A HIGH VOLUME AIR SAMPLER, Rev 0, March 2013	ERM	Refer to SOP	Yes	Based on USEPA Compendium Method IO-2.1
USM-Air-TSP	AMBIENT AIR SAMPLING FOR TOTAL SUSPENDED PARTICULATE MATTER (TSP) METALS USING A HIGH VOLUME SAMPLER, Rev 0, March 2013	ERM	High-volume Air Sampler	Yes	Based on USEPA Compendium Method IO-2.1
USM-Air-Cont-EC	CONTINUOUS AIR MONITORING FOR CHLORINE AND HYDROCHLORIC ACID USING AN ELECTRO-CHEMICAL ANALYZER, Rev 0, March 2013	ERM	Industrial Scientific Model BM25	Yes	Based on Manufacturer's Manual
USM-04	SAMPLE MANAGEMENT AND SHIPPING, Rev 2, September 2013	ERM	N/A	Yes	
USM-06	FIELD DOCUMENTATION, Rev 2, September 2013	ERM	N/A	Yes	

Notes:
N/A = Not applicable
SOP = Standard Operating Procedure

SAP Worksheet #22 –
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Polyurethane Foam (PUF) Sampler (Discrete) – SVOC, D/F, PCB

Parameters: High-volume air samplers are used to expose PUF media cartridges constituting discrete samples for chronic toxicants. PUF is prepared and certified by the analytical laboratory. Each PUF sampler is spiked with a non-analyte surrogate compound in a known amount, which provides a recovery check species. The PUF is then solvent extracted and the extractate analyzed for specific rosters of chemical species. Typical detection limits are those for D/F, which are in the range of 0.01 to 0.2 picograms/cubic meter (pg/m^3) concentrations as low as 0.2 pg/m^3. For the US Magnesium RI/FS PUF media sampling methods are TO-4A (PCB), TO-9A (D/F), and TO-13A (SVOC).

Calibration: Each PUF-loaded cartridge is prepared and certified by the analytical laboratory. Air flow drawn by the sampler unit is to be calibrated by a multi-point procedure prior to initiating the air sampling program and not less frequently than every 360 hours of sampler opperation. Single point flow audits are to be conducted before and after each sample. Typical audit procedures are found in TO-9A, Sections 11.2.1 and 11.2.3. The audits use a calibrated orifice transfer standard, prepared as described in TO-9A, Section 11.2.2. The flow audits are to be accompanied by a leak check of the sampling unit.

Maintenance: Only normal housekeeping comprises the routine maintenance identified by the method for high-volume PUF samplers:

1) Clean the interior passages of the sampler unit using lint free cloths and solvent every 30 days.
2) Clean the seals that contact the PUF cartridge inlet/outlet after each sampling event.
3) No less frequently than every 500 sampler operating hours, replace blower motor brushes and inspect mechanical and electrical condition of sampler components, in accordance with manufacturer recommendations.
4) As needed, or on an annual basis, the O-rings and other seals along the internal sampling path will be replaced to keep the system in a leak-free condition.

All maintenance activities should be appropriately documented in a logbook that is dedicated to maintenance and corrective actions for this instrument type (i.e., multiple instruments of the same type can be logged in one logbook).

Testing: High-volume samplers must utilize AC power input provided by a generator located 200 feet from the sampler.

Prior to the test period, a certified PUF cartridge and tared filter are installed in the sampler. A timer is set to initiate and end the sampling period. Typical installation of the PUF sample media and filter is described in standard operating

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

procedure (SOP) USM-Air-PUF, Section 9. For the Phase 1A RI, unspiked backup sorbent media (consisting of an additional sorbent cartridge in series with the primary sampler) will be used at a frequency of 10 percent to verify lack of sample breakthrough (see Worksheet #12 and #20). Magnahelic gauge readings to verify flow consistency should be collected at startup, daily throughout each sample collection period, and prior to turning off the sampler at the end of the sampling period. All testing activities should be appropriately documented in accordance with SOPs USM-Air-PUF and USM-06 (see Worksheet #21) and the US Magnesium RI/FS Draft Data Management Plan. The sealed, exposed PUF/filter media are shipped to the identified laboratory for analysis. Sampler preparation is described in TO-9A, Section 12. The analytical method is GC/MS; and D/F must use high-resolution, GC/MS, as described in TO-9A, Sections 13 and 14.
Inspection: As part of each sample collection, the operator is to inspect the operation and display parameters for the sampler. The operator is to verify pressure readings for the sampler daily. A single-point flow audit and leak check is to be performed. All inspection activities should be appropriately documented.
Frequency: The frequency of the sampler flow audit and leak check will be upon the collection of each sample. Magnahelic gauge readings to verify flow consistency should be collected at startup, daily throughout each sample collection period, and prior to turning off the sampler at the end of the sampling period. Other parameter audits may be performed each sampling event season.
Acceptance: Acceptable readings will be defined by the field sampling SOP and laboratory quality assurance (QA) procedures for the individual toxic organic methods for which PUF sample media are used, including spike recovery checks and analyte audit samples. Sampler flow checks should be within ±10 percent of the sampler set point.
Corrective Action: If a sampler flow check or leak check is not passed, then that specific sample is a candidate to be disqualified, and the USEPA project team is to be consulted. The operator will investigate the reason for a detected leak or variation in flow in the sampler unit. If flow audit is failed (between sampling periods), the speed of the sample pump is to be adjusted to restore the sampler flow to the specified flow rate, to be verified by a flow test. A new multipoint calibration of the sampler may be required if a sampler cannot pass the flow test. If deviations from the Work Plan or SOP are required during sampling activities, the procedures and documentation of

deviations must be performed in accordance with Section 9.0 of SOP USM-06, Field Documentation. Owner's manuals should be kept on site by field personnel to assist with corrective actions.
Responsible Person: Field Team Leader
SOP Reference: USM-Air-PUF

High-Volume Particulate Sampler (Discrete) - PM10 and metals
Parameters: For sampling of inhalable particulate (PM10) and particulate-borne toxic metals, a unit meeting USEPA specifications will be utilized. For metals, the sampler will be configured and operated in a mode to collect total suspended particulate (TSP), which usually provides a more practical sample mass for metals analysis. A typical non size-specific TSP high-volume sampler is a compact unit consisting of a protective housing; an electric motor driven; a high-speed, high-volume blower; a filter holder capable of supporting a 203 x 254-mm (8 in. by 10 in.) filter; and a flow-controller for controlling the air-flow rate through the instrument at 40-60 ft3/min. The sampler performance criteria are specified in 40 CFR 53 and appendices. For PM10 measurement, the traditional gable roof of the TSP sampler is replaced with a size-select inlet. The design preferred for use in this program for PM10 measurement is the cyclone inlet. This consists of an omnidirectional cyclone inlet that allows particles to enter from all angles of approach. An angular velocity component is imparted to the sample air stream and the particles contained. Larger particle removal occurs in an inner collection tube. The smaller particles (i.e., PM10 fraction) deposit on a filter for subsequent analysis. Control of air velocities in the cyclonic inlet is critical to maintain the correct particle size cutpoint. This design flow rate is specified by the manufacturer in the instruction manual. For example, a popular cyclonic impaction inlet has a design flow rate of 1.13 m3/min. PM10 mass is detected gravimetrically. Metals content is analyzed by digesting the TSP sample filter and captured particles, followed by wet analysis of the digestate by suitable techniques, such as cold vapor atomic adsorption (CVAA) and inductively coupled plasma/mass spectroscopy (ICP/MS).
Calibration: Several audit procedures are used for the sampler to ensure accurate air sample flow and compensation for actual temperature and pressure during the sampling period. Methods for calibrations/audits are provided in IO-2.1, applicable calibration procedures are in Section 7.3 for calibration of an orifice transfer standard (which is normally performed by a supplier of orifice standards for field use), Section 7.4 for a Mass-Flow-Controlled high volume sampler and Section 7.5 for a Volumetric-Flow-Controlled sampler. Flow audit checks are to be performed before each sample is

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

collected to ensure the flow is 1.13 m^3/min, within specified tolerances.

1) **Maintenance:** Only normal housekeeping comprises the routine maintenance identified by the method for high-volume particulate samplers. Inspect the interior passages of the sharp-cut cyclone separator after each sample is collected and clean as necessary but no less frequently than every 14 sampling days (e.g. after four 3-day samples) using lint free cloths and solvent.
2) Clean the seals that contact the particulate filter cartridge inlet/outlet sides after each sampling event.
3) No less frequently than every 500 sampler operating hours, replace blower motor brushes and inspect mechanical and electrical condition of sampler components, in accordance with manufacturer recommendations.
4) As needed, or on an annual basis, the O-rings and other seals along the internal sampling path will be replaced to keep the system in a leak-free condition.

All maintenance activities should be appropriately documented in a logbook that is dedicated to maintenance and corrective actions for this instrument type (i.e., multiple instruments of the same type can be logged in one logbook.) All documentation must be completed in accordance with SOPs USM-Air-PUF and USM-06 (see Worksheet #21) and the US Magnesium RI/FS Draft Data Management Plan.

Testing: Several audit procedures are used for the sampler to ensure accurate air sample flow and compensation for actual temperature and pressure during the sampling period. Methods for calibrations/audits are provided in IO-2.3, Section 9.1 for temperature sensor, Section 9.2 for barometric pressure sensor, and actual air flow rate in Section 9.4. Flow audit checks are to be checked before each sample is collected to ensure the flow is 1.13 m^3/min, within specified tolerances.

All testing activities should be appropriately documented.

Inspection: As part of each sampling event, a leak check is to be performed to verify that the high-volume blower is functioning properly free from obstruction. In addition, the operator is to inspect the interior passages of the sharp-cut cyclone separator after each sample is collected and clean as necessary but no less frequently than every 14 sampling days (e.g. after four 3-day samples) using lint free cloths and solvent. Further, the seals that contact the particulate filter cartridge inlet/outlet sides are to be inspected and cleaned (if necessary) after each sample.

Frequency: The frequency of the sampler flow audit and leak check will be upon the collection of each sample. Other parameter audits may be performed each sampling event season.

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Acceptance: Acceptable readings will be defined by laboratory QA procedures for the individual toxic metals methods for which digested filter media are used, these include spike recovery checks and analytical analyte audit samples. The average flow rate during sampling should be within ± 10 percent of the design flow rate of the sampler.

Corrective Action: If a sampler flow check or leak check is not passed, then that specific sample is a candidate to be disqualified, and the USEPA project team is to be consulted. The operator will investigate the reason for a detected leak or variation in flow in the sampler unit. If flow audit is failed, the speed of the sample pump is to be adjusted to restore the sampler to pass audit for high-volume flow.

If deviations from the Work Plan or SOP are required during sampling activities, the procedures and documentation of deviations must be performed in accordance with Section 9.0 of SOP USM-06, Field Documentation.

Owner’s manuals should be kept on site by field personnel to assist with corrective actions.

Responsible Person: Field Team Leader

SOP Reference: USM-Air-PM, USM-Air-TSP

Industrial Scientific BM25 (Continuous) – Acute Air Toxicants

Parameters: The BM25 gas detector is a stand-alone, electrochemical cell gas detector that provides simultaneous detection of up to five gases present in the air by means of sensors specific to each constituent. The removable, interchangeable and intelligent sensor blocks are made of catalytic, electrochemical, or IR sensor and electronic components, including an “EEPROM” memory in which INDUSTRIAL SCIENTIFIC- has stored the sensor's specific characteristics (measuring range, various correction coefficients, STEL and TWA alarms, date of manufacture, serial number, etc.). For the continuously monitoring gases in this study, Cl_2 range is 0.1 to 10 ppm, and HCl from 0.1 to 30 parts per million (ppm). Another parameter called the "wear rate" is used by the BM25 to automatically determine the optimal time to replace the sensor. The BM25 toxic gas detectors to be used for this study will sample ambient air in “diffusion” mode, without active pumping of ambient air samples. However, the unit can be equipped with an internal electrical pump or an external manual pump to measure gas concentrations in inaccessible locations or in locations needing to be verified before access. For the US Magnesium RI/FS, the BM25 instrument is a candidate technology for continuous ambient monitoring of definitive concentrations of Cl_2 and HCl as both acute and chronic toxicants.

Calibration: Industrial Scientific further recommends that a full instrument calibration be performed using a known and

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

certified concentration of calibration gas at a minimum frequency of monthly to ensure accuracy of the instrument. **However, for Phase 1A sensor calibrations will be performed daily.** The sensor calibration menu is used to regularly reset the electrochemical sensor response, and assure future accuracy.

The first step of calibration consists of exposing the passive sensor surface to air with negligible concentration of the target gasses, waiting for the closest approach of the response to "0.0," then tapping the input button to tag that response as zero concentration. After installing the special manifold to isolate the sensor surfaces, a known reference gas for one of the target compounds is introduced through the manifold. The operator awaits the closest approach of the instrument response to the reference concentration, and then taps the monitor input button to tag that response as corresponding to the reference gas level (typically 10 ppm for either Cl_2 or HCl). The high-level gas calibration procedure is then repeated for the second target gas. Flow rate of the reference gas should nominally be 1 L/min, to effectively flush the gas through the special manifold volume.

To calibrate, access the calibration menu and follow prompted instructions.

- choose sensor to calibrate
- set, if necessary, the maintenance interval
- indicate the standard gas level used
- proceed to "zero" as per prompts from the software
- proceed to sensitivity, after selecting (in red) the standard gas level to be injected

If a gas detector does not respond within 15 percent of the zero or reference gas level within several minutes, and this behavior is repeated for two consecutive daily calibrations, then the monitor is likely in need of maintenance or sensor replacement by the manufacturer.

Maintenance and Testing: The BM25 unit performs a range of internal tests and checks upon each power up. The sensor Calibration menu is used to regularly calibrate the sensors connected to the instrument. Calibration consists of setting the zero response of the instrument upon exposure to clean air (under conditions that are free of sensed target gas) and similarly setting the response of the monitor to the concentration of two standard gases of known concentration. To perform calibrations, access the Calibration menu and follow prompts given on the screen.

These recommendations are consistent with applicable industry safety protocols and with the standards and directives

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

relative to the safety of industrial sites. All maintenance activities should be appropriately documented in a logbook that is dedicated to maintenance and corrective actions for this instrument type (i.e., multiple instruments of the same type can be logged in one logbook).
Inspection: The condition of the sensor interface with sample gas will be checked periodically and are to be replaced not less frequently than annually. The exterior surfaces of the BM25 should be checked for cleanliness and decontaminated as needed. In addition, an inspection will include viewing active fault alarms. These alarms are: 1) Faults concerning sensors: out of range, worn sensors, request for calibration in the case of a major deviation during auto-adjustment. These faults generate messages on the display unit. 2) Faults concerning the instrument itself (discharged batteries or electronic fault). The corresponding fault message appears at the bottom of the display unit. It takes priority over all other sensor-related messages. All inspection activities should be appropriately documented.
Frequency: The field calibration is recommended by Industrial Scientific to be performed monthly. For purposes of this study, the planned procedure is to perform the zero and upper-range calibration cycle not less frequently than daily while a unit is in the field.
Acceptance: Acceptable readings will be values above the specified unit detection limit of 0.1 ppm as Cl_2, and 0.1 ppm as HCl.

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Corrective Action: If a gas detector does not respond within 15 percent of the zero or reference gas level within several minutes, and this behavior is repeated for two consecutive daily calibrations, then the monitor will be considered to be out of calibration and likely in need of maintenance or sensor replacement by the manufacturer. If a gas calibration in the field is not passed, then the actions that can be taken by the Field Team Leader are limited. Generally, the recommendation from Industrial Scientific is to ensure the sample interface is clean. The gas sensing block can be replaced by the manufacturer if needed, and in this case Industrial Scientific is to be contacted for service instructions. If it is discovered that the battery voltage is below specified range and the unit displays “Low Voltage” message, then the sampler must be removed from service, and connected to a standard 110VAC outlet to restore the battery charge. The power supplies used during deployment in the field will maintain battery charge, but not restore charge of a weak battery. Owner’s manuals should be kept on site by field personnel to assist with corrective actions. If deviations from the Work Plan or SOP are required during sampling activities, the procedures and documentation of deviations must be performed in accordance with Section 9.0 of SOP USM-06, Field Documentation.
Responsible Person: Field Team Leader
SOP Reference: USM-Air-Cont-EC

SAP Worksheet #23 –
Analytical SOP References Table

SAP Worksheet #23 – Analytical SOP References Table

Reference Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Air Matrix Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
BU-TP-2002-v05	*Determination of Particulate Matter* BU-TP-2002-v05 Particulates 14 Nov 2012	Definitive	PM_{10}	Gravimetric	ALS Environmental, Burlington ON	N
BU-TP-2003-v01 BU-TM-1002-v13 BU-TM-1001-v05	*Microwave Assisted Digestion of HiVol Particulate Matter,* BU-TP-2003-v01 15 Nov 2012 *Metals by ICP/MS* BU-TM-1002-v13 ICPMS 27 March 2013 *Mercury Prep & Analysis via CVAA* BU-TM-1001-v05 CVAA 14 Nov 2012	Definitive	TSP Metals	ICP/MS, CVAA	ALS Environmental, Burlington ON	N
NA-QM-0001v04	*ALS Environmental Division (Canada) National Quality Manual* NA-QM-001 v04 Quality Manual, 22 November 2011	Definitive	TSP Metals, PM_{10}	ICP/MS, CVAA, Gravimentric	ALS Environmental, Burlington ON	N
SVO-13A	*Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in Ambient Air using Gas Chromatography/Mass Spectrometry (GC/MS)* SVO-13A, Rev.15, 12 April 2014 *Sample and Media Preparation per USEPA Compendium Method TO-13A*, SVP-TO13A, Rev.12.0, 15 February 2014	Definitive	SVOC	GC/MS	ALS Environmental, Simi Valley CA	N

SAP Worksheet #23 – Analytical SOP References Table

Reference Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Air Matrix Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
VOA-TO15	*Determination of Volatile Organic Compounds in Air Samples Collected in Specially Prepared Canisters and Gas Collection Bags by Gas Chromatography/Mass Spectrometry (GC/MS),* VOA-TO15, Rev.19, 2/13/2012	Definitive	VOC	GC/MS	ALS Environmental, Simi Valley CA	N
ALSMV-QAM	*Quality Assurance Manual* ALSMV-QAM Rev. 27, 11 January 2014	Definitive	VOC, SVOC	GC/MS	ALS Environmental, Simi Valley CA	N
HE-EXT004 HE-EXT002	*Air Trap Preparation* HE-EXT004 Rev. 0, 31 January 2013 *Soxhlet extraction of Solid/Tssue/Air Samples for Analysis of PCB and PCDD/F Compounds by HRMS* HE-EXT002 Rev. 0.1 1 February 2014	Definitive	Dioxins/Furans	HRGC-HRMS	ALS Environmental, Houston, TX	N
HE-HMS001	*Analysis of PCDD/PCDF by HRGC/HRMS* HE-HMS001 Rev.0.1, 1 February 2013	Definitive	Dioxins/Furans	HRGC-HRMS	ALS Environmental, Houston, TX	N

SAP Worksheet #23 – Analytical SOP References Table

Reference Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Air Matrix Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
HE-EXT004 HE-EXT002	*Air Trap Preparation* HE-EXT004 Rev. 0, 31 January 2013 *Soxhlet extraction of Solid/Tssue/Air Samples for Analysis of PCB and PCDD/F Compounds by HRMS* HE-EXT002 Rev. 0.1, 1 February 2014	Definitive	PCBs	HRGC-HRMS	ALS Environmental, Houston, TX	N
HMS-1668C	*Analysis of PCBs in Water, Soil, Sediments, Biosolids, and Tissue by Isotope Dilution USEPA 1668C* HMS-1668C Rev. 4.0, 21 June 2013					
HE-HMS003	*HRMS Data Review and Reporting* HE-HMS003 Rev. 0, 1 April 2013	Definitive	PCBs and Dioxins/Furans	HRGC-HRMS	ALS Environmental, Houston, TX	N
HE00215	*Project-Specific Work Instructions ERM US Mag Air Sampling* HE00215, Rev. 0, 16 June 2014	Definitive	PCBs and Dioxins/Furans	HRGC-HRMS	ALS Environmental, Houston, TX	Y
ALSHE-QAM	*Quality Assurance Manual* HE-QAM Rev. 13.1, 10 June 2013	Definitive	PCBs and Dioxins/Furans	HRGC-HRMS	ALS Environmental, Houston, TX	N

SAP Worksheet #24 – Analytical Instrument Calibration Table

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HR/MS (PCDD/F)	Mass Resolution Check	Prior to ICAL and at the beginning of each 12-hour period	Perfluorokerosene (PFK) Static resolving power ≥ 10,000 (10 % valley) for identified masses per method and lock-mass ion between lowest and highest masses for each descriptor and level of reference compound ≤ 10 percent full-scale deflection per method.	Retune instrument, perform preventative maintenance, and verify. Rerun affected samples.	Laboratory Manager/ Analyst	HE-HMS001
HR/MS (PCDD/F)	GC column performance check	Prior to ICAL or CCV per method	1. Peak separation 2,3,7,8-TCDD and other TCDD isomers ≤ 25% valley per method. 2. Identification of all first and last eluters of the eight homologue retention time windows and documentation by labeling on the chromatogram. 3. Absolute retention times for switching from one homologous series to the next ≥ 10 seconds for all components of the mixture.	Identify source of problem, such as the following: - Inspect instrument for leaks, perform preventative maintenance - Check for calculation errors - Check standard concentrations Correct problem in accordance with instrument manufacturer manual/ recommendations or laboratory SOP. Repeat column performance check (no sample run until column performance check has passed).	Laboratory Manager/ Analyst	HE-HMS001

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HR/MS (PCDD/F)	Initial: multi-point	Prior to sample analysis, as needed by the failure of CCV	Ion abundance ratios in accordance with criteria in Table 8 of the method; and signal to noise ratio ≥ 10 for all target analyte ions; and RSD ≤ as per reference method for the RFs for all 17 unlabeled standards and RSD as per reference method for the RFs for the 15 labeled internal standards.	Identify source of problem, such as the following: - Inspect instrument for leaks, perform preventative maintenance - Check for calculation errors - Check standard concentrations Correct problem in accordance with instrument manufacturer manual/ recommendations or laboratory SOP. Rerun ICV; if that fails, repeat ICAL (no sample run until ICAL has passed).	Laboratory Manager/ Analyst	HE-HMS001
HR/MS (PCDD/F)	Continuing: single point	Prior to ICAL or CCV per method	Ion abundance ratios in accordance with Table 8 of the method; and RF within %D as per the reference method relative to the RF established in ICAL.	Identify source of problem, such as the following: - Inspect instrument for leaks, perform preventative maintenance - Check for calculation errors - Check standard concentrations Correct problem in accordance with instrument manufacturer manual/ recommendations or laboratory SOP Reanalyze CCV; if that fails repeat ICAL and reanalyze all samples analyzed since last successful CCV.	Laboratory Manager/ Analyst	HE-HMS001

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GCMS (VOCs TO-15)	BFB Tuning Verification	Once every 24-hours or analytical batch	Ion abundance criteria as described in Table 3 of Method TO-15.	1) Repeat BFB analysis. 2) Retune instrument (no samples may be accepted without a valid tune).	Dept. Supervisor; however, other trained analysts in the team may be responsible.	VOA-TO15 _Rev.19
GCMS (VOCs TO-15)	Initial Calibration (ICAL) – minimum of five levels	Initially or if continuing calibration no longer meets criteria	1) <30% RSD with 2 exceptions up to 40%. 2) Area response at each calibration level within 40% of IS mean area response over the ICAL range. 3) Retention time for each IS within 20s of the mean retention time over the ICAL range.	1) May repeat 1 point (if 5 levels) or 2 points (if 6 levels). 2) Inspect the system for problems and perform required maintenance. 3) Repeat initial calibration. Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15 _Rev.19
GCMS (VOCs TO-15)	Initial Calibration Verification (ICV)	Following every ICAL	Percent difference of +/- 30%.	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Problem must be corrected. Samples may not be analyzed until there is a valid ICV.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15 _Rev.19

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GCMS (VOCs TO-15)	Continuing Calibration Verification (CCV)	Once every 24 hours, if an ICAL has not been performed (within the last 24 hours).	Percent difference of +/- 30%. Note: If CCV is biased high and analyte is ND (not detected) results are acceptable. It will be noted in case narrative.	1) Reanalyze CCV. 2) Identify and correct problem; re-analyze and if necessary qualify the data. 3) Repeat initial calibration if CCV corrective action is unsuccessful.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15 _Rev.19
HR/MS (PCBs)	Mass Resolution check	Prior to ICAL and at the beginning of each 12-hour period	Perfluorokerosene (PFK) Static resolving power ≥ 10,000 (10 % valley) for the centroid of each descriptor and ≥ 8,000 across each descriptor window for the identified masses per method and lock-mass ion and at the level of reference compound ≤ 10 percent full-scale deflection.	Retune instrument, perform preventative maintenance, and verify. Rerun affected samples.	Laboratory Manager/ Analyst	HE-HMS1668C

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HR/MS (PCBs)	GC column performance check	Prior to ICAL or CCV per method	1. For SPB-Octyl column analysis, peak separation of PCB-34 & -24 and PCB-187 & -182 isomers ≤ 40% valley per method; 2. For SPB-Octyl column analysis, PCB-157 & -156 coelute within 2 seconds.	Identify source of problem, such as the following: - Inspect instrument for leaks, perform preventative maintenance - Check for calculation errors - Check standard concentrations Correct problem in accordance with instrument manufacturer manual/ recommendations or laboratory SOP. Repeat column performance check (no sample run until column performance check has passed).	Laboratory Manager/ Analyst	HE-HMS1668C
HR/MS (PCBs)	Initial: multi-point	Prior to sample analysis, as needed by the failure of CCV	Ion abundance ratios in accordance with criteria in Table 8 of the SOP (HMS-1668A); and signal to noise ratio ≥ 10 for all target analyte ions; and RSD ≤ as per reference method for the RFs for all unlabeled standards and RSD as per reference method for the RFs for the nine labeled internal standards.	Identify source of problem, such as the following: - Inspect instrument for leaks, perform preventative maintenance - Check for calculation errors - Check standard concentrations Correct problem in accordance with instrument manufacturer manual/ recommendations or laboratory SOP Rerun ICV; if that fails, repeat ICAL (no sample run until ICAL has passed.)	Laboratory Manager/ Analyst	HE-HMS1668C

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HR/MS (PCBs)	Continuing: single point	Prior to sample analysis and every 12 hours	Ion abundance ratios in accordance with Table 8 of the SOP (HMS-1668A) or within 10% of the ratios in the ICAL; and RF within %D as per the reference method relative to the RF established in ICAL.	Identify source of problem, such as the following: - Inspect instrument for leaks, perform preventative maintenance - Check for calculation errors - Check standard concentrations Correct problem in accordance with instrument manufacturer manual/ recommendations or laboratory SOP Reanalyze CCV; if that fails repeat ICAL and reanalyze all samples analyzed since last successful CCV.	Laboratory Manager/ Analyst	HE-HMS1668C
ICP/MS (Metals)	ICAL	Daily	Analyze a blank standard and a Multi-Point with R^2 > 0.990.	Check solutions, Check instrument. Recalibrate, Document CA.	Laboratory Analyst	BU-TM-1002-v12 ICPMS
ICP/MS (Metals)	ICV	Analyzed after the ICAL	The ICV must be within ±10% of the true value, with a RSD of <5% from 3 replicate integrations.	Reanalyze ICV, Recalibrate, Reanalyze affected samples Document CA.	Laboratory Analyst	BU-TM-1002-v12 ICPMS

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP/MS (Metals)	CCV	The CCV and continuing calibration blank (CCB) pair are analyzed after standardization and after every 10 samples	The CCV must be within ±10% of the true value; the RSD for individual burns of the CCV must be ≤ 5% RPD.	Reanalyze ICV, Recalibrate, Reanalyze affected samples Document CA.	Laboratory Analyst	BU-TM-1002-v12 ICPMS
Balance (PM10)	Check Weights	Daily	2g certified weight within 2mg of certified value.	Clean balance surface, re-tare and reweigh. Annual Service.	Laboratory Analyst	BU-TP-2002-v05 Particulates
CVAA (Hg)	ICAL	Daily	Analyze a blank standard and a Multi-Point with R > 0.995.	Check solutions, Check instrument, Recalibrate Document CA.	Laboratory Analyst	BU-TM-1001-v05 CVAA
CVAA (Hg)	ICV	Analyzed after the ICAL	The ICV must be within ±10% of the true value.	Reanalyze ICV, Recalibrate, Reanalyze affected samples Document CA.	Laboratory Analyst	BU-TM-1001-v05 CVAA

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
CVAA (Hg)	CCV	The CCV and continuing calibration blank (CCB) pair are analyzed after standardization and after every 10 samples	The CCV must be within +15% of the true value.	Reanalyze ICV, Recalibrate, Reanalyze affected samples Document CA.	Laboratory Analyst	BU-TM-1001-v05 CVAA
GC/MS (SVOCs)	DFTPP Tuning Verification	Once every 12-hours or analytical batch	Ion abundance criteria as described in Table 3 of Method TO-13A.	1) Repeat DFTPP analysis. 2) Retune instrument (no samples may be accepted without a valid tune).	Analyst/ Supervisor	SVO-13A, Rev.15

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS (SVOCs)	Initial Calibration (ICAL) – minimum of five levels	Initially or if continuing calibration no longer meets criteria	1) Minimum RRF achieved – see Table 7 of Method TO-13A. 2) Maximum %RSD not to exceed 30% 3) Coefficient of determination ≥0.99 for linear regression. 4) Retention time for each IS within 20s of the mean retention time over the ICAL range. 5) RRT must be within ±0.06 RRT units of the mean RRT for the compound.	1) May repeat 1 point (if 5 levels) or 2 points (if 6+ levels). 2) Inspect the system for problems and perform required maintenance 3) Repeat initial calibration. Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.	Analyst/ Supervisor	SVO-13A, Rev.15
GC/MS (SVOCs)	Initial Calibration Verification (ICV)	Following every ICAL	1) Minimum RRF achieved – see Table 7 of Method TO-13A. 2) Percent difference of +/-30%.	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Problem must be corrected. Samples may not be analyzed until there is a valid ICV.	Analyst/ Supervisor	SVO-13A, Rev.15

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS (SVOCs)	Continuing Calibration Verification (CCV)	Once every 12 hours, if an ICAL has not been performed (within the last 12 hours).	1) Minimum RRF achieved – see Table 7 of Method TO-13A. 2) Percent difference of +/-30%. Note: If CCV is biased high and analyte is ND (not detected) results are acceptable. It will be noted in case narrative.	1) Reanalyze CCV. 2) Identify and correct problem; re-analyze and if necessary qualify the data. 3) Repeat initial calibration if CCV corrective action is unsuccessful.	Analyst/ Supervisor	SVO-13A, Rev.15

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
HRGC/ HRMS (Dioxins/ Furans/ PCBs)	Pumps	N/A	Check pump pressure, check for leaks.	Weekly	Calibration check standards pass	Refer to instrument maintenance manual	Analyst/ Supervisor	HE-HMS001 HE-HMS1668C
	Check pressure and gas supply		N/A	Daily	Pressure ≥ 50 psi	Replace gas tank		
	Change Septum		N/A		N/A	N/A		
	Change injection port liner		Review Column Performance check for acceptance		Valley for TCDD ≤ 25% for PCB-34 & -23/ PCB-187 & -182, ≤ 40%	Change the port liner and rerun the column performance		
	Clip Analytical Colum				Valley for TCDD ≤ 25% for PCB-34 & -23/ PCB-187 & -182, ≤ 40% CCV acceptable	Clip the first foot of the capillary column		
	Replace Guard Column				Valley for TCDD ≤ 25% for PCB-34 & -23/ PCB-187 & -182, ≤ 40% CCV acceptable	Replace guard column and rerun the column performance or CCV		

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
HRGC/ HRMS (Dioxins/ Furans/ PCBs)	Replace Analytical Column	N/A	Review Column Performance check for acceptance	Daily	Valley for TCDD ≤ 25% for PCB-34 & -23/ PCB-187 & -182, ≤ 40% CCV acceptable	Replace analytical column and demonstrate acceptable system performance	Analyst/ Supervisor	HE-HMS001 HE-HMS1668C
	Clean MS Source				Valley for TCDD ≤ 25% for PCB-34 & -23/ PCB-187 & -182, ≤ 40% CCV acceptable	Clean the MS Source demonstrate acceptable system performance		
	Replace pump oil	N/A	N/A	Annually	N/A	N/A		
GCMS (VOCs TO15)	Concentrating Trap: Routine maintenance includes periodic solvent cleaning	N/A	N/A	As needed	N/A	Clean with solvent	Analyst/ Supervisor	VOA-TO15 _Rev.19
	Column performance		Monitored by observing both peak shapes and column bleed.	Daily		Replace analytical column and demonstrate acceptable system performance		

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GCMS (VOCs TO15)	Vacuum System: Change the pump oil and check the molecular sieve in the backstreaming trap	N/A	N/A	Every six months	N/A	Change pump oil, check molecular sieve in trap.	Analyst/ Supervisor	VOA-TO15_Rev.19
	PTFE ferrules: Retighten/replace			Whenever desorber is turned off and heaters are allowed to cool		NA	Analyst	
GC/MS (SVOCs)	Replace septum	N/A	N/A	As Needed	Acceptable CCV	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst/ Supervisor	SVO-13A, Rev.14
	Replace injection port liner							
	Detector maintenance: Cleaning and/or replacing jets and collectors; replacing O-rings, etc.							

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP/MS	Check pumps and tubing	Calibration check standards pass	N/A	Daily, as needed, or when used	Calibration check standards pass (90-110%, per IO 3.5)	Reanalyze and if needed recalibrate, per SOP Section 8.2	Laboratory Analyst	BU-TM-1002-v12 Metals by ICP/MS
	Clean nebulizer							
	Clean sample probe							
	Check plumbing							
CVAA	Change reagent tubing	Calibration check standards pass	N/A	As needed	Calibration check standards pass (85-115%, per SOP)	Clean or replace tubing	Laboratory Analyst	BU-TM-1001-v05 Mercury Prep & Analysis via CVAA
	Change filter					Clean or replace filter		
	Change Hg absorber			Biannually		Change adsorber		
	Clean cell			Every 6 months or when contaminated		Clean cell		

Notes:
N/A= Not applicable

SAP Worksheet #26 –
Sample Handling System Table

SAP Worksheet #26 – Sample Handling System Table

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Field Team Leader- Kevin Lundmark / ERM, Salt Lake City, UT
Sample Packaging (Personnel/Organization): Field Team Leader- Kevin Lundmark / ERM, Salt Lake City, UT
Coordination of Shipment (Personnel/Organization): Field Team Leader- Kevin Lundmark / ERM, Salt Lake City, UT
Type of Shipment/Carrier: Courier and overnight shipping
SAMPLE RECEIPT AND ANALYSIS ALS Project Manager for the US Magnesium RI/FS Project – Samantha Henningsen, ALS Environmental, Simi Valley, CA
Sample Receipt (Personnel/Organization): Simi Valley Sample Management Office Supervisor - Manny Zamora Burlington Sample Receipt Technician - Alastair Blythe Houston: Sample Receipt Technician - Andrew Lopez
Sample Custody and Storage (Personnel/Organization): Simi Valley Sample Management Office Supervisor- Manny Zamora Burlington Sample Control Specialist - Alastair Blythe Houston: Sample Control Specialist – Andrew Lopez
Sample Preparation (Personnel/Organization): Simi Valley Department Supervisors - Wida Ang, Wade Henton, Madeleine Dangazyan Burlington Assistant Project Manager - Katrina Zwambag Houston: Extraction Technicians – Will McDounough, Hoi-Chi Lueng
Field Sample / Sample Extract Storage (No. of days from analysis): After all analyses have been completed and the final report has been generated and mailed to the client, sample media (filters and digestion solutions, PUF extract solvent) are held for up to 30 days for possible reanalysis. Summa Canister samples may be analyzed up to 30 days after sampling, and will be held for 7 days after analysis.

SAP Worksheet #26 – Sample Handling System Table

SAMPLE DISPOSAL
Personnel/Organization: Simi Valley Sample Management Office Supervisor- Manny Zamora Burlington Sample Control Specialist - Alastair Blythe Houston: Sample Control Specialist - Andrew Lopez
Number of Days from Analysis: Upon completion of all analyses, the laboratory samples are retained in accordance with the requirements specified in the analytical method SOPs and the laboratory SOPs for Waste Disposal (e.g., DSP-Waste). The samples are disposed according to approved disposal practices or returned to the client (if applicable). All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. This evaluation is generally based on results from analyses performed on the sample by ALS. It should be noted that all wastes produced at the laboratory, including the laboratory's own various hazardous waste streams, are treated in accordance with all applicable local, State and Federal laws. Complete documentation is maintained for samples from initial receipt through final disposal. This ensures an accurate record of the samples from "cradle to grave."

SAP Worksheet #27 –
Sample Custody Requirements

SAP Worksheet #27 – Sample Custody Requirements

27.1 FIELD SAMPLE CUSTODY PROCEDURES

Detailed field sample management procedures (including sample packaging and shipment to the laboratory) are described in Standard Operating Procedure (SOP) USM-04, SAMPLE MANAGEMENT. Generally, field sample custody procedures include the following:

- PUF samples (SVOCs, and PCBs/PCDDs/PCDFs)
  - Fold quartz filter and place in end of PUF cartridge
  - Ensure PUF cartridges are wrapped tightly in hexane rinsed aluminum foil
  - Place PUF cartridge in shipping container (e.g., a large-mouth glass jar with lid) and affix printed label with sample ID to shipping container
  - Wrap shipping container in bubble-wrap to protect from breakage
  - Place samples upright in a waterproof cooler with inert cushioning material lining the cooler bottom
  - Place blue ice around, among, and on top of the sample cartridges
  - Fill remaining space in cooler with inert cushioning material
  - Tape the original copy of the completed chain-of-custody record to the cooler lid inside a waterproof plastic bag
  - Place custody seals across the cooler closure in two locations
  - Label the cooler with the shipping address and return address

- Filter samples (PM_{10} and total suspended particulate [TSP] Metals)
  - Place recovered filter in the same folder it was delivered in
  - Label the folder with sample identification number prior to recovering the exposed filter from the filter holder
  - Place folders containing the samples in one large envelope
  - Place the envelope in a waterproof plastic bag
  - Pack samples in a sturdy box with cushioning material to ensure samples do not shift during transport
  - Place the original copy of the completed chain-of-custody record in the box inside a waterproof bag
  - Place custody seals across the closure of the box in two locations
  - Label the box with the shipping address and return address

- Summa canisters (VOCs)
  - Remove flow controller from canister and replace brass cap over the canister intake threads
  - Ensure sample label is attached to the canister
  - Place canister and flow controller in the shipping boxes they were delivered in
  - Place the chain-of-custody in the box with the canister and securely tape the box shut
  - Place custody seals across the closure of the box in two locations

  - Label the box with the shipping address and return address

Coolers and boxes will be delivered to the FedEx shipping center at the Salt Lake City International Airport on an as-needed basis to ensure that holding times listed in Worksheet #19 are met. Shipping addresses for the laboratories are provided in Worksheet #30.

27.2 SAMPLE IDENTIFICATION PROCEDURES

Each sample collected will have a unique sample identification (ID) number. A sample label will be affixed to each sample container. The sample label, at a minimum, will be completed with the following information:

- Client name (ERM) and ERM project number
- Sample ID number
- Date and time of sample collection
- Initials of sampler
- Analysis to be performed

Sample IDs should include the following formats:

> ***PRI18-XX-METHOD-YY-MMDDYY***
>
> where:
>
> ***PRI18-XX*** is the location ID. These are identified in Worksheet #18.
>
> ***METHOD*** is the analytical method used to analyzed the sample (TO-13, TO-4/TO-9, TSP, PM10, TO-15)
>
> ***YY*** is a sequential number for the sample
>
> > Primary sample – 01
> >
> > Field Duplicate (Field QC Sample) – 11
> >
> > Field Blank (Field QC Sample) – 21
>
> ***MMDDYY*** is the date the sample was collected (not the date started).

Field QC samples are identified in Worksheet #20 and include field duplicates and field blanks. Duplicate and field blank samples should have a sequential number so they are blind to the lab, rather than appending with a "D" or an "FB."

27.3 CHAIN-OF-CUSTODY PROCEDURES

Chain-of-custody procedures require a written record of the possession of individual samples from the time of collection through laboratory analyses. A sample is considered in custody under any one of the following circumstances:

- In a person's possession
- In view after being in physical possession
- In a secured condition after having been in physical custody
- In a designated secure area, restricted to authorized personnel

A chain-of-custody record will be used to document the samples collected, sample custody, and the required analyses. Information recorded by field personnel on the chain-of-custody record will include the following:

- Client name (ERM) and ERM project number (1032320)
- Signature of sampler(s)
- Sample identification numbers
- Date and time of sample collection
- Signature of individuals involved in custody transfer (including date and time of transfer)
- Airbill number
- Number of samples collected for each analysis
- Type of analysis and laboratory method number
- Any comments or special instructions regarding individual samples

All chain-of-custody entries will be made using waterproof, indelible black ink and will be legible. Any errors will be corrected by drawing a single line through the incorrect entry, entering the correct information, and then initialing and dating the change. If multiple coolers are sent in one shipment to the laboratory, one cooler will have the original chain-of-custody record and the other coolers will have copies. The plastic bag in which the chain-of-custody records are placed will be marked "ORIGINAL" or "COPY," as appropriate. In addition, the outside of the coolers will be marked to indicate how many coolers are in the shipment. The chain-of-custody will also indicate the number of coolers and/or the specific cooler identification number covered under the chain-of-custody.

Samples are being transported to the laboratory by a commercial carrier. The airbills or other applicable bills of lading will serve as evidence of custody transfer between the field sampler and carrier, as well as carrier and laboratory. Custody seals will be used on each shipping container to ensure custody and will consist of security tape with the date and initials of the sampler. At a minimum, custody seals will be placed in two locations across the cooler closure to ensure that any tampering is detected.

SAP Worksheet #27 – Sample Custody Requirements

The sampler will retain copies of the chain-of-custody record and airbills, or bills of lading. Hard copies of chain-of-custody records and airbills/bills of lading will be provided to the Field Team Leader and will be managed in accordance with the Data Management Plan.

27.4 LABORATORY SAMPLE CUSTODY PROCEDURES

Each analytical laboratory has internal SOPs describing custody procedures. Laboratory sample handling procedures, including receipt, archival, and disposal of samples are described in Worksheet #26.

SAP Worksheet #28 - Laboratory QC Samples Table

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	VOCs
Analytical Method/ SOP Reference	EPA Method TO-15 VOA-TO15

QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank (MB)	Once every analytical batch of 20 or fewer samples	TO-15 / VOA-TO15 No analyte detected equal to or above the reporting limit (QL)	1) Reanalyze blank 2) Identify and correct problem 3) Reanalyze blank and affected samples 4) Qualify data	Analyst	Bias	No analytes detected less than half the QL
Laboratory Control Sample (LCS)	Once every analytical batch of 20 or fewer samples	TO-15 / VOA-TO15 Percent recovery (%R) within laboratory generated limits	1) Reanalyze blank 2) Identify and correct problem 3) Qualify data	Analyst	Accuracy	Laboratory statistically derived control limits
Internal Standards	All field and QC samples.	Percent recovery within 40% (+/-) of CCV or midpoint in the ICAL	Reanalyze samples	Analyst	Accuracy	60 - 140%
Surrogate Monitoring Compounds	All field and QC samples.	Percent recovery within 70%-130%	Reanalyze samples	Analyst	Accuracy	70 - 130%

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	PCBs
Analytical Method/ SOP Reference	HE-HMS1668A

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	Once every analytical batch of 20 or fewer samples	No target compounds ≥ Minimum Level as defined in the 1668A Reference Method	Analyze an instrument blank to demonstrate instrument is free of possible contamination. Evaluate whether entire sample batch must be re-extracted. If reanalysis cannot be performed, qualify the data and explain in case narrative.	Analyst	Accuracy/Bias	Detections < QL
Laboratory Control Sample (LCS)	One per preparatory batch	Native PCB congener recoveries of 60-135%	If LCS or LCSD out, evaluate the labeled standard(s) associated with the compound(s). If associated labeled standards out, evaluate the associated labeled standard(s) in the sample(s). If labeled standard(s) in the sample(s) out, re-extract the samples. If labeled standard(s) meet the acceptance criteria, release the test results.	Analyst	Accuracy	60-135%
Surrogate Monitoring Compounds	All field and QC samples.	Surrogate recovery: 5-145% for C-13 labeled mono- thru tri-; 10-145% for C-13 labeled tetra thru deca-	If the surrogate is out, evaluate the sample(s) for matrix interference. Also evaluate the surrogate standard for any signs of degradation. Flag the data accordingly.	Analyst	Accuracy	5-145 and 10-145%

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	SVOCs
Analytical Method/ SOP Reference	TO-13A Modified/ SVO-13A

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	Once every analytical batch of 20 or fewer samples	TO-13 Modified No analyte detected equal to or above the reporting limit (QL)	1) Reanalyze blank 2) Identify and correct problem 3) Reanalyze blank and affected samples 4) Qualify data	Analyst	Bias	No analytes detected less than half the QL
LCS/LCSD	Once every analytical batch of 20 or fewer samples	40-120% Recovery	1) Reanalyze LCS and/or LCSD 2) Identify and correct problem 3) Qualify data	Analyst	Accuracy/Bias	30% RPD
Internal standards	All field and QC samples	-50 to +100% of the most recent continuing calibration analysis	Evaluate and reanalyze if possible. Determine if matrix interference is the cause. Report data with qualifiers.	Analyst	Accuracy	-50 to +100%
Surrogate Monitoring Compounds	All field and QC samples.	40-120% Provisional limits until sufficient data points available for generation of statistical limits	If the surrogate is out, evaluate the sample(s) for matrix interference. Also evaluate the surrogate standard for any signs of degradation. Flag the data accordingly.	Analyst	Accuracy	40-120%

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	Dioxins and Furans
Analytical Method/ SOP Reference	EPA Method TO9A HE-HMS001

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	Analyze after calibration standards and prior to sample analysis / One per preparatory batch	No target compounds ≥ QL OR > 1/10 amount measured in any sample	Analyze an instrument blank to demonstrate instrument is free of possible contamination. Evaluate whether entire sample batch must be re-extracted. If reanalysis cannot be performed, qualify the data and explain in case narrative.	Analyst	Accuracy/Bias	Detections < QL
Laboratory Control Sample (LCS)	One per preparatory batch	70-130% recovery	If LCS or LCSD out, evaluate the labeled standard(s) associated with the compound(s). If associated labeled standards out, evaluate the associated labeled standard(s) in the sample(s). If labeled standard(s) in the sample(s) out, re-extract the samples. If labeled standard(s) meet the acceptance criteria, release the test results.	Analyst	Accuracy	70-130%
Internal Standards	All field and QC samples.	50-120% recovery for tetra, penta, hexa 40-120% for hepta and octa	Evaluate affect on calculation of native compounds. Qualify data in case narrative if reanalysis cannot be performed.	Analyst	Accuracy	same as acceptance limits

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	Particulate Borne Metals
Analytical Method/ SOP Reference	EPA IO 3.1/3.5 BU-TM-1002-v13 ICPMS

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	Once every analytical batch of 20 or fewer samples	Less than 3x the filter background	1) Reanalyze blank 2) Identify and correct problem 3) Reanalyze blank and affected samples 4) Qualify data 5) Initiate a Non-Conformance Report	Analyst	Bias/Contamination	Same as QC Acceptance Limits
Laboratory Control Samples (LCS)	Once every analytical batch of 20 or fewer samples	Percent recovery (%R) within laboratory generated limits (+/- 20%)	1) Identify and correct problem 2) Qualify data	Analyst	Accuracy/Bias	Same as QC Acceptance Limits
MS/MSD	Once every analytical batch of 20 or fewer samples if required	Percent recovery (%R) within laboratory generated limits (+/- 25%)	1) Identify and correct problem 2) Qualify data	Analyst	Accuracy/Bias	Same as QC Acceptance Limits

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	Mercury in Air
Analytical Method/ SOP Reference	EPA IO 3.1/CVAA BU-TM-1001-v05 CVAA

QC Sample	**Frequency / Number**	**Method / SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank (MB)	Once every analytical batch of 20 or fewer samples	Less than the Reporting Limit	1) Reanalyze blank 2) Identify and correct problem 3) Reanalyze blank and affected samples 4) Qualify data 5) Initiate a Non-Conformance Report	Analyst	Bias/Contamination	Same as QC Acceptance Limits
Laboratory Control Samples (LCS)	Once every analytical batch of 20 or fewer samples	Percent recovery (%R) within laboratory generated limits (+/- 20%)	1) Identify and correct problem 2) Qualify data	Analyst	Accuracy/Bias	Same as QC Acceptance Limits
MS/MSD	Once every analytical batch of 20 or fewer samples if required	Percent recovery (%R) within laboratory generated limits (+/- 25%)	1) Identify and correct problem 2) Qualify data	Analyst	Accuracy/Bias	Same as QC Acceptance Limits

SAP Worksheet #28 - Laboratory QC Samples Table

Matrix	Air
Analytical Group	TSP/PM10
Analytical Method/ SOP Reference	EPA IO 2.3 BU-TP-2002-v05 Particulates

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	Once every analytical batch of 20 or fewer samples	Less than the QL	1) Qualify Data 2) Initiate a Non-conformance report	Analyst	Negative bias	Unspiked media blank is analyzed to confirm accuracy and precision

SAP Worksheet #29 – Project Documents and Records Table

SAP Worksheet #29 – Project Documents and Records Table

The list of project documents and records for this project, the locations where these materials are maintained, and the requirements for analytical data packages are identified in Worksheet #29 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP), which is included in Appendix E of this SAP.

SAP Worksheet #30 – Analytical Services Table

SAP Worksheet #30 – Analytical Services Table

Matrix	Analytical Group	Sample Locations/ ID Number	Analytical Method	Data Package Turnaround Time	Laboratory
Air	PM10	Refer to WS#18	USEPA Method IO-2.1	15 Days	ALS Environmental 5420 Mainway Drive #5Burlington ON L7L 6A4 (905) 331-3111 Shipping Address: Attn: Lynne Wrona ALS Environmental c/o Federal Express Depot 299 Cayuga Road Cheektowaga, NY 14225 (905) 331-3111
Air	Total Particulate Metals	Refer to WS#18	USEPA Method IO-3.1/3.5	15 Days	
Air	Dioxins/ Furans	Refer to WS#18	USEPA Method TO-9A, with High-Res GC/MS	20 Days	Attn: HRMS/Arthi Kodur ALS Environmental 10450 Stancliff Road, Suite 210 Houston, TX 77099 (281) 530-5656
Air	PCB	Refer to WS#18	USEPA Method 1668A, with High-Res GC/MS	20 Days	
Air	SVOC	Refer to WS#18	USEPA Method TO-13A, with High-Res GC/MS	10 Days	ALS Environmental – Simi Valley 2566 Park Center Dr. Suite A Simi Valley, CA 93065 (805) 526-7161
Air	VOC	Refer to WS#18	USEPA Method TO-15	10 Days	

Notes:
WS = Worksheet

SAP Worksheet #31 – Planned Project Assessments Table

SAP Worksheet #31 – Planned Project Assessments Table

Planned project assessments and the roles and responsibilities of those conducting assessments and responding to assessment findings are described in Worksheet #31 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP), which is included in Appendix E of this SAP.

SAP Worksheet #32 – Assessment Findings and Corrective Action Responses

SAP Worksheet #32 – Assessment Findings and Corrective Action Responses

Assessment findings and corrective action responses are described in Worksheet #32 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP), which is included in Appendix E of this SAP.

SAP Worksheet #33 –
QA Management Reports Table

SAP Worksheet #33 – QA Management Reports Table

Quality Assurance (QA) Management Reports are described in Worksheet #33 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP), which is included in Appendix E of this SAP.

SAP Worksheet #34 – Verification (Step I) Process Table

SAP Worksheet #34 – Verification (Step I) Process Table

The data quality verification (Step I) process for verifying data to be legally and technically defensible is described in Worksheet #34 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP), which is included in Appendix E of this SAP.

SAP Worksheet #35 –
Validation (Steps IIa and IIb)
Process Table

SAP Worksheet #35 – Validation (Steps IIa and IIb) Process Table

The validation process (Steps IIA and IIB) for the implementation of daily operations and laboratory analyses is described in Worksheet #35 of the September 2013 Phase 1A Sampling and Analysis Plan (SAP), which is included in Appendix E of this SAP.

SAP Worksheet #36 – Validation (Steps IIa and IIb) Summary Table

SAP Worksheet #36 – Validation (Steps IIa and IIb) Summary Table

36.0 DATA VALIDATION AND USABILITY

This section describes the minimum procedures that US Magnesium/ERM will use to review, verify, and validate field and laboratory data. This section also discusses procedures for verifying that the data are adequate to meet project quality objectives (PQO) and measurement quality objectives (MQO) for the project. Validation and verification of the data generated during field and laboratory activities are essential to obtaining defensible data of acceptable quality. Verification and validation methods for field and laboratory activities are presented below.

36.1 FIELD DATA VERIFICATION

Project personnel will verify field data through reviews of data sets to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this Phase 1A RI Sampling and Analysis Plan (SAP) so that defensible and justifiable data are obtained.

Data values that are significantly different from the population are called "outliers." A systematic effort will be made to identify any outliers or errors before field personnel report the data. Outliers can result from improper sampling or measurement methodology, data transcription errors, calculation errors, or natural causes. Outliers that result from errors found during data verification will be identified and corrected; outliers that cannot be attributed to errors in sampling, measurement, transcription, or calculation will be clearly identified in project reports.

36.2 LABORATORY DATA VERIFICATION

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method and any project-specific adjustments required by this SAP. Laboratory personnel will make a systematic effort to identify any outliers or errors before reporting the data. Outliers that result from errors found during data verification will be identified, corrected, and documented by corrective action procedures; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package.

36.3 LABORATORY DATA VALIDATION

An independent third-party contractor will validate all laboratory data in accordance with current EPA national functional guidelines (EPA 2008, 2010, 2011). Ninety percent of the data for the Phase 1A RI will undergo cursory verification/validation, and 10 percent of the data for the Phase 1A RI will undergo full validation for this project. Requirements for cursory and full validation are listed below.

SAP Worksheet #36 – Validation (Steps IIa and IIb) Summary Table

Cursory Data Validation

Cursory verification/validation (Stage 2B) will be completed on 90 percent of the summary data packages for the Phase 1A RI. This verification/validation requires a completeness review of the data packages for all deliverables required in Worksheet #29 with particular attention to the confirmation by the laboratory contained in the case narrative that the methods were performed according to this Phase 1A RI SAP. The Stage 2B verification/validation will confirm the quality control (QC) portion of the package meets the stated performance ranges or are specifically cited in the narrative. (The remaining 10 percent of the packages will be subjected to full validation.) The third-party data reviewer will request any missing information needed from the laboratory. Missing information will be saved in the project files and incorporated as addenda to the laboratory data packages stored on the ERM Scottsdale server. Elimination of the data from the review process is not allowed. All data will be qualified as necessary in accordance with established criteria. Data summary packages will consist of sample results and QC summaries, including calibration and internal standard data. Electronic Data Deliverable (EDD) verification with the laboratory package data will be consistent with the project-specific DMP.

Full Data Validation

Full validation (Stage 4) will be completed on 10 percent of the full data packages for the Phase 1A RI. The third-party data reviewer will request any missing information needed from the laboratory. Missing information will be saved in the project files and incorporated as addenda to the laboratory data packages stored on the ERM Scottsdale server. Elimination of data from the review process is not allowed. All data will continue through the validation process and will be qualified in accordance with established criteria. Data packages will consist of sample results, QC summaries, and all raw data associated with the sample results and QC summaries.

36.4 DATA VALIDATION CRITERIA

Data validation criteria are presented in Table 36-1.Worksheet #12, #24, #25, and #28, along with the analytical methods and laboratory standard operating procedures (SOPs), list the QC checks and criteria that will be reviewed for both cursory and full data validation. The data validation criteria selected from Table 36-1 will be consistent with the project-specific analytical methods referenced in Worksheet #19.

SAP Worksheet #36 – Validation (Steps IIa and IIb) Summary Table

Data Validation Criteria

Step	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Air	HRGC/HRMS PCBs	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	Dioxins	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	Semi-volatiles	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	PAHs	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	Volatiles	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	ICP/MS Metals	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	Mercury	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIa	Air	Particulates	In accordance with this SAP and the method SOP established through the DMA	Laboratory QA Manager
IIb	Air	HRGC/HRMS PCBs	In accordance with this SAP, EPA Method 1668C (SOP HE-HMS002), and EPA National Functional Guidelines (2011). See note [i]	Data Validation Contractor Project Manager
IIb	Air	Dioxins	In accordance with this SAP, the Compendium Method TO-9A (SOP HE-HMS001), and EPA National Functional Guidelines (2011). See note [i]	Data Validation Contractor Project Manager

SAP Worksheet #36 – Validation (Steps IIa and IIb) Summary Table

Step	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIb	Air	Semi-volatiles	In accordance with this SAP, EPA Compendium Method TO-13A, (SOPs SVP-13A Rev.12 and SVO-13A Rev.15), and EPA National Functional Guidelines (2008)	Data Validation Contractor Project Manager
IIb	Air	PAHs	In accordance with this SAP, EPA Compendium Method TO-13A (SOPs SVP-13A Rev.12 and SVO-13A Rev.15), and EPA National Functional Guidelines (2008)	Data Validation Contractor Project Manager
IIb	Air	Volatiles	In accordance with this SAP and EPA Compendium Method TO-15 (SOP VOA-TO-15 Rev.19) and EPA National Functional Guidelines (2008)	Data Validation Contractor Project Manager
IIb	Air	ICP/MS Metals	In accordance with this SAP and EPA Compendium Method IO 3.5 (SOP BU-TM-1002-v13), and EPA National Functional Guidelines (2010)	Data Validation Contractor Project Manager
IIb	Air	Mercury	In accordance with this SAP and EPA Compendium Method IO 3.1 (SOP BU-TM-1001-v05), and EPA National Functional Guidelines (2010)	Data Validation Contractor Project Manager
IIb	Air	Particulates	In accordance with this SAP and EPA Compendium Method IO 2.3 (SOP BU-TP-2002-v05), and EPA National Functional Guidelines (2010)	Data Validation Contractor Project Manager

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[i] Validation of Estimated Maximum Potential Concentration (EMPC) Results - PCB and dioxin/furan (D/F) data qualified by the laboratory as an EMPC will be qualified during data validation as not-detected, with the detection limit reported as the EMPC concentration. EMPC results will be assigned a "UQ" qualifier to differentiate them from other not-detected results. The basis for qualification of EMPC results as not-detected is described in Worksheet 36 of the Phase 1A SAP (ref?).

SAP Worksheet #37 –
Usability Assessment

SAP Worksheet #37 – Usability Assessment

The data usability evaluation for Phase 1A RI air data will include comparison of analytical results to measurement quality objectives (MQOs) and an evaluation of the sampling and analytical program against the study design data quality objectives (DQOs). This SAP worksheet describes the usability assessment to be performed to evaluate data against project MQOs and DQOs.

37.1 MEASUREMENT QUALITY OBJECTIVES

All analytical results will be evaluated in accordance with precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the project objectives. The definitions of the terms PARCCS are provided in the UFP-QAPP Manual (USEPA 2005):

> Precision — The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, or range, in either absolute or relative terms.
>
> Accuracy — The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias), components that are due to sampling and analytical operations.
>
> Representativeness — A measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition.
>
> Completeness —A measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct, normal conditions.
>
> Comparability — The degree to which different methods or data agree or can be represented as similar. Comparability describes the confidence that two data sets can contribute to a common analysis and interpolation.
>
> Sensitivity — The capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.

The following subsections describe each PARCCS parameter and how it will be assessed for the Phase 1A RI for Air (OU-2). Of the PARCCS parameters, precision and accuracy will be evaluated quantitatively by collecting the QC samples listed in Worksheets 20 and 28 of this SAP.

SAP Worksheet #37 – Usability Assessment

37.1.1 PRECISION

Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. Usually, combined field and laboratory precision are evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples as a relative percent difference (RPD):

$$RPD = \frac{2 \times |A - B|}{A + B} \times 100\%$$

where:

A = First duplicate concentration
B = Second duplicate concentration

Overall precision associated with discrete air sampling and laboratory analysis is evaluated by analyzing field duplicate samples (see Worksheet 20). Calculation of RPD is performed for those analytes detected above the reporting limit in duplicate samples from the same sampling method. Laboratory analytical precision is evaluated by analyzing laboratory duplicates or matrix spike/matrix spike duplicate (MS/MSD) samples, if appropriate for the method. For the Phase 1A RI for Air (OU2) analytical program, laboratory duplicates will be analyzed for metals, PM_{10}, and VOCs only, and MS/MSD will be analyzed for metals only (see Worksheets 12 and 28). The results of the analysis of each field, laboratory, and MS/MSD or duplicate pair will be used to calculate an RPD for evaluating precision. Worksheets 12 and 28 present the precision goals for this project.

A different precision evaluation is suitable for large sets of paired instrumental concentration data points, such as those recorded by the BM25 monitors for Cl_2 and HCl. These data sets are evaluated using a Wilcoxon Signed Rank Test, as recommended by USEPA guidance (*Quality Assurance Handbook for Air Pollution Measurement Systems, Vol. II Ambient Air Quality*, EPA-454/B-08-003, Dec. 2008, Section 18). This is a non-parametric test to assess the hypothesis that two data sets represent the same population, and therefore differences between the data sets are not significant. The method does not require that the data or the values of differences between paired data be normally distributed. The analysis is based on the differences, both direction and magnitude, between concurrent data pairs. Data pairs are discarded if both are non-detects, or are identical values. Remaining data-pair differences are ranked according to magnitude, and the ranks of positive and negative deviations are summed. For small data sets (N < 30), the methods calculates a "W statistic" for the ranked set of data pair differences. For large data sets, the data-pair differences typically are normally distributed, and a corresponding "Z statistic" is calculated. Then, comparison of either the W or Z statistic to the critical value, P, is used to assess significance of the data set differences.

37.1.2 ACCURACY

Field sampling accuracy will be assessed by collecting and analyzing field blank QC samples, calibrations of air sampler flow rate, preparing PUF sampling media using field spikes, and analyzing backup sorbent media, when appropriate for the sampling method (see Worksheets 12 and 20). Field blank QC samples will be used to evaluate the potential for target analytes to enter samples as a result of sampling processes (potential bias).

For PUF sampling media field spikes, which are surrogates and/or isotopically-tagged compounds spiked into the PUF media prior to shipping the cartridges to the field, will be used to evaluate potential bias due to sampling process for SVOCs, PCBs, and PCDD/PCDF. Backup media will be used to monitor for target analyte breakthrough or field surrogate loss from primary sampling media for SVOCs, PCBs, and PCDD/PCDF. Worksheet 12 presents the accuracy goals for filed QC samples for the Phase 1A RI for Air (OU2).

Laboratory analytical accuracy will be evaluated based on the results of analyses of method/process blank samples, MS/MSD samples, laboratory control samples (LCS) and through the use of surrogate monitoring compounds and internal standards, as appropriate for each method. Accuracy of gravimetric laboratory measurements of total sample mass, as used for PM10 and TSP metals analyses, is assured by periodic multi-point calibrations of the laboratory scales, using traceable standards. Laboratory QC samples and the associated accuracy goals are described in Worksheets 12 and/or 28 of this SAP. Results that fall outside the accuracy goals will be evaluated further on the basis of the results of other QC samples.

The results of the spiked samples are used to calculate percent recovery (%R) for evaluating accuracy.

$$\%R = \frac{S - M}{T} \times 100\%$$

where:

S = Measured mass in sample
M = Unspiked air sample mass
T = True or actual mass of the spike

For ambient air samples, the accuracy of reported concentration values also relies on quality assurance procedures for sampler air flow rate. High-volume sampling methods (i.e., TO-4A, TO-9A, TO-13A, PM10 and TSP metals) require an initial multi-point calibration to validate the correlation between the individual sampler air flow rate and pressure drop across an orifice reference standard. The multi-point calibrations are performed just prior to the start of each sampling deployment for Phase 1A. After collection of each sample, a single-point flow audit check is performed following procedures in each method, to assess flow consistency and accuracy. The results of the single-point audit are reported as a percent difference between initial and final values of calculated air flow, based on a single-flow reading with the orifice reference standard.

37.1.3 REPRESENTATIVENESS

For this project, representative data will be obtained through careful selection of sampling locations and analytical parameters, as described in Worksheet 11, Section 11.3.7. Representative data will also be obtained through proper collection and handling of samples to avoid interference and minimize contamination. Representativeness of data will also be ensured through consistent application of established field and laboratory procedures, as provided in USEPA Compendium Methods. Laboratory blank samples will be evaluated for presence of contaminants to aid in evaluating representativeness of sample results.

37.1.4 COMPLETENESS

Completeness is a measure of the percentage of project-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with QC procedures outlined in this SAP, and when none of the QC criteria that affect data usability are exceeded. When all data validation is completed, the percent completeness value will be calculated by dividing the number of useable sample results by the total number of sample results planned for this investigation. Based on assumed statistical criteria to established sample size for OU-2 Phase 1A, a minimum of 29 acceptable samples from each method for chronic toxicants, not counting duplicates, is expected to comprise a complete data set (refer to Worksheet 11, Section 11.3.7.2.2).

As discussed further in Section 37.2, completeness will also be evaluated during the comparison of the data set to DQOs. This evaluation will help determine whether the Phase 1A RI for Air (OU-2) data set is adequately complete to support the use of the data for COPC selection. On the basis of this evaluation and with concurrence of USEPA, the Phase 1A sampling timeframe may be extended to allow collection of additional samples for some or all of the chronic toxicants.

37.1.5 COMPARABILITY

Comparability of data will be achieved by consistently following standard field and laboratory procedures described in USEPA Compendium Methods and by using standard measurement units in reporting analytical data. Field procedures will be standardized to ensure comparability. Comparability of laboratory data will be assured by use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, or similar units), and consistency in reporting units (ppm, ppb, and so forth).

37.1.6 SENSITIVITY

Sensitivity will be evaluated by comparing the quantitation limit (QL) and detection limit (DL) of each non-detected result to the associated Target Quantitation Limit (TQL). The DL is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The QL represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a specific sample matrix. The TQLs for the Phase 1A RI for Air (OU-2) are equal to the USEPA human health Regional Screening Levels for ambient air, which are also equal to the Risk Based Concentrations (RBCs) for air identified in the Screening Level Risk Assessment Technical Memorandum (ERM 2014).

Analytical methods have been selected for this project so that the QL, or less preferably the DL, for each target analyte is below the applicable comparison criteria wherever practical. Worksheet 15 compares the QLs and DLs for each analytical method to the TQLs. This comparison shows that the selected analytical methods and the associated QLs and/or DLs are capable of quantifying the candidate COPCs at concentrations below the applicable screening criteria, in most cases. For the Phase 1A RI for Air (OU-2) program, analytical results will be reported to the DL. All analytes will be reported as estimated values if concentrations are less than the QL but greater than the DL.

37.2 DATA QUALITY OBJECTIVES

The adequacy of data relative to the project DQOs will be reviewed by ERM and USEPA to assess whether the data set acquired during Phase 1A RI Air (OU-2) program might have limitations that could reduce confidence in COPC selection. As described in Worksheet 11, Section 11.3.7.2.3, the key factors that influence the level of confidence include:

- Whether the plant was operating in a normal manner (i.e., >90% of typical production rates) so that emissions during Phase 1A are representative;
- Whether or not dispersion modeling of the wind patterns during the time of acquisition of the Phase 1A samples demonstrates that it is likely that at least one sample in the data set contained a concentration equal to or exceeding the modeled $\bar{C}_{max}$;
- Review of continuous acute toxicants concentration trends (to be provided by near-continuous air monitoring for Cl_2 and HCl at each sampling station using BM25 monitors) that are expected to provide a physical indicator that, for at least some portion of a sampling period, the facility emissions were dispersed in the direction of the sample location. However, the data from the BM25 monitors are for qualitative purposes only and will not be considered sufficient to alter the conclusions of the data adequacy assessment.
- If an analyte was never detected, whether the analytical detection limit for that analyte was sufficient to detect it if it was present at a level of potential concern.

Each of these key considerations will be addressed as described in the following sections. Taken together the factors listed above should provide several lines of evidence to assess Phase 1A data adequacy and to support COPC selection. This is an accepted for monitoring evaluation of airborne pollutant impacts surrounding a source or group of sources. It is not uncommon for a limited set of discrete air samples alone to be inconclusive. Also, the variability of wind patterns from year to year reduces the accuracy of dispersion modeling as a predictive tool for future impacts. Consideration of multiple lines of evidence, and collection of a data set of sufficient size, improves the reliability of the overall data usability assessment.

37.2.1 Plant Operating Conditions

Advance interactions with US Magnesium will be conducted to ensure that plant operations during the Phase 1A sampling period will reflect normal operating conditions. If operations reflect conditions substantially below normal production rates, the Phase 1A data set might not be reliable for COPC selection. Samples obtained during conditions that show expected relative concentrations above modeled $\bar{C}_{max}$ (described in following sections) should also correspond to normal production rates to provide representative ambient air concentrations to support COPC selection. ERM will collect from US Magnesium the daily production records (e.g., material throughput summaries) to document plant operating level during the Phase 1A sampling event. Significant periods (i.e., of one day or longer) at lower-than-normal production may warrant extending the Phase 1A sampling event.

37.2.2 Assessing if One or More Samples Are Expected to Exceed the Modeled $\bar{C}_{max}$

As described in Worksheet 11, Phase 1A sampling locations for monitoring stack releases and/or fugitive releases were selected using AERMOD calculations where the probability of a sample exceeding the modeled $\bar{C}_{max}$ was expected to be high based on typical wind patterns for July-August-September. Whether or not any of the concentration values actually measured during Phase 1A are likely to exceed the modeled $\bar{C}_{max}$ will be evaluated using AERMOD as discussed in this section. *As required by USEPA, the sampling program will not be demobilized until USEPA concurs with ERM's AERMOD calculations and a finding of data adequacy*. This concurrence shall be discussed during a meeting following collection of the 30 (minimum) air samples to be collected under this SAP.

In general, the post-sampling AERMOD calculations will be performed as follows:

1. At each Phase 1A sampling station, use AERMOD to calculate the average relative concentration due to stack-only releases during each sampling interval during Phase 1A using the concurrent meteorological data from the ATI meteorological station. At each station, count the number of samples in which the relative concentration value exceeded the value of the modeled $\bar{C}_{max}$ (based on the 3 years of AERMOD data) for stack-only release.
2. At each Phase 1A sampling station, use AERMOD to calculate the average relative concentration due to fugitive-only releases during each sampling interval during Phase 1A using the concurrent meteorological data from the ATI meteorological station. At each station, count the number of samples in which the relative concentration value exceeded the value of the modeled $\bar{C}_{max}$ for fugitive-only release.

The procedures for collecting meteorological data, using those data to perform AERMOD calculations, and assessing Phase 1A RI data quality based on AERMOD results is included in Appendix F. It is anticipated that the process of conducting the AERMOD calculations and developing the receptor ranking results will be performed on approximately a weekly basis during Phase 1A, to assess the sampling conditions of the prior week. ERM will provide USEPA the meteorological data and AERMOD calculations on a weekly basis to allow concurrent evaluation by USEPA.

In principle, if at least one sample out of the combined data set (30 total samples) has a relative concentration that exceeds the modeled $\bar{C}_{max}$ for stack-only releases, the data set should be adequate for COPC selection for stack emissions. Likewise, if at least one sample out of the combined data set (30 total samples) has a relative concentration that exceeds the modeled $\bar{C}_{max}$ for fugitive-only releases, the data set should be adequate for COPC selection for fugitive sources. However, because AERMOD calculations of relative concentration may not be entirely accurate, and because AERMOD does not take random fluctuations in release rates into account, confidence in the adequacy of the data set increases with increases in the frequency and magnitude of AERMOD exceedances of the modeled $\bar{C}_{max}$.

In addition to the AERMOD calculations described above, the continuous trace of acute toxicants (to be provided by near-continuous air monitoring for Cl_2 and HCl at each sampling station using BM25 monitors) will provide a physical indicator that, for at least some portion of a sampling period, the facility emissions were dispersed in the direction of the sampler. This approach will provide a reasonable ability to detect the occurrence of plume contact at a given location, to corroborate the AERMOD assessments of relative concentration during the Phase 1A sampling period. However, the data from the BM25 monitors are for qualitative purposes only and will not be considered sufficient to alter the conclusions of the data adequacy assessment.

37.2.3 Assessing Detection Limit Adequacy

As described in Section 11.3.7.2.3 of Worksheet 11, the adequacy of analytical method DLs relative to Phase 1A RI objectives will be evaluated by classifying results for each analyte into one of three situations:

1. The chemical was detected one or more times, and the maximum detected value exceeded the RBC. Because the chemical was detected above the RBC, the DL is adequate for COPC selection (even if the detection limit exceeds the RBC).
2. The chemical was detected one or more times, and the maximum detected concentration did not exceed the RBC. This implies that the DL is lower than the RBC, so it may be concluded the detection limit was adequate. (Note, however, that if DLs for an analyte vary widely among samples, with some non-detect samples having DLs higher than the RBC, this conclusion may not be valid).
3. The analyte was never detected. In this case, if the DL is approximately constant among samples, and if the DL is equal to or less than the RBC, it may be concluded with

reasonable certainty that the analyte is unlikely to contribute significant risk and may be excluded as a COPC. If the DL in some or all non-detect samples is higher than the RBC, the chemical cannot be reliably excluded as a COPC without further rationale or assessment.

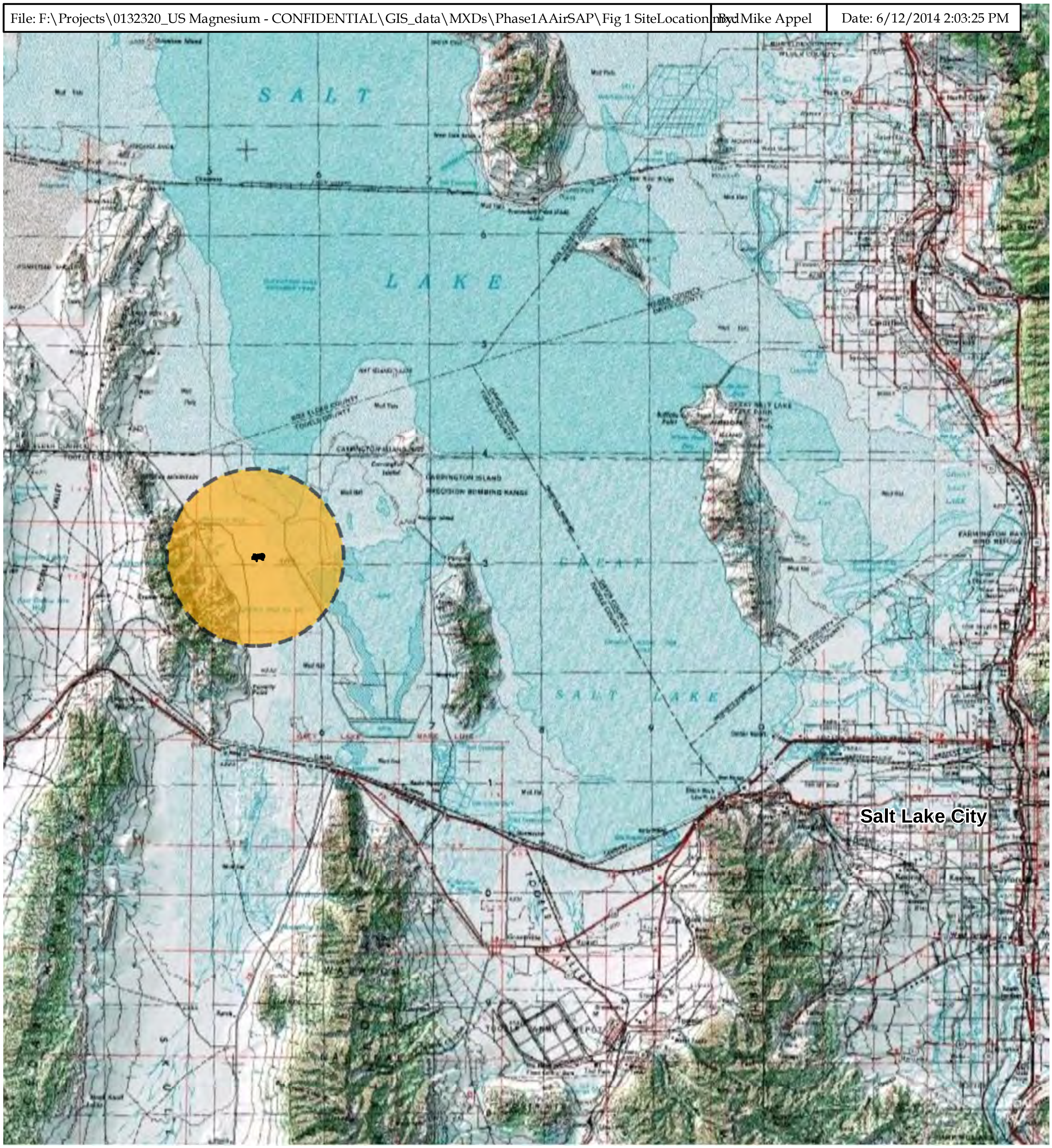
A comparison of individual analytical results to RBCs will be performed during the Phase 1A RI Air (OU-2) data usability assessment; however, the formal evaluation of Phase 1A RI Air (OU-2) data for COPC selection will be performed for the Screening Level Risk Assessment for OU-2, as described in the Screening Level Risk Assessment Technical Memorandum (ERM, 2014).

37.3 REPORTING

The Phase 1A RI for Air (OU-2) Data Report will discuss any potential impacts of these reviews on data usability, and will clearly define any limitations associated with the data. Laboratory managers are responsible for day-to-day identification of laboratory data issues and resolution of those issues, as identified in Worksheets 6 and 7. Data collected under this Phase 1A RI SAP shall be reported by US Magnesium/ERM; therefore, the ERM Project Manager and ERM Field Team Leader (Worksheet 3) will ensure proper documentation of data usability through the final reports and subsequent meetings as needed.

Appendix A
Figures

File: F:\Projects\0132320_US Magnesium - CONFIDENTIAL\GIS_data\MXDs\Phase1AAirSAP\Fig 1 SiteLocation.mxd | By: Mike Appel | Date: 6/12/2014 2:03:25 PM



● US Magnesium Facility

● RI/FS Study Area Boundary

N

0 10 20 Miles

1:500,000

Figure 1

Site Location Map

Phase 1A Air SAP

U.S. Magnesium, LLC

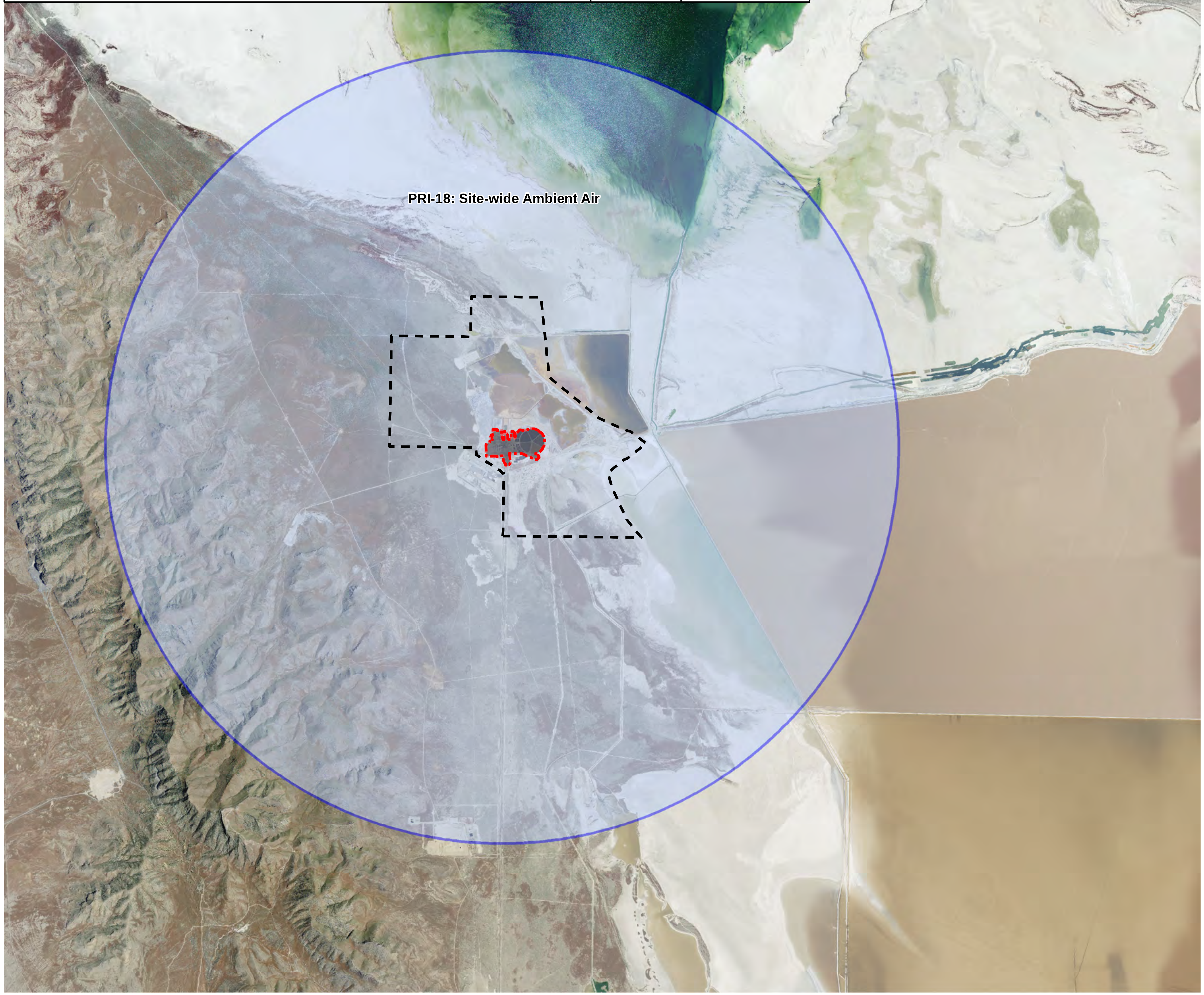
Rowley, Utah

USmag®

Environmental Resources Management
102 West 500 South, Suite 650
Salt Lake City, Utah 84101-2334

ERM

File: F:\Projects\0132320_US Magnesium - CONFIDENTIAL\GIS_data\MXDs\Phase1AAirSAP\Fig 2 PRI Area.mxd | By: Mike Appel | Date: 7/1/2014 11:50:58 AM



⬭ PRI-18: Site-wide Ambient Air
▨ Operating Facility
⌜⌟ US Magnesium Property

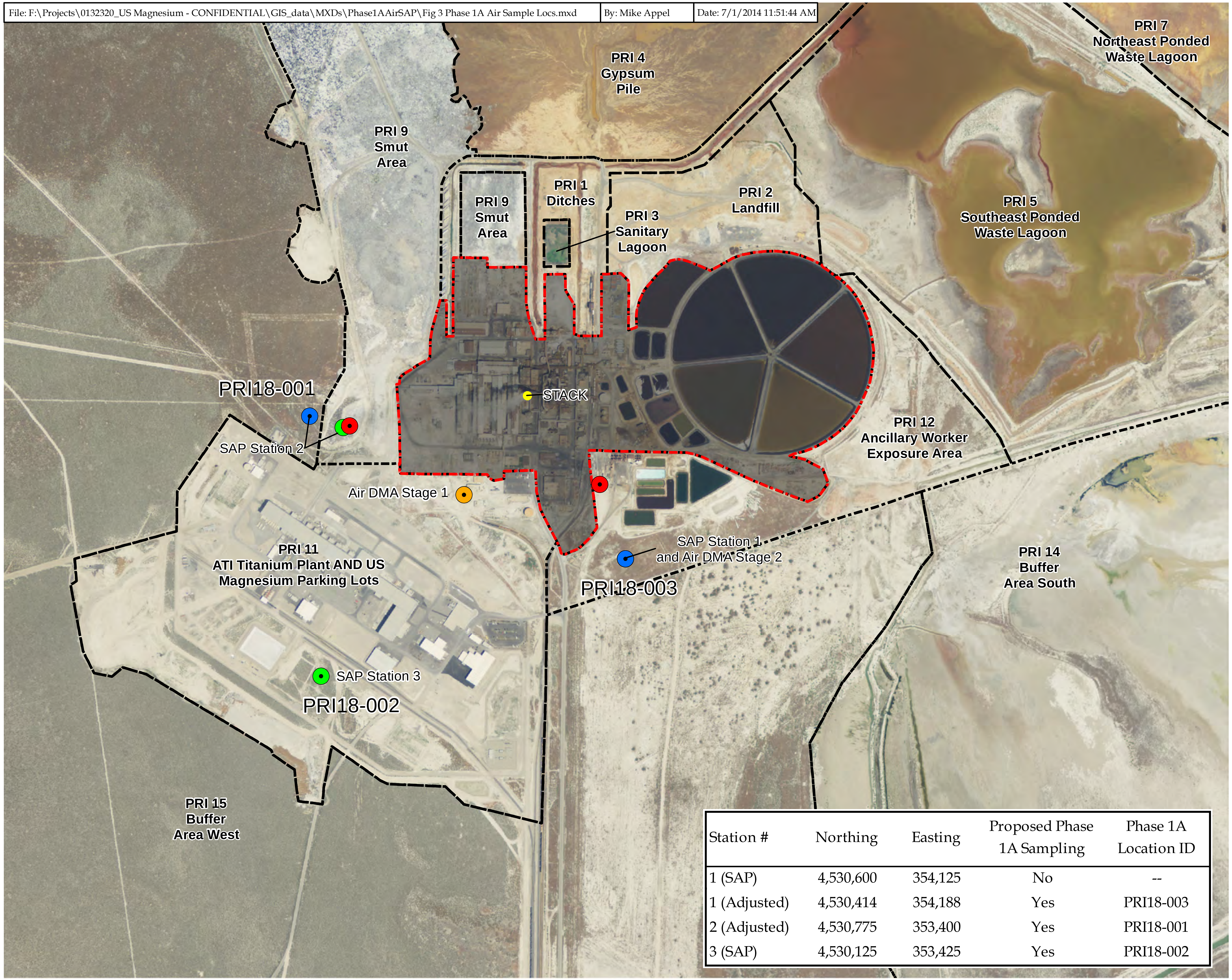
Notes:
All boundaries approximate, originally provided by EPA
Revised Buffer Areas - April 2012.
Aerial Photo: NAIP (USDA) July 3, 2011

Figure 2
Preliminary Remedial Investigation Area 18
Site-wide Ambient Air
Phase 1A Air SAP
U.S. Magnesium, LLC
Rowley, Utah

usmag®

Environmental Resources Management
102 West 500 South, Suite 650
Salt Lake City, Utah 84101-2334
ERM

File: F:\Projects\0132320_US Magnesium - CONFIDENTIAL\GIS_data\MXDs\Phase1AAirSAP\Fig 3 Phase 1A Air Sample Locs.mxd | By: Mike Appel | Date: 7/1/2014 11:51:44 AM



Station #	Northing	Easting	Proposed Phase 1A Sampling	Phase 1A Location ID
1 (SAP)	4,530,600	354,125	No	--
1 (Adjusted)	4,530,414	354,188	Yes	PRI18-003
2 (Adjusted)	4,530,775	353,400	Yes	PRI18-001
3 (SAP)	4,530,125	353,425	Yes	PRI18-002

Phase 1A Air Sampling Locations

- 🔵 Adjusted Location - 24 September 2013
- 🟢 Optimum for Stack
- 🔴 Optimum for Fugitive
- 🟠 Air DMA Sample Location
- ⬚ Preliminary Remedial Investigation Areas
- ▨ Operating Facility

Notes:
All boundaries approximate, originally provided by EPA.
Adapted from September 2013 USEPA Final Phase 1A SAP Figure 14-15.
Aerial Photo: NAIP (USDA) July 3, 2011.

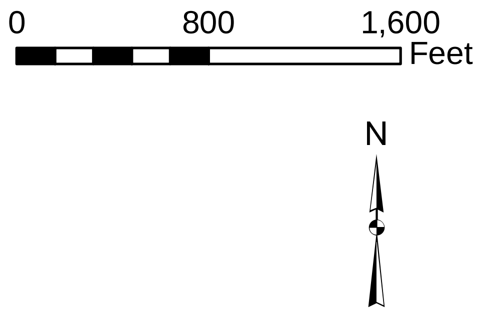
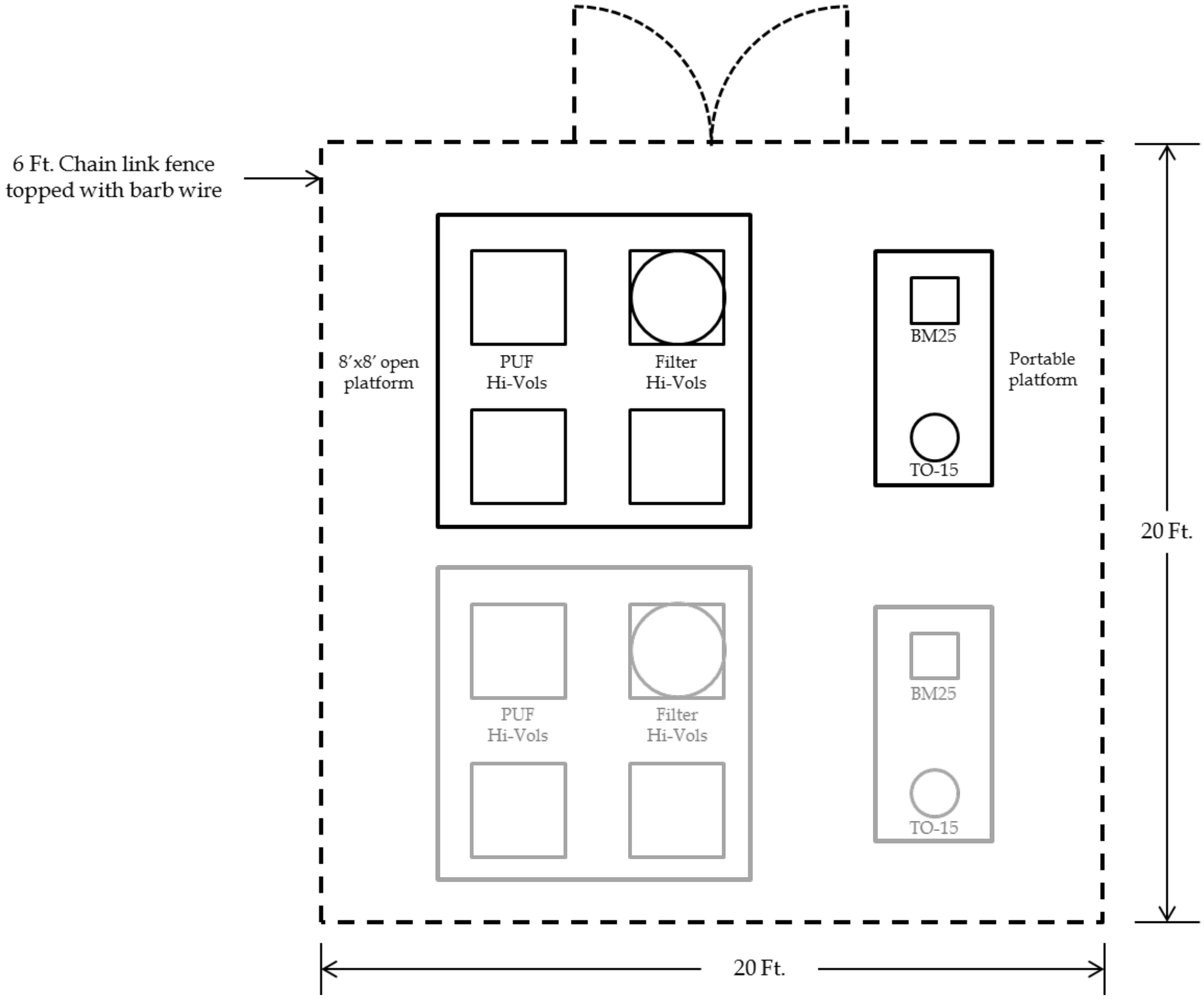


Figure 3
Air DMA and Phase1A
Air Sampling Locations
Phase 1A Air SAP
U.S. Magnesium, LLC
Rowley, Utah

USmag®

Environmental Resources Management
101 SW Main St, Suite 804
Portland, Oregon 97204
ERM



Note:

Grey outlined equipment showing layout for co-located samples at PRI18-001.

Figure 4

Phase 1A Sampling Station Equipment Layout

Phase 1A Air SAP

US Magnesium RI/FS

Appendix B
Project Scoping Documentation

B-1

Proposed Phase 1A Air PRI Sampling and Analysis Plan Changes

Technical Memorandum

Environmental
Resources
Management

7272 E. Indian School Road
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Scottsdale, AZ 8251
(480) 998-2401
(480) 998-2106 (fax)

ERM®

To: Ken Wangerud, USEPA Region 8

From: Bob Farmer and David Abranovic, ERM

Cc: David Gibby, US Magnesium

Date: 12 May 2014

Subject: Proposed Phase 1A Air PRI Sampling and Analysis Plan Changes

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Introduction

The objective of the Phase 1A Ambient Air Preliminary Remedial Investigation (Air PRI) is the identification of constituents of potential concern (COPCs) to be included in the screening-level risk analysis for inhalation exposure. Phase 1A sampling in the Air PRI area surrounding the US Magnesium (US Mag) plant in Rowley, Utah (the Site) is designed to identify and quantify chronic airborne toxicants that may contribute to inhalation exposures. Detailed planning is now underway for Phase 1A Air PRI field sampling, which will apply the methodology described in the United States Environmental Protection Agency's (USEPA's) *Phase 1A Remedial Investigation Sampling and Analysis Plan*, US Magnesium NPL Site, September 2013 (Phase 1A SAP). Per the current schedule, this investigation phase will occur during summer 2014 at selected locations in the near-vicinity of the US Mag facility.

Ambient air sampling for Phase 1A will focus primarily on several categories of chronic contaminants suspected to be present at the Site:

- Volatile organic compounds;
- Polychlorinated biphenyls (PCBs);
- Semi-volatile organic compounds, including hexachlorobenzene and polycyclic aromatic hydrocarbons;
- Dioxin/furan congeners (D/F):
- Inhalable particulate matter less than 10 microns in diameter (PM_{10}); and
- Particulate-borne toxic metals.

This memorandum presents a proposed approach and rationale for several aspects of the Phase 1A sampling activity. Given the planned mobilization to the field during summer 2014, these questions warrant prompt consideration:

1) What rationale and qualifications will warrant ERM switching to a different ALS lab location for TO-4A and TO-9A analysis of PCBs and D/F, respectively?

2) Will three Phase 1A stations be sufficient to cover the model-predicted areas of higher concentrations, versus four station locations proposed in the USEPA Phase 1A SAP?
3) Would it be acceptable to implement a rotating daily schedule to service the discrete sampling stations (sample recovery and initiation), addressing one station per day?
4) What continuous monitoring for acute toxicants is appropriate for Phase 1A, since the two contaminants of interest (hydrogen chloride [HCl] and chlorine [Cl_2]) are confirmed as COPCs?

As a precursor to Phase 1A ambient air sampling, a demonstration of methods applicability (DMA) has been completed to validate the methods used to measure air concentrations of both acute and chronic toxicants. Outcomes of the DMA served to inform the field and laboratory procedures and establish data-handling procedures that will be used during Phase 1A. Establishing an appropriate duration of chronic toxicant sampling was a key aspect for the Phase 1A sampling design, which examined extended sample durations of 3 and 6 days, in comparison to concurrent 1-day samples. A key outcome of the DMA is that extended sampling times of 3 days are practical and sufficiently sensitive to meet the Phase 1A data quality objectives. Further, the DMA provided a satisfactory demonstration of monitoring hardware for the two acute ambient air COPCs: Cl_2 and HCl.

Replacing the Current Lab for TO-4A and TO-9A Analyses

DMA analyses for PCBs, D/F, and PM_{10}/toxic metals were done by the ALS laboratory in Burlington, Ontario, Canada. This laboratory was selected by ERM because it offered high-resolution gas chromatography/mass spectrometry for PCBs and D/F with low detection and quantitation limits necessary for low airborne concentrations of potential COPCs with low Regional Screening Level (RSL) benchmarks.

During the Air DMA, ERM documented several performance issues with the ALS Burlington laboratory. The quality of the analytical data delivered was satisfactory, as was shown by data validation conducted prior to issuing final Air DMA data reports. However, multiple iterations were needed to obtain final lab reports, and quality control during the PCB and D/F reporting process has been problematic. These matters consumed an inordinate amount of ERM's time and necessitated repeated communications with the lab.

Another issue noted by ERM and USEPA oversight contractors has been the condition of the polyurethane foam (PUF) sample media for combined PCBs and D/F analyses supplied by Burlington. As tested during the Air DMA, the TO-4A and TO-9A media were constructed as a "sandwich" of top and bottom layers of PUF, with XAD-2 adsorbent resin in the middle. This was thought to be an enhancement of the standard Compendium Method TO-4A, which specify only a single 3-inch layer of PUF. The presence of the XAD, according to the Burlington lab, would improve retention of the more volatile PCB congeners, specifically monochlorobiphenyls and dichlorobiphenyls.

However, upon delivery of sample cartridges to the field, it was found there were multiple instances in which Burlington lab-prepared PUF/XAD sandwich lost integrity. A substantial amount of the XAD resin particles was found to have migrated between the glass and the PUF layer, to the extent that some resin might have been lost during shipping. Presence of an air gap between the PUF and glass could have also provided a channeling path for the ambient air sample flow. ERM sought to find a solution to this issue with Burlington and, based on the on-site (Stage 1) DMA experience, ALS implemented a corrective action where the PUF thickness and height was increased to improve fit within the glass sampling cartridge, thereby reducing the shifting of resin. However, this corrective action was found to not completely correct the problem of resin shifting, which was observed during the Stage 2 DMA event.

The Burlington laboratory has not adequately addressed these concerns in a manner that will assure the PCB and D/F sampling media and data delivery problems will not reoccur during Phase 1A. Therefore, we request that the Phase 1A SAP allow ALS to perform these organic analyses in their Houston facility, which has extensive experience conducting the TO-4A and TO-9A analyses. The Houston facility has agreed to prepare the PUF cartridges using the same sandwich structure with addition of the XAD2 resin layer, consistent with the sampling media used during the DMA, to enhance recovery of more-volatile PCB congeners. The PM_{10}/metals analyses (IO-2.1 and IO-3.1) will still be performed by the ALS Burlington lab. Based on information received from the ALS Houston lab for UFP-QAPP Worksheet 15 (attached as Appendix A), the DL and QL performance on TO-4A and TO-9A is comparable between ALS Houston and ALS Burlington. Revised/finalized UFP-QAPP worksheets reflecting the proposed changes in the analytical laboratory for PCB, and D/F will be included in the Phase 1A Air DMA Report.

Mobilization of Three Stations for Phase 1A Air PRI Sampling

During the preparation of the USEPA Phase 1A SAP for the Air PRI, the selection of air sampling locations was based on systematic, quantitative evaluations to improve the likelihood of capturing higher-occurring concentrations. To meet the primary data quality objective for Phase 1A, it is necessary that the highest measured concentration for the sample data set (C_{max}) exceeds the highest receptor mean found among the population of actually-occurring concentrations for each toxicant. Refined simulations were performed by ERM and USEPA using the AERMOD dispersion modeling systems for a domain of receptor points to predict the distribution of concentrations surrounding the Site. The refined dispersion modeling tool examined the effects of actual meteorology and topography on the dispersion of elevated stack plumes and plant-level fugitive emissions.

Analysis of AERMOD results for a 3-year period (August 2009 to August 2012) showed a tendency for higher (above-mean) concentrations to occur repeatedly during the summer months of July through September in localized areas to the south and west of the plant boundary. Based on these findings, the USEPA proposed four sampling stations in the near-vicinity of the Site, as illustrated in Phase 1A SAP Figure 14-15 and in the attached Figure 1.

Members of the project teams from ERM and USEPA performed a field reconnaissance of the four proposed monitoring sites on 24 September 2013. This survey considered the accepted ambient air sampling site selection criteria (40 CFR Part 53, and Appendices). In general, these specifications address distance between the sampler and surrounding vegetation, adjacent sources on emissions (e.g., unpaved roads or industrial activity), obstacles to ambient wind, personnel access, and practical logistics (e.g., access to power or remote power source, weather exposure, and equipment security). Based on this reconnaissance, Stations 2 and 4 were relocated about 100 yards away from the modeled receptor points (Figure 1).

ERM has evaluated the four candidate locations in the context of accepted ambient air sampling practice and has concluded that candidate Station 1 would provide results that are redundant with relocated Station 2. As shown on Figure 1, the two locations are approximately 400 meters apart, compared with the AERMOD model grid resolution of 250 meters. In light of the uncertainty of dispersion model's ability to predict future concentrations at closely spaced locations, it is a gross over-reliance of model results to conclude that Stations 1 and 2 will have significantly different concentrations during Phase 1A. In addition, Stations 1 and 2 are aligned in the same compass direction from known plant sources, which suggests that both will have similar likelihood of plume contact when the wind direction is toward the west.

Station 2 was shown by modeling to be sensitive to both Main Stack emissions and to near-ground level fugitive emissions, so ERM proposes to retain the relocated Station 2 monitoring location. We also propose that Station 1 not be included in Phase 1A. The USEPA technical team has indicated on several occasions that there is no statistical justification that the Phase 1A samples must be collected from a specific number of stations. The confidence level achieved for a highest measured concentration (C_{max}) above the highest 3-year receptor mean is independent of whether the samples are collected at a single location or several.

There would not be a reduction in the total number of samples collected during Phase 1A if three stations were utilized rather than four. One aspect of the ERM sampling strategy is that the adequacy of the number of samples collected will be evaluated in near real-time using AERMOD and concurrent meteorological data. Should the Phase 1A monitoring duration need to be extended to ensure that the sample data C_{max} exceeds the highest 3-year receptor mean, then it would be better to utilize project resources to collect additional samples from Stations 2, 3, and 4, rather than collecting what will be essentially be duplicate samples from the Station 1 location. Therefore, ERM has included a SAP Modification form to eliminate Station 1 from the Air PRI Phase 1A field sampling program (attached at Appendix B).

Implementation of a Daily Rotation for Station Servicing

Assessment of inhalation risk for chronic toxicants is proportional to the long-term average exposure concentration. As stated by the USEPA, selection of COPCs from Phase 1A Air PRI data is based on obtaining a sufficient sample population to avoid eliminating a candidate COPC that should have been retained for evaluation of long-term average exposure (i.e., a Type 1 error). During development of the Phase 1A SAP for the Air PRI, it was determined that a minimum sample size of 29 for each toxicant should be sufficient, based on statistical considerations, for COPC selection (refer to the Phase 1A SAP, Sept. 2013, pg. 91).

On this basis, the Phase 1A sampling plan was developed. To provide better temporal coverage of ambient concentrations due to variable stack and fugitive emission rates, the Phase 1A samples will be taken, to the extent practical, in a nose-to-tail fashion. In practice, there may be occasional gaps in the time sequence of samples at a given location, due to the impracticality of initiating or recovering a set of samples at night. Overall, collection of 30 three-day samples spread across three proposed stations amounts to at least a 31-day sampling program, operated on a 7-day-per-week basis.

To improve the likelihood that sampled concentrations are high-biased, AERMOD will be run during Phase 1A sampling using concurrent on-site meteorological data. Short-term relative concentrations predicted for the Phase 1A period will be compared to the highest 3-year average receptor mean obtained through earlier AERMOD studies. This will allow essentially real-time judgments on whether higher concentrations had impacted one or more monitoring sites, and will indicate if sampling must be extended or can be concluded after 30 samples are obtained.

As stated previously, there is no statistical reason why the Phase 1A samples must be collected from a specific number of stations. The confidence level for obtaining one or more samples above the highest receptor mean concentration in a specified population size is the same, regardless of the number of sampling locations. However, prior studies using AERMOD evaluated the distribution of relative concentrations over the area of the PRI, and informed the placement of monitors at multiple positions during specific months of the year. This strategy should increase the likelihood that a sample size of 30 will be successful (Phase 1A SAP, Sept. 2013, pgs. 89 and 90). This same logic suggests that there is no statistical benefit to the collection of concurrent samples at multiple locations in Phase 1A. The timing of relatively higher concentrations at one station is independent of their occurrence at another station.

Consequently, the experimental design for the Phase 1A samples need not require different locations to be collected on the same schedule. Side-by-side comparison of samples at different stations at the same time is not an element of the data analysis for COPC selection. Furthermore, the alignment of sample times is also not necessary for comparison to dispersion model results. The AERMOD tool will simulate the relative concentrations at the monitoring locations for each day during the sampling program, allowing analysis at each sample location during any 3-day period. In this manner, the relative concentrations during a 3-day sample at one location will be assessed independently of the other monitoring locations in the Air PRI area.

In view of the above argument, ERM proposes that the sample initiation and recovery at the three proposed sampling locations be performed on a daily rotating basis. That is, the work at one station will be performed each day, rotating daily among the stations. This proposed schedule is motivated in part by practicality and cost. Staffing of the field operation will be more efficient if the daily workload is more consistent. If all three stations (four sets of samplers in total) were to be served in a single day, then a staff of three would necessary on those days, along with multiple sets of field equipment. There would be added workload and higher potential for errors in documenting and packaging a large sample set every 3 days.

ERM believes that this approach is consistent with the Phase 1A SAP; therefore, a modification is not required.

It should also be noted that spreading the tasks of sample initiation and recovery over a 3-day rotation does not affect the procedure for daily quality assurance/quality control practiced during the DMA. ERM will visit each station daily during Phase 1A, to check and record the function of the air samplers, and conduct calibrations and functional checks on continuous monitoring instruments.

Appropriate Continuous Monitoring for Phase 1A Air PRI

For Phase 1A, concentration data at each monitoring site will be provided by four different samplers for chronic toxicants. In addition, ERM has proposed co-located continuous monitoring for the acute toxicants at each station. Because the acute toxicants Cl_2 and HCl will be included as COPCs for this investigation, the USEPA Work Plan did not specify a sampling design for these toxicants in Phase 1A (Phase 1A SAP, Sept. 2013, pg. 89). However, ERM recognizes that there is value in obtaining continuous monitoring data for acute toxicants.

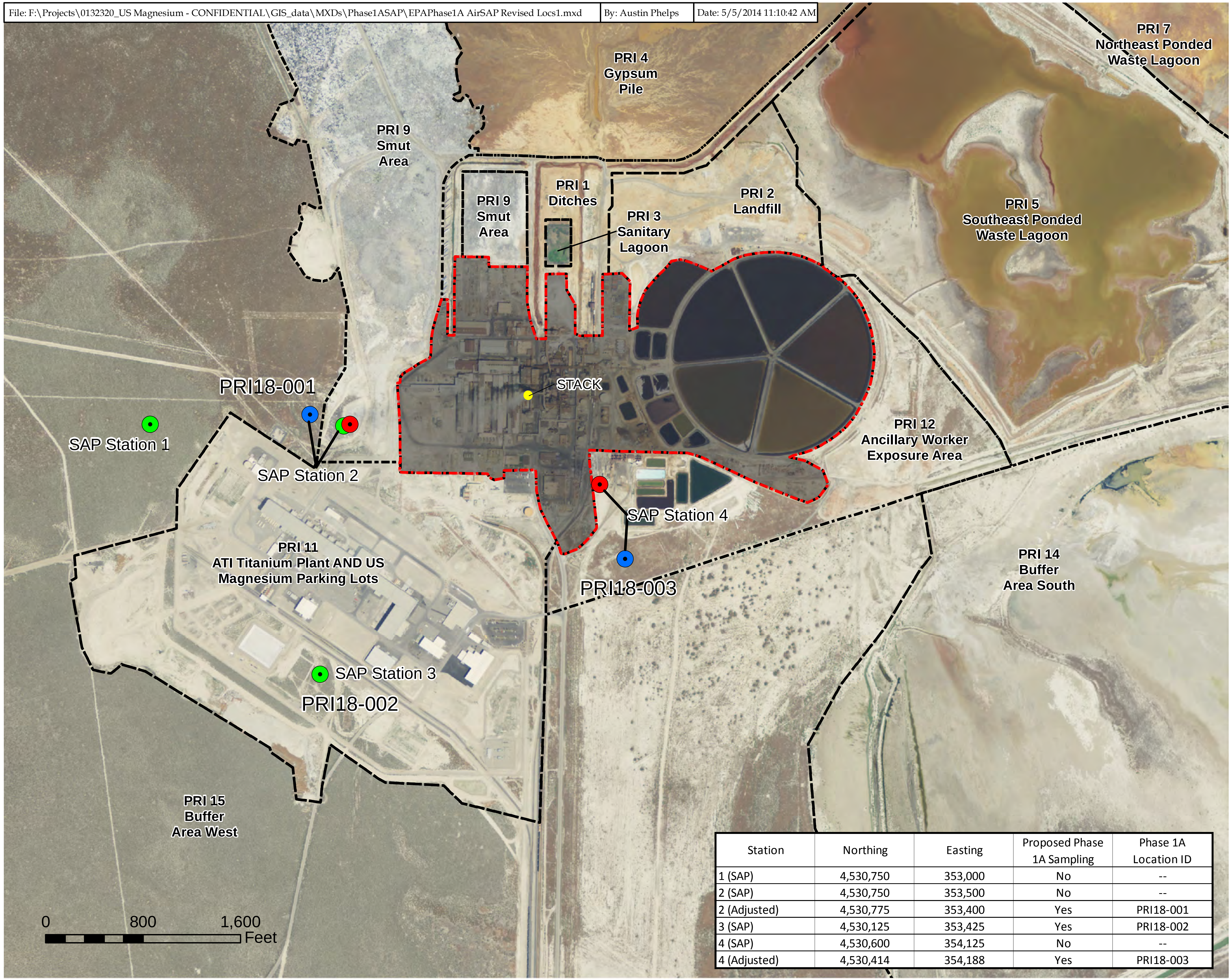
Comparisons between measured concentrations of different analytes at a single monitoring location can provide key supporting information for data evaluation, beyond the measurements of each analyte alone. The continuous monitoring component of Phase 1A sampling serves this purpose. Since the two acute toxicants are known to be present in the facility stack plume, the detection of these gases would serve as an indicator of plume contact at a given location and time. In particular, the continuous trace of acute toxicants (which are anticipated to be detectable in downwind plumes) will provide a physical indicator that, for at least some portion of a sampling period, the facility emissions were dispersed in the direction of the sampler.

ERM proposes that the electrochemical continuous monitors for both Cl_2 and HCl (Industrial Scientific Model BM25) be deployed at each Phase 1A station. Based on their performance during Stage 2 of the Air DMA program, the BM25 analyzers have shown to be reliable monitors. The electrochemical sensors are capable of reporting concentrations down to 0.1 parts per million for both gases. These units can also be field-calibrated using known reference gases, to provide quality assurance for these data.

One BM25 analyzer would be positioned at two of the three proposed stations. A co-located pair of BM25 samplers will be operated at the third station to provide an indication of monitoring precision. This approach will provide a reasonable ability to detect the occurrence of plume contact at a given location, to corroborate the AERMOD assessments of relative concentration during the Phase 1A sampling period.

It is noted that a sampling design for acute toxicants was not included in the Phase 1A SAP. However, the inclusion of some continuous monitoring in the Phase 1A mobilization offers preliminary information regarding the nature and extent of plume-conveyed toxicants and, as such, is outside the objectives of Phase 1A. Since continuous monitoring is not a required element in the Phase 1A SAP, ERM believes that a SAP modification is not required for monitoring of Cl_2 and HCl.

File: F:\Projects\0132320_US Magnesium - CONFIDENTIAL\GIS_data\MXDs\Phase1ASAP\EPAPhase1A AirSAP Revised Locs1.mxd | By: Austin Phelps | Date: 5/5/2014 11:10:42 AM



Station	Northing	Easting	Proposed Phase 1A Sampling	Phase 1A Location ID
1 (SAP)	4,530,750	353,000	No	--
2 (SAP)	4,530,750	353,500	No	--
2 (Adjusted)	4,530,775	353,400	Yes	PRI18-001
3 (SAP)	4,530,125	353,425	Yes	PRI18-002
4 (SAP)	4,530,600	354,125	No	--
4 (Adjusted)	4,530,414	354,188	Yes	PRI18-003

● Adjusted Location - 24 September 2013

SAP Target Location

● Optimum for Stack

● Optimum for Fugitive

▨ Operating Facility

▭ Preliminary Remedial Investigation Areas

Notes:
Parcel Boundaries and Land Ownership from Utah GIS Portal.
All boundaries approximate, originally provided by EPA.
Adapted from September 2013 USEPA Final Phase 1A SAP Figure 14-15.
Aerial Photo: NAIP (USDA) July 3, 2011.

DRAFT

Figure 1

Proposed Air PRI Phase
1A Sampling Locations
U.S. Magnesium, LLC
Rowley, Utah

USmag®

Environmental Resources Management
101 SW Main St, Suite 804
Portland, Oregon 97204
ERM

Appendix A

ALS Houston UFP-QAPP
Worksheet 15

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory:	ALS Houston
Matrix:	Air
Analytical Group:	PCBs (EPA TO-4/1668A)
Concentration Level:	Low

Analyte	CAS Number	Target Quantitation Limit [1] (µg/m3)	Laboratory-specific Quantitation Limit [2] (µg/sample)	Laboratory-specific Detection Limit [2] (µg/sample)	Air Quantitation Limit [3] (µg/m^3)	Air Detection Limit [3] (µg/m^3)
Total PCBs [4]	1336-36-3	2.1E-02	4.0E-04	n/a	1.0E-06	n/a
PCB-77	32598-13-3	3.2E-03	4.0E-05	1.0E-05	1.0E-07	2.61E-08
PCB-81	70362-50-4	1.1E-03	4.0E-05	8.5E-06	1.0E-07	2.12E-08
PCB-105	32598-14-4	1.1E-02	4.0E-05	7.4E-06	1.0E-07	1.85E-08
PCB-114	74472-37-0	1.1E-02	4.0E-05	6.9E-06	1.0E-07	1.73E-08
PCB-118	31508-00-6	1.1E-02	4.0E-05	6.9E-06	1.0E-07	1.73E-08
PCB-123	65510-44-3	1.1E-02	4.0E-05	8.6E-06	1.0E-07	2.16E-08
PCB-126	57465-28-8	3.2E-06	4.0E-05	7.2E-06	1.0E-07	1.79E-08
PCB-156	38380-08-4	1.1E-02	8.0E-05	6.1E-06	2.0E-07	1.52E-08
PCB-157	69782-90-7	1.1E-02	8.0E-05	6.1E-06	2.0E-07	1.52E-08
PCB-167	52663-72-6	1.1E-02	4.0E-05	4.6E-06	1.0E-07	1.16E-08
PCB-169	32774-16-6	1.1E-05	4.0E-05	5.0E-06	1.0E-07	1.25E-08
PCB-189	39635-31-9	1.1E-02	4.0E-05	1.1E-05	1.0E-07	2.65E-08

Notes

[1] Target Quantitation Limit (TQL) is the USEPA RSL for Industrial Air. The RSL value used is the lesser of the cancer value and 0.1 times the non-cancer value. The TQL for total PCBs equals the RSL for total PCBs, high risk, CAS 1336-36-3.

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be presented to the results will be reported to the estimated DL (EDL), which is DL calculated for each congener in each sample during each HRMS analytical run.

[3] Assuming a 400 m^3 sample volume.

[4] Total PCB concentration will be calculated as the sum of 209 PCB congeners.

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

SAP Worksheet #15 - Reference Limits and Evaluation Table

Laboratory:	ALS Houston
Matrix:	Air
Analytical Group:	Dioxins and Furans (TO-9A)
Concentration Level:	Low

Analyte	CAS Number	Target Quantitation Limit [1] (pg/m^3)	Laboratory-specific Quantitation Limit [2] (pg/sample)	Laboratory-specific Detection Limit [2] (pg/sample)	Air Quantitation Limit [3] (pg/m^3)	Air Detection Limit [3] (pg/m^3)
1,2,3,7,8-PeCDD	40321-76-4	1.9E-02	5.0E+01	8.8E-01	1.3E-01	2.2E-03
1,2,3,7,8-PeCDF	57117-41-6	3.8E-01	5.0E+01	1.3E+00	1.3E-01	3.2E-03
1,2,3,4,7,8-HxCDF	70648-26-9	1.9E-01	5.0E+01	9.4E-01	1.3E-01	2.3E-03
1,2,3,4,7,8-HxCDD	39227-28-6	1.9E-01	5.0E+01	1.2E+00	1.3E-01	2.9E-03
1,2,3,6,7,8-HxCDD	57653-85-7	1.9E-01	5.0E+01	7.8E-01	1.3E-01	2.0E-03
1,2,3,7,8,9,-HxCDD	19408-74-3	1.9E-01	5.0E+01	1.2E+00	1.3E-01	3.1E-03
1,2,3,6,7,8,-HxCDF	57117-44-9	1.9E-01	5.0E+01	8.2E-01	1.3E-01	2.1E-03
1,2,3,7,8,9,-HxCDF	72918-21-9	1.9E-01	5.0E+01	1.2E+00	1.3E-01	2.9E-03
1,2,3,4,6,7,8-HpCDD	35822-46-9	1.9E+00	5.0E+01	1.4E+00	1.3E-01	3.5E-03
1,2,3,4,6,7,8-HpCDF	6756-39-4	1.9E+00	5.0E+01	1.1E+00	1.3E-01	2.9E-03
1,2,3,4,7,8,9-HpCDF	55673-89-7	1.9E+00	5.0E+01	1.5E+00	1.3E-01	3.6E-03
2,3,7,8-TCDD	1746-01-6	1.9E-02	1.0E+01	1.5E+00	2.5E-02	3.7E-03
2,3,7,8-TCDF	51207-31-9	1.9E-01	1.0E+01	1.6E+00	2.5E-02	4.0E-03
2,3,4,7,8-PeCDF	57117-31-4	3.8E-02	5.0E+01	8.2E-01	1.3E-01	2.1E-03
2,3,4,6,7,8,-HxCDF	60851-34-5	1.9E-01	5.0E+01	8.6E-01	1.3E-01	2.2E-03
OCDD	3268-87-9	1.9E+02	1.0E+02	1.7E+00	2.5E-01	4.4E-03
OCDF	39001-02-0	1.9E+02	1.0E+02	1.9E+00	2.5E-01	4.8E-03

Notes

[1] Target Quantitation Limit (TQL) is the US EPA Regional RSL for Industrial Air for 2,3,7,8-TCDD. The RSL value used is the lesser of the cancer value and 0.1 times the non-cancer value. TQLs for PCDD/PCDF are calculated by dividing the 2,3,7,8-TCDD TQL by the WHO Toxicity Equivalency Factor (TEF) and by the number of WHO PCDD/PCDF compounds (17).

[2] Quantitation limits (QLs) and detection limits (DLs) provided by ALS. Analytical results will be presented to the results will be reported to the estimated DL (EDL), which is DL calculated for each congener in each sample during each HRMS analytical run.

[3] Assuming a 400 m^3 sample volume.

No Color	No color – The QL and DL both are lower than the TQL.
Yellow	Yellow – The TQL falls between the QL and the DL.
Orange	Orange – The QL and DL both exceed the TQL.

Appendix B

SAP Modification Form – Use Three Phase 1A Sampling Stations

Document Tracking Number: 14C-2-22

RECORD OF UFPQAPP-SAP MODIFICATION

INSTRUCTIONS: This form is required anytime a modification is being made to any worksheets or sections for any portion of the Phase 1A SAP, including attachments, tables, figures, and/or SOPs.

Requestor:	Bob Farmer
Title:	ERM Air Task Lead
Name of Site/Field Event:	US Magnesium Phase 1A RI SAP, Revision 0
Date of Proposed Modification:	5 May 2014
Modified SAP Section(s):	Worksheet 14, Add (new) Table 14-4 Worksheet 18, Table 18-1

Describe the Modification:

1) Add Table 14-4 to identify Phase 1A ambient air sampling locations and rationale:

Table 14-4: Ambient Air Monitoring Locations and Rationale Northings and eastings are based on UTM, Meters, Zone 12N, NAD 83 Map Projection

Ambient Air Sampling Location ID	Northing	Easting	Rationale
PRI18-001	4530775	353400	Optimum location for stack releases and fugitive emissions.
PRI18-002	4530125	353425	Optimum location for stack releases
PRI18-003	4530414	354188	Optimum location for fugitive emissions

2) Revise Table 18-1 for PRI-18 and footnote 1:

Table 18-1: Summary of Sampling Requirements

Sample Type	Number of Sample Locations	Number of samples per location	Total Samples	Analytical Group (Method)
PRI Area 18, Air				
Ambient Air	3	10	30	VOCs, SVOCs, PCBs, PCDD/PCDF, PM10, and metals

[1] Rationale for each sample location is provided on Tables 14-1 (solids), 14-2 (water), and 14-4 (air).

Justification or Reason for the Modification:

During the preparation of the USEPA Phase 1A SAP for the Air PRI, the selection of air sampling locations was based on systematic, quantitative evaluations to improve the likelihood of capturing higher-occurring concentrations. To meet the primary DQO for Phase 1A, it is necessary that the highest measured concentration for the sample data set (Cmax) exceeds the highest receptor mean found among the population of actually-occurring concentrations for each toxicant. Refined simulations were performed by ERM and USEPA using the AERMOD dispersion modeling systems for a domain of receptor points to predict the distribution of concentrations surrounding the Site. The refined dispersion modeling tool examined the effects of actual meteorology and topography on the dispersion of elevated stack plumes and plant-level fugitive emissions.

Analysis of AERMOD results for a three-year period (August 2009 – August 2012) showed a tendency for higher (above mean) concentrations to occur repeatedly during the summer months of July through September in localized areas to the south and west of the plant boundary. Based on these findings, USEPA proposed four sampling stations in the near-vicinity of the U.S Mag plant in the USEPA Phase 1A SAP, Sept. 2013. These stations are shown in the attached figure.

Members of the project teams from ERM and USEPA performed a field reconnaissance of the four proposed monitoring sites on September 24, 2013. This survey considered the accepted ambient air sampling site selection criteria (40 CFR Part 53, and Appendices). In general, these specifications address distance between the sampler and surrounding vegetation, adjacent sources on emissions (e.g., unpaved roads or industrial activity), obstacles to ambient wind, personnel access, and practical logistics (e.g., access to power or remote power source, weather exposure, and equipment security). Based on this reconnaissance, Stations 2 and 4 were relocated about 100 yards away from the modeled receptor points.

ERM has evaluated the four candidate locations in the context of accepted ambient air sampling practice and has concluded that SAP Station 1 would provide results that are redundant with the Adjusted Station 2. As shown in the attached figure, the two locations are approximately 400 meters apart, compared with the AERMOD model grid resolution of 250 meters. In light of the uncertainty of dispersion model's ability to predict future concentrations at closely spaced locations, it is a gross over-reliance of model results to conclude that Stations 1 and 2 will have significantly different concentrations during Phase 1A. In addition, Stations 1 and 2 are aligned in the same compass direction from known plant sources, which suggests that both will have similar likelihood of plume contact when the wind direction is toward the west.

Station 2 was shown by modeling to be sensitive to both Main Stack emissions and to near-ground level fugitive emissions, so ERM proposes to retain the Adjusted Station 2 monitoring location. We also propose that Station 1 not be included in Phase 1A. The USEPA technical team has indicated on several occasions that there is no statistical justification that the Phase 1A samples must be collected from a specific number of stations. The confidence level achieved for a highest measured concentration (Cmax) above the highest 3-year receptor mean is independent of whether the samples are collected at a single location or several.

The total number of samples collected during Phase 1A if three stations were utilized (n = 30 samples) rather than four (n = 32 samples) would still meet the required number of samples (n = 29) specified in the USEPA Phase 1A SAP. One aspect of the ERM sampling strategy is that the adequacy of the number of samples collected will be evaluated in near real-time using AERMOD and concurrent meteorological data. Should the Phase 1A monitoring duration need to be extended to ensure that the sample data Cmax exceeds the highest 3-year receptor mean, then it would be better to utilize project resources to collect additional samples from Stations 2, 3, and 4, rather than collecting what will be essentially be duplicate samples from the Station 1 location.

In addition to refining the number of sampling locations from four to three, this SAP Modification also identifies the Location IDs to be used during Phase 1A air sampling at PRI18.

EPA Review/Approval: ____**Date:** ________________
(RPM or designee)

Each approved UFPQAPP-SAP Modification Form will become part of Attachment 17B in the Phase 1A Final SAP and also incorporated into the appropriate RI Results Report. A copy is to be provided to all recipients identified on SAP Worksheet #3.

B-2

15 May 2014 PWT3 Technical Scoping Meeting Summary

PWT3/ERM Agenda
Air Phase 1A Technical Scoping Meeting
US Magnesium Superfund Site, Rowley, Utah
Thursday, May 15, 2014 9:30 a.m.
Dial In Number: 1-866-692-5721 Meeting ID#: 4764274

Attendees:
ERM: Bob Farmer, Judy Nedoff, David Abranovic, Kevin Lundmark
PWT3: Robert Howe, Doug Herlocker, Catherine LeCours
Meeting summary italic font; action items in red font

Purpose: Technical Scoping of Key Issues for Phase 1A RI SAP, Revision 1 for PRI 18.

The agenda for this conference call crossed in the email with a Technical Memorandum prepared by ERM, dated 12May 2014 regarding Proposed Phase 1A Air PRI Sampling and Analysis Plan Changes (Tech Memo). The meeting discussion incorporated the Tech Memo as appropriate.

1. Analytical Laboratory
    - Change from Ontario to Texas – justification and goal
        - *Bob F – concerned that Burlington lab followed a different procedure for the PUF causing shift, Houston can meet project quality and reporting requirements*
        - *Judy N – data reporting is adequate and yet not smooth or efficient*
        - *Doug H – supports change, good timing before Phase 1A sampling*
        - *Robert H – concerns with changing post-DMA and pre-Phase 1A and Houston having similar problems or not familiar with the Site matrix/media/issues*
        - *Judy N – Houston is testing cleaning and constructing PUF sandwiches, shipping back and forth to simulate shipping to Site, testing clean up cartridges to ensure reporting limits*
        - *Doug H – suggests the DMA did not indicate matrix issues with the samples*
        - *Doug H – timing of audit and pre-sample testing?*
            - *Audit – Bob F prior to starting the samples being sent to Houston, how about being there for the spiked "blank" for the audit*
            - *Pre-Sampling testing – Bob F suggested Houston could ship a spiked "blank" PUF to ERM in SLC, open it, photo and observe and ERM ship back for analysis*
            - *David A concerned about timing of the process prior to the July Phase 1A start*
            - *Judy N / Doug H – timing and schedule will work, they will make it work*
            - *Judy N – will get the results from the test ship today or tomorrow and then work with the lab regarding the timing of the spike and shipment, Judy will also ensure that Canada is talking with Houston regarding any site-specific matrix/sample issues noted in the DMA samples in anticipation of the Phase 1A samples*
2. Number of Sampling Stations
    - Ken to discuss with David to provide a proposal to EPA team
        - *David A – the tech memo contains a detailed proposal for the combination of Stations 1 and 2*
        - *Catherine L – the appropriate team members are not on the phone to make this decision, Catherine will rally the EPA team and move towards a decision early next week*
        - *Bob F – not discussing reducing the number of samples (extending over a longer time period with less stations), just the cost of an additional station, will also ask that if the decision is to stick with 2 closely spaced stations, please provide a strong technical rationale*
        - *David A – this is a key issue for both ERM and US Mag regarding cost, keep overall goal in mind, resources better spent on a longer sample collection time frame (more seasonal variations) rather than data from two close stations*

    - *Doug H – how difficult to re-run the model with a tighter grid spacing?*
    - *Bob F – not difficult if necessary to prove the case*

3. Rotating Daily Schedule
    - Rotation by analytical method or by station?
        - *Robert H – discussed within EPA meeting, if visited every station every day then maybe one method per station per day would provide correlative data*
        - *Bob F – three stations with a three-day rotation would work well, if going by method – it would be more than one method per day so not as straight-forward*
        - *Robert H – is fine either way*
        - *Catherine L – will forward this thought process to the EPA group for response to ERM's tech memo*
        - *Kevin L – staggering methods would not correlate directly with the AERMOD modeling simulation runs*
        - *David A – reminding the DQO is not requiring long-term averaging or correlation between stations*
        - *Doug H – these are all manual methods so correlated start/stop times would not be possible*

4. Cl_2/HCl continuous monitoring during Phase 1A
    - None required by EPA
        - *Bob F – may provide another layer of "plume impact" confirmation, will assist ERM interpreting the results for the discrete samples*
        - *Catherine L – explained the inclusion of the data in definitive decision making, would this be included in the EPA-approved SAP?*
        - *Bob F – will include this in the SAP for EPA approval of the data to use in the overall interpretation of the Phase 1A data as another line of evidence*

5. Format for Phase 1A RI SAP for PRI 18
    - Air shall be addressed as Revision 1 to the current Phase 1A RI SAP
    - Focus on PRI 18 only (will not incorporate all the "outer-PRI SAP mods")
    - Coordinating author is PWT
        - *Catherine L – ERM will prepare the Air SAP – whether that be a Rev 1 or a stand-alone Air SAP is at the discretion of ERM*
        - *David A – how will this happen? Using track changes, review process, etc. It makes sense to create a new SAP for the Air pathway as a stand-alone document*
        - *Catherine L – agreed the mechanics make sense as a new document, suggested some tracking method to assist with the focus of the review team to not re-work text that comes from the approved Phase 1A RI SAP, Rev. 0*
        - *Kevin L – opinion to be most efficient for ERM to do and EPA to review, Kevin will look at the changes necessary to the SAP to cost-benefit the options of Rev 1 vs a new SAP*
        - *Robert H – does it make sense to piece-meal the review? CSM and DQO's might make sense to get to EPA early*
        - *David A – thinks that it does make sense for schedule constraints to supply specific WS/SOPs etc per the DMA report that would move right into the Phase 1A SAP*
        - *Kevin L – Phase 1A SAP Rev 0 has DQOs – except for continuous monitoring and 3 stations*
        - *David A – will show reviewers what is coming from Phase 1A SAP vs referencing Phase 1A SAP*
        - *ERM will evaluate the process for writing the Air SAP and report to EPA which path will be taken*

B-3

EPA Comments on ERM's Technical Memorandum Proposing Phase 1A Air PRI Sampling and Analysis Plan Changes

EPA COMMENTS ON ERM's
TECHNICAL MEMORANDUM
PROPOSING PHASE 1A AIR PRI SAMPLING AND ANALYSIS PLAN CHANGES
(ERM Document date: 12 May 2014)
US MAGNESIUM NPL SITE, TOOELE COUNTY, UTAH

June 3, 2014

Introduction

The EPA is providing the following comments in response to ERM's Proposed Phase 1A Air PRI Sampling and Analysis Plan Changes Technical Memorandum (Air SAP TM), submitted to the EPA 12 May 2014 and as discussed during a 15 May 2014 teleconference between ERM and the EPA. The Air SAP TM includes proposed changes to the general approach and rationale for four key aspects of the Phase 1A Air SAP.

In general, the EPA will allow ERM's proposals for the Phase 1A Air SAP; however, the EPA is not accepting or approving the Air SAP TM as written. The EPA understands that ERM intends to prepare and submit a draft final Phase 1A Air SAP Revision 0 for the EPA's review and approval. The Phase 1A Air SAP will become a "stand-alone" document originating from (and cross-referencing to) the Phase 1A RI SAP Rev. 0 issued by the EPA in September 2013. It is within the Phase 1A Air SAP that the subjects of the Air SAP TM and the EPA's comments below will be incorporated and addressed for the EPA review and approval as a Final Phase 1A Air SAP.

The EPA assumes that the operating plans and specifications as proposed and described in the Air SAP TM will be reflected in the Phase 1A Air SAP to be submitted for EPA review and approval, and are the conditions under which the EPA accepts elements of ERM's proposal.

General Comments

1. The SAP shall be prepared by using (or incorporating by reference) the Phase 1A RI SAP Rev. 0 with only minor modifications to pertinent sections/worksheets as noted herein.

2. As ERM prepares the Phase 1A Air SAP, the EPA will require Section 10.3.3 of the Phase 1A RI SAP Rev. 0 to be included either verbatim or by direct cross-reference.

3. The Phase 1A Air SAP shall include, either verbatim or through direct cross-reference, the DQOs for COPC selection for air as presented in Section 11.3.3 of the Phase 1A RI SAP Rev. 0, including the evaluation of data adequacy. Minor modifications may be made for the details noted below (e.g., number of stations).

Specific Comments

In the Air SAP TM, ERM posed four questions for the EPA. Each question was supported by a discussion of key elements for the air program requiring resolution such that planning for the 2014 field work can proceed as quickly as possible. The EPA has reviewed the associated remarks provided by ERM and has the following observations and recommendations. The EPA's observations and recommendations provided below do not represent sanction or approval of the content put forth in ERM's Air Sap TM, including appendices therein (Appendix A Worksheet 15 and Appendix B the SAP Modification Form).

Q1: What rationale and qualifications will warrant ERM switching to a different ALS lab location for TO-4A and TO-9A analysis of PCBs and D/F, respectively?

A1: The EPA will allow ERM to transfer the analyses required for Methods TO-4A and TO-9A. However, ERM must understand that it assumes the responsibility for ensuring that the laboratory has all the appropriate qualifications and certifications and that the data set generated by each of the laboratories will meet the data quality objectives.

One of the primary objectives of the Air DMA was to verify laboratory performance and refine data handing protocols prior to implementing the Phase 1A RI. Changing laboratories at this juncture of the RI process could result in delays and problems with data quality and reporting during the Phase 1A Air sampling event. The EPA is concerned that ERM did not perform sufficient due diligence when selecting and managing laboratory services for the Air DMA as required in Worksheet 30 of the Phase 1A RI SAP, Rev.0. ERM is advised that changing laboratories (versus rectifying intra-lab issues) for the TO-4A and TO-9A is done at their own risk.

The draft final Phase 1A Air SAP shall include the appropriate certifications, standard operating procedures (SOPs), etc. that will satisfy the worksheet requirements for each laboratory to be utilized during Air Phase 1A program.

Q2: Will three Phase 1A stations be sufficient to cover the model-predicted areas of higher concentrations, versus four station location proposed in the USEPA Phase 1A SAP?

A2: The EPA will allow ERM to utilize a three-station design (i.e., abandonment of Station 1) for Phase 1A. However, ERM must assume the responsibility of ensuring the data set will meet the evaluation of data adequacy as detailed in Section 11.3.3 of the Phase 1A RI SAP Rev. 0. In addition, ERM shall provide in the Phase 1A Air SAP detailed plans for the “real time” collection of meteorological data, the use of those data to perform AERMOD calculations and the “real time” data quality assessments, as described in the Air SAP TM. ERM shall also describe plans and time-frame (e.g., 3 days after each 3-day sample collection run) for providing the EPA with the meteorological data and ERM’s AERMOD calculations for concurrent evaluation with ERM. The sampling program will not be demobilized until the EPA concurs with ERM’s AERMOD calculations and a finding of data adequacy. This concurrence shall be discussed during a meeting at the end of the initial sampling period.

Q3: Would it be acceptable to implement a rotating daily schedule to services the discrete sampling stations (sample recovery and initiation), addressing one station per day?

A3: The EPA does not have a concern with this proposal as presented in the Air SAP TM. The Phase 1A Air SAP and associated SOPs shall specify the particular checks to be performed at each station, including an appropriate field checklist. The use of a field checklist during daily inspections will ensure that consistent checks are performed to cover critical elements at each air sampling station.

Q4: What continuous monitoring of acutes toxicants is appropriate for Phase 1A, since the two contaminants of interest (hydrogen chloride [HCl] and chlorine [Cl_2]) are confirmed as COPCs?

A4: The EPA does not require that any continuous monitoring of Cl_2 and HCl be performed during the Phase 1A Air sampling event. Chlorine and HCl have already been identified as COPCs. However, ERM may choose to undertake such sampling at their own discretion. Any such data will not alter the requirements of the evaluation of data adequacy as detailed in Section 11.3.3 of the Phase 1A RI SAP Rev. 0.

Kevin Lundmark

From:	Wangerud, Ken <wangerud.ken@epa.gov>
Sent:	Tuesday, June 03, 2014 4:01 PM
To:	David Abranovic
Cc:	Bob Farmer; Kevin Lundmark; Catherine D. LeCours (clecours@PWT.COM); 'Herlocker, Douglas' (Douglas.Herlocker@tetratech.com); Justin Burning; Mark Ransom; OBrien, Wendy; brattin@syrres.com; Wangerud, Ken; cgilgen@utah.gov; severett@utah.gov; Wall, Dan
Subject:	RE: EPA responses to ERM 12May2014 Tech-Memo re Proposed Changes to Phase 1A Air PRI SAP
Attachments:	Final EPA Comments and RTQ on Ph1A Air SAP TM_3June2014.pdf

David etal:

Please find attached EPA's response-to-questions posed in your 12 May tech-memo addressing Ph1A Air SAP matters.

You and Mark Ransom then met with Steve Wharton and me on May 14 to discuss work plans and path-forward planning. Regarding an OU2 Sitewide Air-shed, I left it to ERM's choice whether you would want to develop and submit a modification to the September 2013 Ph1A (Air) SAP or prepare a 'stand-alone' UFP-QAPP Work Plan that would transition SAP materials from the Phase 1A SAP to an OU-specific document.

My subsequent understanding from PWT's Catherine LeCours (per discussions with Kevin Lundmark) and from you, is that ERM would prefer a 'stand-alone' SAP. The attached comments reflect that understanding, and as such the SAP Modification Request that ERM appended to the Air-TM has not been addressed.

Please advise immediately if EPA's understandings are correct with respect to ERM's intended plans for the Final Ph1A Air SAP.

Thanks.

____
Ken Wangerud, Remedial Project Manager
Superfund Remedial Program
Office of Ecosystems Protection and Remediation
USEPA Region 8 - EPR/SR
1595 Wynkoop, Denver CO 80202-1129
- -
ofc. tel. 303-312-6703
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wangerud.ken@epa.gov

From: David Abranovic [mailto:David.Abranovic@erm.com]
Sent: Monday, May 12, 2014 6:50 PM
To: Wangerud, Ken
Cc: Bob Farmer; Kevin Lundmark; Catherine D. LeCours (clecours@PWT.COM); 'Herlocker, Douglas' (Douglas.Herlocker@tetratech.com); Justin Burning; Mark Ransom
Subject: TM with Proposed Changes to Phase 1A Air PRI SAP

Ken,

Please find attached a technical memorandum that discusses the four critical path items that Bob Farmer mentioned in an e-mail to Doug Herlocker dated 21 April 2014. These items include one modification to the Phase 1A Air PRI SAP, as well as several items that ERM requires EPA concurrence on in order to proceed with the planning of the monitoring program. Please feel free to call me or Bob Farmer if you have any questions regarding this memorandum.

david

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1 July 2014 PWT3 Technical Scoping Meeting Summary

SUMMARY

Air DMA/Phase 1A
Draft SAP Worksheets 12, 15, 19, 20, 21, 22, 23, 24, 25, 26, 28, 30,
Conference Call
US Magnesium Superfund Site, Rowley, Utah
Tuesday, July 1, 2014 9:00 a.m.

Purpose: Concise discussion of draft Worksheets prior to ERM submittal of Draft Phase 1A Air SAP.

The Agenda items below reflect points of discussion and suggested text revisions. The outcome will be a meeting summary prepared by PWT (LeCours) and a Draft Phase 1A Air SAP reflecting the agreements made during the call.

Discussion summary in italic font and prepared by C. LeCours

Attendees

ERM: Judy Nedoff, Kevin Lundmark, Bob Farmer
PWT: Catherine LeCours
Tetra Tech: Doug Herlocker, Robert Howe

General

1. Please ensure the SAP includes the backup sample media at the same frequency as field duplicate QC samples (10%). (K. Lundmark email 24Jun2014)
    - *Team agreed there is no requirement that the backup sample is coincident with the duplicate sample.*
    - *BF: Duplicate samples should be collected across the time during which sampling will be conducted during the Phase 1A air program, but can and will be collected from a single station.*
    - *BF: Backup media to evaluate breakthrough will be collected at all three sampling stations.*
    - *KL: A backup sample will be collected over three consecutive 10 day periods at each sampling location.*
    - *The three day sample interval for collection of the backup sample at each station within the consecutive three 10 day sampling intervals planned during Phase 1A will be randomly selected at any one of the three sampling locations.*
    - *KL: Duplicate samples will be collected at random times once every 10 days from a single sampling location to be specified in the Phase 1A SAP.*

Worksheet 12

1. Discussion: Measurement Performance Criteria – some values seem out of a normal acceptance range and do not reflect that of the Phase 1A RI SAP (for "outer" PRIs).
    - *KL: values came from Phase 1A RI SAP and simplified for the QL multipliers*
    - *PUF Field Duplicate: will revise to read as the Phase 1A RI SAP*
    - *PUF Field Spike: acceptable as written*
    - *PUF Blank Spike (SVOC): from laboratory SOP, acceptable as written*
    - *Particulate Field Duplicate: will revise to read as the Phase 1A RI SAP*
    - *Summa Field Duplicate: will revise to read as the Phase 1A RI SAP*
    - *Summa Laboratory Duplicate: from laboratory SOP, acceptable as written*
    - *Near-continuous CVC: may change to be +/- 15% and possible addition of text to explain the criteria*
2. Discussion: PUF Media Method; Field Spike – possible revision based on PUF backup frequency.
    - *Comment no longer applicable*

3. Text: Summa Canister Method; Laboratory Control Sample; Measurement Performance Criteria: ERM please ensure Phase 1A Air SAP includes either the actual limits it this table OR a citation of reference (Lab SOPs?) for where PWT/Tetra Tech may find those limits.
   - *Acceptable*
4. Text: Notes; a. Please revise as follows: “When established criteria…, the proposed criteria were selected based on *default data validation criteria*.”
   - *Acceptable*
5. Text: Notes; b. Please insert “b” in the “Measurement Performance Criteria” header and include a note as follows: “*Decisions about analytical methods and QC requirements for air samples may be revised based on results of the DMA and laboratory audit findings*.”
   - *Can be addressed in SAP mods*
6. Discussion: Field Blank – description of the collection process.
   - *BF: described in methods, do everything short of turning the blower on*

Worksheet 15

1. Text:
   a. All footnotes 1 should be revised to read: “Target Quantitation Limit (TQL) values are based on USEPA RSLs for Industrial Air. The RSL value used is the lesser of the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1.”
   - *Acceptable*
   b. PCBs: Footnote 1 should read: “The TQL for total PCBs is based on Aroclor mixtures.”
   - *Verify with risk assessors*
   c. PCBs: Footnote 4 should read: “Total PCB concentration will be calculated as the sum of 209 PCB congeners, ~~assigning ½ the detection limit to non-detects~~”.
   - *ERM would assign non-detect as zero – consistent with the SLRA June 19 meeting and Final SLRA TM.*
   - *POST MEETING NOTE – UPON FURTHER INVESTIGATION, THE FOOTNOTE IS CORRECT AS WRITEN IN THE WORKSHEETS.*
   d. All tables where one or more TQL values are “—“, the first note should be modified to say: “—“ = No screening value available.
   - *Acceptable*
2. Discussion: Analytical Groups: PCBs, D/F, SVOCs, note 3 – High volume methods used during the DMA pulled less than 600 cubic meters of air. Detection limits should probably be evaluated at 500 cubic meters as opposed to 600 cubic meters final volume.
   - *BF: the detection limit is based on the sample volume – conversion process*
   - *KL: will adjust the values based on the DMA – 500 across the board*
3. Discussion: Analytical Group: PCBs – Total PCBs; detection limits.
   - *JN: will go back to laboratory for clarification, the DL varies based on the congeners, QL is below TQL*
4. Text: Analytical Group: D/F – The calculated TQLs are based on WHO TEFs from 1998. These values have been updated and TEFs from WHO 2005 should be used. This decreases the TQLs for four analytes: 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, OCDD and OCDF.
   - *Acceptable*
5. Text: Analytical Group: SVOCs; phenol – The CAS should be 108-95-2 and the RSL should be 8.8E+01.
   - *ERM will confirm with risk assessors*
6. Text: Analytical Group: VOCs; 1,4-dioxane – The TQL should be 2.5E+00.
   - *ERM will confirm with risk assessors*
7. Text: Analytical Group: Inorganics
   a. For consistency in format, the heading above the table should be modified to say: Analytical Group: Inorganics (EPA IO 2.1/3.1 Modified/3.5)
   - *Acceptable*

    b. The TQL shown for cadmium is not the lower of the two values in the RSL Table. The correct value is 1.5E-04.
- *ERM will confirm with RSL tables*
    c. No TQL is shown for chromium. Recommend Cr(VI) = 1.5E-04 ug/m3, even though not all Cr in air may be Cr(VI). Add a footnote stating the values assumes 100% Cr(VI).
- *ERM will confirm with the risk assessors and compare to SLRA tech memo*
    d. No TQL is shown for vanadium. The RSL Table shows a value of 4.4E-02.
- *Acceptable – will confirm upon review and revise as appropriate*

8. Discussion: Analytical Group: Inorganics; note 3 – Detection limits should probably be calculated at 3000 to 3500 cubic meter final volume to be consistent with expected volumes based on Stage 1 and 2 flow rates.
    - *KL: will adjust the values based on the DMA – 3000 across the board*

Worksheet 19

1. Text: Please include both the holding times for extraction (preparation) and analysis when feasible.
    - *Acceptable*
2. Discussion: Ambient Air Volume per Sample should not exceed the values listed in the table to remain consistent with the DMA and WS#15 calculations. Consider revising text to state “less than” instead of “approximately.”
    - *BF: will leave as approximate, the samples are calculated based on actual volume. PUF media samples with post-sample calculated total volume more than 10% above target volume will warrant examination of spike recoveries to identify possible breakthrough*
3. Discussion: Holding time for D/F.
    - *JN: will confirm with laboratory and revise as appropriate*
4. Discussion: Footnote 3 is included in the table and not below the table. Should there be a “3” that reads: “Duplicate samples will have backup PUF cartridges.”?
    - *Comment no longer applicable – remove the “3” reference from the table*

Worksheet 20

1. Text: Note 4 should reference the XAD-2 cartridge.
    - *Acceptable*

Worksheet 22

1. Discussion: PUF Sampler; Maintenance: Add maintenance item to ensure that motor brushes will be exchanged as needed (manufacturer specifications is once every 500 hours and during the sampling program each hi-vol sampler will run for at least 720 hours - 24x30).
    - *BF: already accounted for this, will add a statement in the table*
2. Discussion: BM25; Calibration: Insert acceptance criteria as specified in table and corrective action if units fall outside this range.
    - *Comment discussed earlier. Repeat daily calibrations for which zero or high-level gas response discrepancy is greater than 15% of reference value may warrant manufacturer maintenance.*

Worksheet 23

1. Discussion: Please provide HE00215 (Project-Specific Work Instructions) of 11 June 2014 for PWT/Tetra Tech review.
    - *ERM will provide with the draft SAP or earlier if possible*

Worksheet 24

1. Text: HR/MS (PCDD/F); Tuning; Corrective Action: Please include the following language in corrective actions for all MS methods: “(no samples may be accepted without a valid tune)”
    - *Acceptable after confirmation with laboratory*

2. Text: HR/MS (PCDD/F); GC column performance check; Corrective Action: Please include the following language in corrective actions for all MS methods: "(no sample run until column performance check has passed)"
   - *Acceptable after confirmation with laboratory*
3. Discussion: GCMS (VOCs TO-15 and SVOCs); CCV; Acceptance Criteria and Corrective Action: Consistently biased high values may indicate a method problem. Data qualification is not acceptable as corrective action.
   - *Acceptable after confirmation with laboratory*
4. Discussion: GCMS (VOCs TO-15 and SVOCs); IS and Surrogate Standards; Corrective Action: Samples should always be reanalyzed to define the scope of matrix interference.
   - *Acceptable after confirmation with laboratory*
5. Discussion: GCMS (VOCs TO-15); MB; Frequency of Calibration: Please confirm the method requires calibration on every analytical batch and not "of 20 or fewer samples".
   - *Laboratory is saying a batch cannot exceed 20 samples*
6. Text: GCMS (VOCs TO-15); HT; Acceptance Criteria: Please delete reference to Tedlar bags as they are not proposed in Phase 1A.
   - *Acceptable*
7. Discussion: GCMS (VOCs TO-15 and SVOCs); LOQ and DL; Corrective Action: N/A may not be appropriate.
   - *ERM will discuss with laboratory and complete as appropriate*
8. Discussion: GC/MS (SVOCs) Surrogate Standards; Acceptance Criteria: The range appears to be high.
   - *ERM will confirm with laboratory – will revise to match WS12*
9. Discussion: HR/MS (PCBs); Tuning; Corrective Action: Possible typographical errors that affect the content.
   - *ERM will review and confirm and revise as appropriate*
10. Text: HR/MS (PCBs); Initial; multi-point; Acceptance Criteria: Please clarify where Table 8 is found; e.g., TO-04 Method or the laboratory-specific SOP?
    - *Acceptable*
11. Discussion: GC/MS (SVOCs); LD; Acceptance Criteria and Corrective Action: The application of the RPD and the reporting of three aliquots.
    - *ERM to verify and revise as appropriate*
12. Discussion: Holding time for SVOCs.
    - *ERM will confirm with laboratory*

Additional Note: the use of LOD and DL – please make consistent and confirm with laboratory

Worksheet 25

1. Discussion: ICP/MS and CVAA; Acceptance Criteria.
   - *ERM to revise to direct reader to acceptance criteria or state here*
2. Discussion: ICP/MS; Corrective Action: Please provide specific reference.
   - *Acceptable*

Worksheet 28

1. Discussion: SVOCs; Surrogate Monitoring Compounds; Method/SOP QC Acceptance Limits.
   - *ERM will confirm with laboratory*

Worksheet 30

1. Discussion: Data Package Turnaround Time: The times appear to be short. Why are the short TAT's necessary?
   - *Listed as business days not calendar days.*
   - *ERM will confirm with laboratories and make changes if requested.*

B-5

15 July 2014 ERM Responses to USEPA Comments on Draft Air SAP Worksheets

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From:	Judy Nedoff
Sent:	Tuesday, July 15, 2014 5:22 PM
To:	clecours@PWT.COM
Cc:	Kevin Lundmark
Subject:	ERM responses to summary of Air Phase 1A SAP comments
Attachments:	RTC to SUMMARY OF Air Phase 1A SAP Worksheet Review.pdf

Hi, Catherine,

See attached for some information regarding the revisions made to the Worksheets in the Phase 1A Air SAP based on discussions with the risk assessors and laboratories (ALS Burlington, Houston, and Simi Valley). Please contact me or Kevin if you have any questions.

Judy Nedoff
Senior Project Manager

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RESPONSES TO SUMMARY OF COMMENTS

Air DMA/Phase 1A
Draft SAP Worksheets 12, 15, 19, 20, 21, 22, 23, 24, 25, 26, 28, 30, Conference Call
US Magnesium Superfund Site, Rowley, Utah
Tuesday, July 1, 2014 9:00 a.m.

A call was held to discuss PWT3 comments on the draft Air Phase 1A SAP prepared by ERM. Notes are provided below regarding changes made based on discussions with risk assessors and laboratories.

Purpose: Concise discussion of draft Worksheets prior to ERM submittal of Draft Phase 1A Air SAP.

The Agenda items below reflect points of discussion and suggested text revisions. The outcome will be a meeting summary prepared by PWT (LeCours) and a Draft Phase 1A Air SAP reflecting the agreements made during the call.

Discussion summary in italic font and prepared by C. LeCours

Attendees

ERM: Judy Nedoff, Kevin Lundmark, Bob Farmer
PWT: Catherine LeCours
Tetra Tech: Doug Herlocker, Robert Howe

General *Changes made as described below.*

1. Please ensure the SAP includes the backup sample media at the same frequency as field duplicate QC samples (10%). (K. Lundmark email 24Jun2014)
    - *Team agreed there is no requirement that the backup sample is coincident with the duplicate sample.*
    - *BF: Duplicate samples should be collected across the time during which sampling will be conducted during the Phase 1A air program, but can and will be collected from a single station.*
    - *BF: Backup media to evaluate breakthrough will be collected at all three sampling stations.*
    - *KL: A backup sample will be collected over three consecutive 10 day periods at each sampling location.*
    - *The three day sample interval for collection of the backup sample at each station within the consecutive three 10 day sampling intervals planned during Phase 1A will be randomly selected at any one of the three sampling locations.*
    - *KL: Duplicate samples will be collected at random times once every 10 days from a single sampling location to be specified in the Phase 1A SAP.*

Worksheet 12 *Changes made as described below.*

1. Discussion: Measurement Performance Criteria – some values seem out of a normal acceptance range and do not reflect that of the Phase 1A RI SAP (for "outer" PRIs).
    - *KL: values came from Phase 1A RI SAP and simplified for the QL multipliers*
    - *PUF Field Duplicate: will revise to read as the Phase 1A RI SAP*
    - *PUF Field Spike: acceptable as written*
    - *PUF Blank Spike (SVOC): from laboratory SOP, acceptable as written*
    - *Particulate Field Duplicate: will revise to read as the Phase 1A RI SAP*
    - *Summa Field Duplicate: will revise to read as the Phase 1A RI SAP*
    - *Summa Laboratory Duplicate: from laboratory SOP, acceptable as written*
    - *Near-continuous CVC: may change to be +/- 15% and possible addition of text to explain the criteria*

2. Discussion: PUF Media Method; Field Spike – possible revision based on PUF backup frequency.
   - *Comment no longer applicable*
3. Text: Summa Canister Method; Laboratory Control Sample; Measurement Performance Criteria: ERM please ensure Phase 1A Air SAP includes either the actual limits it this table OR a citation of reference (Lab SOPs?) for where PWT/Tetra Tech may find those limits.
   - *Acceptable*
4. Text: Notes; a. Please revise as follows: "When established criteria…, the proposed criteria were selected based on *default data validation criteria*."
   - *Acceptable*
5. Text: Notes; b. Please insert "b" in the "Measurement Performance Criteria" header and include a note as follows: "*Decisions about analytical methods and QC requirements for air samples may be revised based on results of the DMA and laboratory audit findings*."
   - *Can be addressed in SAP mods*
6. Discussion: Field Blank – description of the collection process.
   - *BF: described in methods, do everything short of turning the blower on*

Worksheet 15

1. Text:
   a. All footnotes 1 should be revised to read: "Target Quantitation Limit (TQL) values are based on USEPA RSLs for Industrial Air. The RSL value used is the lesser of the values based on a cancer risk of 1E-06 or a Hazard Quotient of 0.1."
   - *Acceptable*

   Revised.

   b. PCBs: Footnote 1 should read: "The TQL for total PCBs is based on Aroclor mixtures."
   - *Verify with risk assessors.*

     Footnote 1 was revised as follows: The TQL for total PCBs equals the RSL for total PCBs, high risk, CAS 1336-36-3.

   c. PCBs: Footnote 4 should read: "Total PCB concentration will be calculated as the sum of 209 PCB congeners, ~~assigning ½ the detection limit to non-detects~~".
   - *ERM would assign non-detect as zero – consistent with the SLRA June 19 meeting and Final SLRA TM.*
   - *POST MEETING NOTE – UPON FURTHER INVESTIGATION, THE FOOTNOTE IS CORRECT AS WRITEN IN THE WORKSHEETS.*

   d. All tables where one or more TQL values are "—", the first note should be modified to say: "—" = No screening value available.
   - *Acceptable*

   Revised.
2. Discussion: Analytical Groups: PCBs, D/F, SVOCs, note 3 – High volume methods used during the DMA pulled less than 600 cubic meters of air. Detection limits should probably be evaluated at 500 cubic meters as opposed to 600 cubic meters final volume.
   - *BF: the detection limit is based on the sample volume – conversion process*
   - *KL: will adjust the values based on the DMA – 500 across the board*

   Revised.
3. Discussion: Analytical Group: PCBs – Total PCBs; detection limits.
   - *JN: will go back to laboratory for clarification, the DL varies based on the congeners, QL is below TQL.*

   Footnote 4 now includes an explanation of the detection limit for total PCBs (this value is sample-specific): "The detection limit will be the lowest of the individual congener EDLs for the sample."

4. Text: Analytical Group: D/F – The calculated TQLs are based on WHO TEFs from 1998. These values have been updated and TEFs from WHO 2005 should be used. This decreases the TQLs for four analytes: 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, OCDD and OCDF.
   - *Acceptable.*

   Revised to use the 2005 TEFs.
5. Text: Analytical Group: SVOCs; phenol – The CAS should be 108-95-2 and the RSL should be 8.8E+01.
   - *ERM will confirm with risk assessors.*

   Revised as requested.
6. Text: Analytical Group: VOCs; 1,4-dioxane – The TQL should be 2.5E+00.
   - *ERM will confirm with risk assessors.*

   Revised as requested.
7. Text: Analytical Group: Inorganics
   a. For consistency in format, the heading above the table should be modified to say: Analytical Group: Inorganics (EPA IO 2.1/3.1 Modified/3.5)
   - *Acceptable.*

   Revised as requested.

   b. The TQL shown for cadmium is not the lower of the two values in the RSL Table. The correct value is 1.5E-04.
   - *ERM will confirm with RSL tables.*

   The value for cadmium in the note appears to be a typo. The correct value is 4.4E-03 and has been revised.

   c. No TQL is shown for chromium. Recommend Cr(VI) = 1.5E-04 ug/m3, even though not all Cr in air may be Cr(VI). Add a footnote stating the values assumes 100% Cr(VI).
   - *ERM will confirm with the risk assessors and compare to SLRA tech memo.*

   The Cr(VI) RSL was added as the chromium TQL, with the following note: "An Air RSL for total chromium is not available. The TQL shown is the Industrial Air RSL for hexavalent chromium. The proportion of chromium present in the hexavalent form, if any, is not known and is not quantified by method EPA IO 2.1/3.1 Modified/3.5."

   d. No TQL is shown for vanadium. The RSL Table shows a value of 4.4E-02.
   - *Acceptable – will confirm upon review and revise as appropriate.*

   Revised as requested.
8. Discussion: Analytical Group: Inorganics; note 3 – Detection limits should probably be calculated at 3000 to 3500 cubic meter final volume to be consistent with expected volumes based on Stage 1 and 2 flow rates.
   - *KL: will adjust the values based on the DMA – 3000 across the board.*

   Revised.

   Note: all TQLs are industrial air RSLs from the November 2013 RSL table, consistent with values used in the SLRA Technical Memorandum.

Worksheet 19 *Changes made as requested or described below.*

1. Text: Please include both the holding times for extraction (preparation) and analysis when feasible.
   - *Acceptable*
2. Discussion: Ambient Air Volume per Sample should not exceed the values listed in the table to remain consistent with the DMA and WS#15 calculations. Consider revising text to state "less than" instead of "approximately."
   - *BF: will leave as approximate, the samples are calculated based on actual volume. PUF media samples with post-sample calculated total volume more than 10% above target volume will warrant examination of spike recoveries to identify possible breakthrough*
3. Discussion: Holding time for D/F.
   - *JN: will confirm with laboratory and revise as appropriate*

4. Discussion: Footnote 3 is included in the table and not below the table. Should there be a "3" that reads: "Duplicate samples will have backup PUF cartridges."?
   - *Comment no longer applicable – remove the "3" reference from the table*

   Footnote 3 now reads: For 10 percent of the Phase 1A samples (see Worksheet #20), the PUF samples will include unspiked back-up media that will be analyzed as a quality control measure to verify absence of significant breakthrough of spike compounds and/or target analytes.

Worksheet 20

1. Text: Note 4 should reference the XAD-2 cartridge.
   - *Acceptable*

   Revised.

Worksheet 22 *Changes made as requested below.*

1. Discussion: PUF Sampler; Maintenance: Add maintenance item to ensure that motor brushes will be exchanged as needed (manufacturer specifications is once every 500 hours and during the sampling program each hi-vol sampler will run for at least 720 hours - 24x30).
   - *BF: already accounted for this, will add a statement in the table*
2. Discussion: BM25; Calibration: Insert acceptance criteria as specified in table and corrective action if units fall outside this range.
   - *Comment discussed earlier. Repeat daily calibrations for which zero or high-level gas response discrepancy is greater than 15% of reference value may warrant manufacturer maintenance.*

Worksheet 23

1. Discussion: Please provide HE00215 (Project-Specific Work Instructions) of 11 June 2014 for PWT/Tetra Tech review.
   - *ERM will provide with the draft SAP or earlier if possible*

   Provided on 8 July 2014.

Worksheet 24

1. Text: HR/MS (PCDD/F); Tuning; Corrective Action: Please include the following language in corrective actions for all MS methods: "(no samples may be accepted without a valid tune)"
   - *Acceptable after confirmation with laboratory*

   The entry was revised to be consistent with the laboratory's HRMS methods, in which a mass resolution check is done, which is not the same as tuning.
2. Text: HR/MS (PCDD/F); GC column performance check; Corrective Action: Please include the following language in corrective actions for all MS methods: "(no sample run until column performance check has passed)"
   - *Acceptable after confirmation with laboratory*

   Revised.
3. Discussion: GCMS (VOCs TO-15 and SVOCs); CCV; Acceptance Criteria and Corrective Action: Consistently biased high values may indicate a method problem. Data qualification is not acceptable as corrective action.
   - *Acceptable after confirmation with laboratory*

   A series of actions are taken if the CCV does not meet criteria and sample results are affected, and these steps are described in the laboratory SOP. The actions are difficult to capture in the space available, but if there are issues that affect data quality, reanalysis of the CCV is required. If the CCV fails again, the ICAL is rerun. Note that if the CCV is biased high and the associated analyte(s) are ND, results are acceptable. If no other CCV issues are present, the CCV does not need to be reanalyzed.

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4. Discussion: GCMS (VOCs TO-15 and SVOCs); IS and Surrogate Standards; Corrective Action: Samples should always be reanalyzed to define the scope of matrix interference.
   - *Acceptable after confirmation with laboratory*

   These entries were removed from Worksheet 24as they are not related to calibration. Acceptance criteria and corrective actions are included in Worksheet 28.
5. Discussion: GCMS (VOCs TO-15); MB; Frequency of Calibration: Please confirm the method requires calibration on every analytical batch and not "of 20 or fewer samples".
   - *Laboratory is saying a batch cannot exceed 20 samples*

   This entry was removed from Worksheet 24as they are not related to calibration. Acceptance criteria and corrective actions are included in Worksheet 28.

6. Text: GCMS (VOCs TO-15); HT; Acceptance Criteria: Please delete reference to Tedlar bags as they are not proposed in Phase 1A.
   - *Acceptable*

   Revised.
7. Discussion: GCMS (VOCs TO-15 and SVOCs); LOQ and DL; Corrective Action: N/A may not be appropriate.
   - *ERM will discuss with laboratory and complete as appropriate*

   These entries were removed from Worksheet 24, as corrective action related to calibration does not apply.

8. Discussion: GC/MS (SVOCs) Surrogate Standards; Acceptance Criteria: The range appears to be high.
   - *ERM will confirm with laboratory – will revise to match WS12*

   Entry removed from Worksheet 24; acceptance criteria were confirmed with the laboratory and are shown on Worksheet 28.
9. Discussion: HR/MS (PCBs); Tuning; Corrective Action: Possible typographical errors that affect the content.
   - *ERM will review and confirm and revise as appropriate*

   Revised.
10. Text: HR/MS (PCBs); Initial; multi-point; Acceptance Criteria: Please clarify where Table 8 is found; e.g., TO-04 Method or the laboratory-specific SOP?
    - *Acceptable*

    Revised.
11. Discussion: GC/MS (SVOCs); LD; Acceptance Criteria and Corrective Action: The application of the RPD and the reporting of three aliquots.
    - *ERM to verify and revise as appropriate*

    Entry removed from Worksheet 24; acceptance criteria were confirmed with the laboratory and are shown on Worksheet 28.
12. Discussion: Holding time for SVOCs.
    - *ERM will confirm with laboratory*

    Entry removed from Worksheet 24; holding time was confirmed with the laboratory and is shown on Worksheet 19.

Additional Note: the use of LOD and DL – please make consistent and confirm with laboratory

Comment no longer applicable.

Worksheet 25 Changes made as described below.

1. Discussion: ICP/MS and CVAA; Acceptance Criteria.
   - *ERM to revise to direct reader to acceptance criteria or state here*
2. Discussion: ICP/MS; Corrective Action: Please provide specific reference.
   - *Acceptable*

Worksheet 28

1. Discussion: SVOCs; Surrogate Monitoring Compounds; Method/SOP QC Acceptance Limits.
   - *ERM will confirm with laboratory*

   Revised.

Worksheet 30

1. Discussion: Data Package Turnaround Time: The times appear to be short. Why are the short TAT’s necessary?
   - *Listed as business days not calendar days.*
   - *ERM will confirm with laboratories and make changes if requested.*

   Revised to indicate business days. VOC and SVOC data package turnaround time changed to 15 days.

B-6
18 July 2014 USEPA Comments on Phase 1A Air SAP Rev 0 July 2014

EPA Technical Comments on ERM-West Inc.'s
DRAFT PHASE 1A REMEDIAL INVESTIGATION SAMPLING AND ANALYSIS PLAN FOR OPERABLE UNIT 2 – AMBIENT AIR, Revision 0
(Document date: July 2014)
U.S. MAGNESIUM NPL SITE, TOOELE COUNTY, UTAH
July 18, 2014

GENERAL COMMENTS

1. Revise "USUSEPA" to read "USEPA" throughout the document.
2. Include the complete references for USEPA 2001, USEPA 1989, USEPA 1997, USEPA 2006, EPA 2008, EPA 2010, and EPA 2011 on the reference page.
3. The ATI meteorological station provides critical data for the Phase 1A Air SAP data quality objectives (DQOs). ERM should provide an Appendix to the Phase 1A Air SAP with details regarding the meteorological station equipment specifications, routine site operations, calibrations, and independent audits. This Appendix may be an Operations and Maintenance manual from the subcontractor.

SPECIFIC COMMENTS

Introduction

1. Third paragraph, fourth sentence: Revise the text as follows: "…buildings are a series of waste disposal evaporation ponds, a concentrator…".

Worksheet #1

1. Remove Kristen Keteles as a signatory and add the following line to Ken Wangerud "Delegated QA Approving Officer, EPR-SR."

Worksheet #3

1. Replace "~~TBD~~" for Air Specialist with: Rebecca Matichuk, Air Modeling Specialist, USEPA, Office: (303) 312-6867, email Matichuk.rebecca@epa.gov.
2. Revise Wendy O'Brien to read: "Human-health ~~(and eco-)~~ Risk Assessment."
3. Notes: Add "(for USEPA)" after PWT3 and SRC.
4. Notes: Revise ~~SRC~~ to read "SRC = SRC, Inc."
5. Include Linda Rauto and Casey Lenhart from WS#5.

Worksheet #5

1. Revise upper boxes to clarify the USEPA is the SAP Issuer and ERM is the SAP Developer.
2. Replace "TBD" for (Air) on the USEPA Project Team with Rebecca Matichuk and remove "TBD" from notes.
3. Remove Robert Howe from the EPA Contractor box.

Worksheet #7

1. Add the following text to the Responsibilities of Judy Nedoff: "The ERM QA Manager will remain independent of the data generation activities."
2. Identify the individual responsible for maintaining the official, approved Phase 1A Air SAP. In addition (possibly in WS#3, WS#4 and through Appendix G), state how individuals identified in WS#3 will receive the most current copy of the approved Phase 1A Air SAP and identify the individual responsible for this.
3. Identify the USEPA (e.g., Catherine LeCours) and ERM team personnel responsible for assuring training and certification requirements identified in WS#8 are satisfied.

4. Identify the USEPA (e.g., Catherine LeCours) and ERM team personnel (including laboratory) responsible for identifying critical supplies and consumables, noting supply source, acceptance criteria, and procedures for tracking, storing and retrieving these materials.

Worksheet #11

1. Section 11.1, second paragraph: Revise the text as follows: "…~~Environmental~~ Ecological Risk Assessment…" to be consistent with other project documents.
2. Section 11.3.3: Include text to clearly identify that information which is critical (e.g., meteorological station data and analytical results) to achieving the DQOs, versus what is for informational purposes (e.g., Cl_2 and HCl monitoring results).
3. Section 11.3.4.2, last paragraph: Revise the text as follows: "To achieve the overall objective in Section 11.3.2, the timeframe for Phase 1A air sampling was selected to increase the probability of obtaining samples with ~~due to a higher likelihood for capture of~~ concentrations that are high-biased compared to long-term averages. As discussed below, r~~R~~efined dispersion modeling using a 3-year data set was used to select optimum sampling times and locations. The results indicate~~s~~ that late summer months (i.e., July – September) experience a higher-occurrence of high-biased concentrations at selected sampling locations within the west to southeast directions from the Magnesium Plant."
4. Section 11.3.7, second paragraph, last sentence: Revise the text as follows: "…number of samples and Phase 1A sampling period ~~may be extended~~ will be extended until the DQO criteria, as specified in this SAP, have been achieved."
5. Section 11.3.7.1, last paragraph: … of a given monitoring station. However, the data from the BM25 monitors are for qualitative purposes only and will not be considered sufficient to alter the conclusions of the data adequacy assessment."
6. Section 11.3.7.2.1, last paragraph on page 6 of 13, last sentence: Insert text directing the reader to Section 11.3.3, Step 7, of the September 2013 Phase 1A RI SAP for further explanation.
7. Section 11.3.7.2.1, last paragraph: Revise as follows: "…and concluded that 2013 SAP Station 1 ~~would~~ could provide results that ~~are~~ may be redundant with the Adjusted 2013 SAP Station 2. …In light of the uncertainty of the dispersion model's ability to predict differences in future concentration at closed spaced locations, it is not ~~reasonable to conclude~~ certain that 2013 SAP Stations 1 and 2 ~~will~~ would have significantly different concentrations during Phase 1A. …"
8. Section 11.3.7.2.3 *Plant Operating Conditions*: Revise the text to include evaluation of conditions that may reflect normal operating conditions (e.g., stack release rates, production rates, shut-downs, malfunctions, fugitive releases, etc.). The new text of "below normal production rates" should read "If operations reflect conditions substantially different from normal, …" The data report must include a detailed discussion of any abnormal operating or other conditions that are observed or recorded by ERM during the Phase 1A sampling episode.
9. Section 11.3.7.2.5: Include a discussion of spiked media samples.

Worksheet #14

1. Identify potential resource and time constraints that may impact the field activities and resolutions.
2. Assessment/Audit Tasks
   a. Second bullet: Revise as follows: "...contractor) at least twice, or as needed, during the…"
   b. Third bullet: Revise as follows: "…contractor) once, or as needed based on laboratory performance or other data quality issues, during…"

Worksheet #18

1. PRI18-002 and PRI18-003: Remove Cl2 and HCl from the Analytical Groups column.
2. Add a definition of mN and mE to the notes.
3. Note 2: Revise the text to read "…described in ~~Filed~~ Field Sampling SOP…"

Worksheet #19

1. Revise instances of "(4ºC)" to read "(≤4ºC)".

Worksheet #22

1. PUF Sampler, Calibration: The SOP states multi-point calibrations will be conducted every 360 hours of operation. Therefore, two calibrations will be required during a 30-day sampling program. Revise the text to be specific to this sampling event.
2. PUF Sampler, Testing: Specify a distance from the sampler (e.g., 100 meters depending on site conditions or constraints).
3. High-Volume Particulate Sampler – PM10 and metals, Calibration and Testing: The reference to 16.7 l/min appears to be a typographical error. The design flow rate is 1.13 m^3/min. Revise accordingly.
4. High-Volume Particulate Sampler – PM10 and metals, Maintenance, 1): The PM10 sampler uses a particulate separation design and should be inspected after each sample event and cleaned as necessary. Revise accordingly.
5. High-Volume Particulate Sampler – PM10 and metals, Inspection: This section references "low-volume" pump. Review and revise to be appropriate for the high-volume sampler.
6. BM25, Calibration: The flow rate for the reference gas should be 1 L/min provided the short-term (i.e., 5-10 minute) interval required for monitor calibration. Revise accordingly.

Worksheet #28

1. Air, PCBs, Surrogate Monitoring Compounds, Corrective Action: Revise the text to include a re-extraction and analysis of the samples prior to flagging.

Worksheet #36

1. Remove note "i" as flagging the data as "EMPC" is sufficient to ensure proper use of the values, depending on the data needs.

Worksheet #37

1. Section 37.2: Remove the third bullet from the text.
2. Section 37.2.2, last paragraph: Delete the entire paragraph.

SOP USM-Air-PUF

1. Section 9.1.1, fourth bullet: Include this frequency of 360 hours in Worksheet 22.

Appendix F

1. General
   a. If data gaps occur in the met data from the ATI station, this will not be "filled" using surrogate data. Any analytical data collected during a period where data are not available from the ATI met station will not be considered as counting toward the total of 30 samples, and the sampling period shall be extended as necessary to ensure the appropriate number of samples to meet the data assessment criteria. Revise text throughout the document as appropriate.
   b. AERMOD calculations should be performed only for the three monitoring stations. Calculations at any location other than the stations are irrelevant and, if performed by ERM, should not be undertaken as part of this SAP and Report-of-Findings.

2. Obtaining and Processing Meteorological Data
   a. Second paragraph: Replace "~~Subsequently~~" with "Weekly at a minimum" to coincide with the modeling.
   b. Second paragraph: Identify *who* (by name or position) will review the raw onsite data and the extracted data.

   c. Second paragraph: If data gaps occur in the ATI meteorological data, these will not be filled "from other sources" and the samples will not count toward the minimum of 30. Delete the text as follows: "~~ERM will review the extracted data and identify data gaps that must be filled from other sources. AERMOD will not operate with an incomplete meteorological data set.~~"
   d. Bullet list: Revise to clarify if the wind speed is either scalar or vector. Wind speed cannot be both.
   e. First paragraph after bullet list: Calculations should be performed for the three monitoring stations without regard to their immediate vicinity. Calculations at any location other than the stations are irrelevant and should not be performed as part of this SAP project.

3. Use of AERMOD Results to Rank Receptor Concentrations
   a. Last paragraph: Revise this text as follows: "…for example, AERMOD, as implemented in this data adequacy assessment protocol, does not take into account fluctuations in actual emission rates."

B-7

23 July 2014 PWT3 Technical Scoping Meeting Summary

SUMMARY
Air Phase 1A SAP
Draft SAP Agency Comments
Conference Call
US Magnesium Superfund Site, Rowley, Utah
Wednesday, July 23, 2014 9:00 a.m.

Purpose: Concise discussion of Agency Comments on Draft Phase 1A Air SAP.

Discussion summary in italic font and prepared by C. LeCours

Attendees
ERM: David Abranovic, Judy Nedoff, Kevin Lundmark, Bob Farmer
PWT: Catherine LeCours
Tetra Tech: Doug Herlocker

The Agenda items below reflect points of discussion for the Phase 1A Air SAP and field activities. The outcome will be a meeting summary prepared by PWT (LeCours).

1. Inclusion of all TO-15 canister pressure readings for in the data summary report (i.e. pressure readings prior to leaving lab, prior to sample collection, end of sample collection and receipt at lab).
   - *DH: this was not appropriate to put in the SAP comments; however, PWT didn't want to lose this topic for the data report post-sampling*
   - *BF: will include a table in the data report*

2. Proposed locations for Stations 001 and 002.
   - *CL: Station 001 is the best that can be done, reminded team of risk of not meeting the data assessment needs for fugitive by moving further from the grid node location*
   - *DH: Station 002 possible to move further northwest?*
   - *BF: moving could make it closer to the tracks, diesel locomotive once to twice a week risk of false hit from exhaust*
   - *DH: balance the train and the wind direction*
   - *BF: will slide to northwest as best as possible while considering the rail spur*
   - *KL: in line with original spot would put the station 400 feet from spur – Doug's requested location should not be a problem*
   - *Discussion regarding fence, access and security in the area*
   - *Both PWT and ERM recognize objectives and constraints of desired locations – ERM will balance with final placement*
   - *CL: administrative clarification – this is SAP MOD 001 for EPA approval*
   - *KL: the stack location on the figure is taken from Figure 11-2 of the September 2013 SAP*
     - *(see continued discussion under Agenda Item 3)*
   - *BF: shifting the stack and thus the grid points may not affect the results given the restrictions of sample station locations and C_bar_max*

3. AERMOD
   a. Confirm using version and output configuration is same as was used for previous modeling exercise.
      - *BF: post-sampling modeling will only include the sources and three sample locations and will model the grids based on stack and fugitives in their correct locations*
      - *BF: confirmed yes on ERM side of the model and output files for Rebecca*

   b. Delta calculations between 2 and 10 meters / 10 and 50 meters: when are the adjustments made to configuration file (before or after sending to EPA)?
      - *BF: can do it either before or after – Bob will ensure ERM modeler communicates with Rebecca during this phase of modeling*

4. Inclusion of meteorological station information *(General Comment #3)*
   - *BF: ERM can get the information into the SAP (under Appendix F) and may even reference other documents for more details of audits and operations*
   - *DH: can the field team do a quick observation of the equipment and station (access issue?)*
   - *BF: should not be a problem to visit the station*
   - *KL: will follow up with ATI for visit*

5. Field Schedule
   - *DA: intention to get out to field and start sampling next month, didn't see anything in the comments to delay the start, ATI is the only snag and Bob proposed an alternate location*
   - *BF: same procedure for the alternate locations so still on track, maybe simpler with less fencing*
   - *CL: Worksheet 16 will be updated to reflect August 18 proposed start date for field; this is not related to the ATI access but more for field schedules and staff availability*
   - *KL: equipment set up week of August 4, readiness review August 6 and start August 18 and will continue operating until required samples are collected*
   - *DH: will be present on the 18th*
   - *DA: is there a QAPP prepared for ERM review?*
   - *CL: described the simple tech memo outlining PWT's field oversight activities*

6. ERM request for clarification on specific Agency Comments
   - *BF: generally comments are acceptable, Bob focused on Appendix F comments for the data gaps, should not happen during this sampling event, the met station subcontractor will notify ERM immediately to take action*
   - *CL: EPA recognized the very low potential for any data gaps when suggesting the definitive text of extending the samples and not include any analytical results from a met station down-time*
   - *BF: text will be revised as requested*
   - *BF: WS11 and 37: somewhat concerned about the text for the BM25 results, it will be used as extra line of evidence in the report of stack emissions*
   - *DH: reminded team of the fugitive sources too*
   - *KL: Asked about the use of the text from WS#11 Comment #5 to be inserted in WS#37 Sections 37.2 and 37.2.2 INSTEAD of removing the text as requested in WS#37 Comments 1 and 2*
   - *DL/CL: evaluated the text of WS#37 and agreed to the alternate revision proposed by ERM*
   - *KL: WS#11 Comment #6 – if the text is from September 2013 Step 7, then why refer back to it?*
   - *CL: the highlighted yellow text as changed by ERM could possibly be confusing – a simple reference back to the September 2013 SAP would clear up the revised text*
   - *JN: WS#28 – the laboratory does not re-extract/analyze for surrogate issue, the revisions ERM made to the acceptance criteria (after the WS call of July and after discussion with Houston lab) should cover back to this, the tables are now consistent and meet the Houston lab criteria*
   - *JN: WS#36 – wants to leave in the first and second sentences of the footnote and refer back to the September 2013 SAP*
   - *CL/DH: okay with the proposal by ERM on WS#28 and WS#36*

Appendix C
Laboratory Standard Operating Procedures

Appendix D
Field Standard Operating Procedures

Appendix E
September 2013 Phase 1A Sampling and Analysis Plan Worksheets 13, 29 and 31 - 35

Appendix F
Procedure for Post-Sampling AERMOD Calculations

APPENDIX F

Methodology for Air Phase 1A Data Evaluation using AERMOD Simulations

Background

As discussed in Worksheet 11, Phase 1A locations for monitoring stack releases and/or fugitive releases were selected using AERMOD calculations to rank different locations according to the probability of high-biased sample conditions. One result from this modeling was derivation of a relative $\bar{C}_{max}$concentration value. For this analysis $\bar{C}_{max}$ serves as a concentration metric, equal to the highest-predicted, long-term average relative concentration at any receptor in the modeled population.

ERM and EPA performed a dispersion modeling evaluation for the site, using 3-years of available on-site validated meteorological data (2009 – 2011) to determine the value and location of the modeled $\bar{C}_{max}$. The relative concentrations in the modeled population were 3-day averages (from daily values produced by AERMOD), to correspond to the sample duration to be applied in Phase 1A. Separate sets of model runs were performed for the stack and fugitive data sources to independently assess their relative contributions. The combined dataset for three years was divided into modeled 3-month time periods, and it was found that the occurrence of high-biased samples near the magnesium plant were favored by typical wind patterns during the months of July through September. Refer to Section 11.3.7.2.1 in Worksheet 11 for a full discussion of the modeling for prior years.

Objective

As Phase 1A sampling is being conducted, ERM will perform comparable atmospheric dispersion modeling for the time periods that coincide with 3-day samples for each chronic toxicant at each station. The same model construct will be used, including separate runs for stack and fugitive source contributions. Actual meteorological data collected during the sampling event will be utilized in the AERMOD simulations. The objective of this effort will be to assess whether the conditions that occurred during an actual Phase 1A sample interval would result in a predicted relative modeled concentration at one or more sample locations that is higher than the $\bar{C}_{max}$ metric obtained from modeling the prior 3 years. If so, then it can be concluded that the actual sample concentrations for the chronic toxicants are sufficiently high-biased for conservative COPC selection.

Obtaining and Processing Meteorological Data

The initial step during the Phase 1A evaluation modeling will be to obtain and process onsite meteorological data collected at the 50 meter tower located on the adjacent ATI facility. These data will be provided directly to ERM from Met Solutions, Inc. the local ERM contractor operating the onsite meteorological monitoring tower. Raw data files will be obtained several times per week during Phase 1A, for the preceding block of Phase 1A days. Quality assurance/quality control (QA/QC) information for the meteorological tower at the ATI facility is included as Attachment 1 to this Appendix.

Weekly at a minimum, the blocks of raw monitor data will be prepared for input to AERMET, the meteorological processor that works with AERMOD. The raw onsite data, as obtained from Met Solutions, must be reviewed for completeness, converted to hourly averages, and formatted for input to AERMET. These steps will be performed by Vicki Hoffman, a senior air quality scientist in ERM's Walnut Creek office, or a designated air quality analyst. ERM has developed a FORTRAN-coded executable program that will allow the necessary data to be extracted, reformatted and written into a separate file for use as AERMET input. ERM will review the extracted data and identify data gaps. However, if data gaps are observed for a given Phase 1A interval, these data will not be filled from other sources. The samples and analytical data obtained during a period when data is not available from the ATI met station will not be considered as counting toward the total of 30 samples for the Phase 1A program.

The ATI tower data are collected at three heights, 2 meters, 10 meters and at 50 meters. The data extracted for use in AERMOD consist of:

- Atmospheric pressure (mbar)
- Precipitation (inches)
- Solar radiation (watts/square meter)
- Net radiation (watts/square meter)
- Scalar wind speed at 10 meters (meters/second)
- Scalar wind speed at 50 meters (meters/second)
- Wind direction at 10 meters (vector, degrees)
- Wind direction at 50 meters (vector, degrees)
- Temperature at 2 meters (degrees C)
- Temperature at 10 meters (degrees C)
- Temperature at 50 meters (degrees C)
- Relative humidity (percent)
- Delta between 2 and 10 meters (degrees C)
- Delta between 10 and 50 meters (degrees C)

The ERM extraction program first reads in a control file (GET_ONS.ctl) and a second file (par_nms.txt) that lists the various meteorological parameters. The control file identifies the raw hourly meteorological data file (xxdate.hry) for use in the executable ERM program. The program then extracts the appropriate data and writes it to its own output file (onsite.dat), which ready for input to AERMET. After AERMET data processing the resulting data file can be used in AERMOD for calculating hourly and daily average concentrations for the sampling period. These runs will be set up to assess relative concentrations only at the three sampling locations for Phase 1A.

The preparation of the AERMET input is estimated to require no more than one person-day from the time the raw data is obtained. The extraction executable program along with input and output example files will be uploaded to the Project Database (EQuIS) for use and reference during and after Phase 1A.

The onsite data, along with National Climatic Data Center (NCDC) Salt Lake City upper data will be processed using the EPA-approved AERMET for eventual compatibility with the AERMOD dispersion model. The upper air data soundings at the Salt Lake International Airport will be used for calculating mixing height data and boundary layer parameters. ERM will periodically download upper air data from the NOAA/NCDC web site at http://www.esrl.noaa.gov/raobs/ for Salt Lake City. The upper air sounding data is usually available within 24 to 48 hours after collection, on the NCDC website.

Use of AERMOD Results to Rank Receptor Concentrations

For this aspect of the Phase 1A data quality evaluation, the AERMOD dispersion model will be used to predict the relative concentrations of a generic emission during the actual sampling periods for the three sampling locations. It should be noted that the modeling does not utilize actual emission rates, and does not address individual toxicants. Instead the approach is to assign an overall plant emission rate of 100 "units" and proportion this total among the aggregated stack sources, and several fugitive sources at the site, based on process knowledge and prior stack testing. In the same manner as the EPA modeling that established the methodology for this process, the relative off-site concentrations due to stack sources will be modeled separately from those due to fugitive sources. Except for the reduced receptor grid, these model runs will be based on the same stack and fugitive emission parameters, and other AERMOD inputs used for the prior modeling that examined historic patterns of ground-level concentrations (Refer to USEPA, Phase 1A SAP, Attachment 11, September 2013). Predicted relative concentrations for the three Phase 1A stations will be compared to the previously established $\bar{C}_{max}$ values for stack-only and fugitive-only releases, as follows:

1. At each Phase 1A sampling station, use AERMOD to calculate the average relative concentration due to stack-only releases during each 3-day sampling interval during Phase 1A using the concurrent meteorological data from the ATI meteorological station. As the samples accumulate for each station, count the number of samples that have a predicted relative concentration value exceeding modeled $\bar{C}_{max}$ for stack-only release.
2. Similarly, use AERMOD to calculate the average relative concentration due to fugitive-only releases during each 3-day sampling interval during Phase 1A using the concurrent

meteorological data from the ATI meteorological station. As the samples accumulate for each station, count the number of samples that have a predicted relative concentration value exceeding modeled $\bar{C}_{max}$ for fugitive-only release.

In principle, if at least one sample interval evaluated following steps 1 and 2 above during the Phase 1A period (a minimum of 30 investigative samples) corresponds to a predicted relative concentration that exceeds modeled $\bar{C}_{max}$ for stack-only releases, the data set should be adequate for COPC selection for stack emissions. Likewise, if at least one sample interval out of the combined Phase 1A period corresponds to a relative concentration that exceeds modeled $\bar{C}_{max}$ for fugitive-only releases, the data set should be adequate for COPC selection for fugitive sources. It is recognized that there is uncertainty in the relationship between AERMOD calculations of relative concentration and the actual sampled concentrations; for example, AERMOD, as implemented in this data adequacy assessment protocol, does not take into account fluctuations in actual emission rates. Therefore, the confidence in the adequacy of the sampled data set increases with higher frequency and magnitude of predicted relative concentrations above modeled $\bar{C}_{max}$ at the three Phase 1A locations. For this reason, Phase 1A air sampling will continue for the duration required to collect a minimum of 30 samples, regardless of whether initial samples collected during the Phase 1A sampling program are predicted to have a relative concentration exceeding $\bar{C}_{max}$. As required by USEPA, the Phase 1A air sampling program will not be demobilized until the USEPA concurs with ERM's AERMOD calculations and a finding of data adequacy.

Schedule

During the Phase 1A Air Sampling Program, data will be uploaded on a weekly basis to the EQuIS Project Database for use and review by USEPA. Data will be uploaded not later than every Friday and each upload will include:

- On-site meteorological data from ATI and upper air data from NCDC for the preceding week (Monday through Sunday), including the control file (GET_ONS.ctl), parameter file (par_nms.txt), raw hourly meteorological data file (xxdate.hry), and meteorological data output file (onsite.dat) for input to AERMET; and,
- AERMOD input and output files for each 3-day SAP location sample interval that ended during the preceding week (Monday through Sunday), including a tabular summary of calculated average relative concentration due to stack-only releases and due to fugitive-only releases compared to for each 3-day SAP location sample interval.

ATTACHMENT 1 TO APPENDIX F

QUALITY ASSURANCE/QUALITY CONTROL FOR THE ATI METEOROLOGICAL MONITORING STATION

The meteorological data collected at the monitoring station located on the ATI facility will have a key role in data evaluation for Phase 1A air quality sampling. As described in Appendix F to the Air Quality Phase 1A SAP, these on-site data will support dispersion modeling to assess conditions during discrete sampling periods using the AERMOD system. The quality assurance/quality control (QA/QC) program for this station was initiated by ERM in 2012, and comprises several components:

- Periodic data review for consistency and completeness
- Semiannual inspections and calibration checks for all instruments and controls
- Semiannual third-party performance audits

The specific procedures for the semiannual inspections and the semiannual performance audits are detailed in several relevant guidance documents:

- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, Version 2.0 (EPA-454/B-08-002) March 2008.
- Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD), Meteorological Measurements (EPA-450/4-87-007) May 1987.
- Meteorological Monitoring Guidance for Regulatory Modeling Applications (EPA 454/R-99-005) February 2000.

These guidance documents provide the specifications that pertain to the ATI monitoring station, and the detailed procedures and schedules for suitable QA/QC activities. In particular, chapter 5 of the May 1987 guidance provides relevant technical specifications, and specified schedules for QA activities that would qualify the collected data for rigorous PSD air permitting for major sources. This chapter excerpt is included in this attachment for reference.

Data review, and the semiannual inspections/calibrations are performed by MSI Inc. of Salt Lake City (as contractor to ERM). MSI downloads the complete data file remotely and screens the data to identify data gaps and consistency with prior data ranges. Their on-site activity involves verification of instrument accuracy and as-needed replacements or maintenance of the instruments. Independent third-party audits of instruments accuracy and precision are conducted by VSI of Phoenix (as contractor to ERM). These activities have been performed on alternating calendar quarters since mid-2012. The most recent Meteorological System Audit Report prepared by VSI (April 2014) is representative of the ATI instrument performance and is included in this attachment for reference. This report provides a complete description of the ATI station equipment, including manufacturers and model numbers of each instrument.

Chapter 5 of Ambient Monitoring Guidelines for Prevention of
Significant Deterioration (PSD), Meteorological Measurements
EPA-450/4-87-007
May 1987

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA-450/4-87-007
May 1987

Air

AMBIENT MONITORING GUIDELINES FOR PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

5. METEOROLOGICAL MONITORING

5.1 Data Required

The preconstruction review of proposed major emitting facilities will require the use of meteorological data. It is essential that such data be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. The representativeness of the data is dependent upon (a) the proximity of the meteorological monitoring site to the area under consideration, (b) the complexity of the topography of the area, (c) the exposure of the meteorological sensors, and (d) the period of time during which the data are collected. More guidance for determining representativeness is presented in reference 42.

A data base representative of the site should consist of at least the following data:

a. hourly average wind speed and direction

b. hourly average atmospheric stability based on Pasquill stability category or wind fluctuations (σ_θ), or vertical temperature gradient combined with wind speed

c. hourly surface temperature at standard height for climatological comparisons and plume rise calculations

d. hourly precipitation amounts for climatological comparisons.

In addition, hourly average mixing heights may be necessary for the air quality impact analysis. In most cases, this may be limited to an extrapolation of twice-daily radiosonde measurements routinely collected by the National Weather Service (NWS). Sections 5.2 and 6.1 contain specific information on instrument exposure and specifications.

Requirements for additional instrumentation and data will depend upon the availability of information needed to assess the effects of pollutant emissions on ambient air quality, soils, vegetation, and visibility in the vicinity of the proposed source. The type, quantity, and format of the required meteorological data will also be influenced by the input requirements of the dispersion modeling techniques used in the air quality analysis. Any application of dispersion modeling must be consistent with the EPA "Guideline on Air Quality Models" [14]. The guideline makes specific recommendations concerning air quality models and data bases. It also specifies those situations for which models, data, and techniques other than those recommended therein, may be applied.

Site-specific data are always preferable to data collected off-site. The availability of site-specific meteorological data permits relatively detailed meteorological analyses and subsequent improvement of dispersion model estimates. An important source of background information pertaining to on-site meteorological instrumentation is contained in an EPA workshop report [43]. Off-site meteorological data may be used in lieu of site-specific data only if it is agreed by source owner and permit granting authority that the off-site data are reasonably representative of atmospheric conditions in the area under consideration. The off-site meteorological data can sometimes be derived from routine measurements by NWS stations. The data are available as individual observations and in summarized form from the National Climatic Data Center, Federal Building, Asheville, NC 28801. On the other hand, if the nearest source of off-site data is considerably removed from the area under consideration, and especially if there are significant terrain features, urban areas, or large bodies of water nearby, it may be necessary that the required meteorological data be site-specific.

In some cases, it will be necessary that data be collected at more than one site in order to provide a reasonable representation of atmospheric conditions over the entire area of concern. Atmospheric conditions may vary considerably over the area. In some cases, (e.g., complex terrain) it will not be feasible to adequately monitor the entire meteorological field of concern. Then the only recourse is to site the stations in areas where characteristic and significant airflow patterns are likely to be encountered. In any event, one of the meteorological stations should be located so that it represents atmospheric conditions in the immediate vicinity of the source.

Although at least 1 year of meteorological data should be available, a shorter period of record that conforms to the air quality monitoring period of record discussed in Section 2.5 is acceptable when approved by the permit granting authority. If more than 1 year of data is available, it is recommended that such data be included in the analysis. Such a multiyear data base allows for more comprehensive consideration of variations in meteorological conditions that occur from year to year. A 5-year period of record will usually yield an adequate meteorological data base for considering such year-to-year variations.

In all cases, the meteorological data used must be of at least the quality of data collected by the National Weather Service. Desired features of instrumentation for collecting meteorological data are discussed in Section 6.1.

5.2 Exposure of Meteorological Instruments

Measurements of most meteorological parameters are affected by the exposure of the sensor. To obtain comparable observations at different sites, the exposures must be similar. Also, the exposure should be such that the measured parameters provide a good representation of pollutant transport and dispersion within the area that the monitoring site is supposed to represent. For example, if wind flow data over a fairly broad area are desired, the wind sensors should be away from the immediate influence of trees, buildings, steep slopes, ridges, cliffs, or hollows.

The standard exposure of wind instruments over level open terrain is 10 meters above the ground. Open terrain is defined as an area where the distance between the anemometer and any obstruction to the wind flow is at least five times the height of the obstruction. Where a standard exposure is unobtainable at this height, the anemometer should be installed at such a height that its indications are reasonably unaffected by local obstructions and represent as closely as possible what the wind at 10 meters would be in the absence of the obstructions. Detailed guidance on assessing adverse aerodynamic effects due to local obstructions is contained in reference 44. In locating wind sensors in rough terrain or valley situations, it will be necessary to determine if local effects such as channeling, slope and valley winds, etc., are important, or whether the flow outside those zones of influence is to be measured. If the analysis concerns emissions from a tall stack, it may be desirable to avoid the local influences. On the other hand, if pollution from low-level sources is the main concern, the local influences may be important.

If the source emission point is substantially above the standard 10-meter level for wind measurements, additional wind measurements at the height of the emission point and at plume height are desirable. Such measurements are used to determine the wind regime in which the effluent plume is transported away from the source. (The wind speed and direction 50 to 100 meters or more above the surface are often considerably different than at the 10-meter level.) An instrumented tower is the most common means of obtaining meteorological measurements at several elevations in the lower part of the atmospheric boundary layer. For wind instruments mounted on the side of a tower, precautions must be taken to ensure that the wind measurements are not unduly influenced by the tower. Turbulence in the immediate wake of a tower (even a latticetype tower) can be severe. Thus, depending on the supporting structure, wind measuring equipment should be mounted (e.g., on booms) at least two structure widths away from the structure, and two systems mounted on opposite sides of the structure will sometimes be necessary. A wind instrument mounted on top of a tower should be mounted at least one tower width above the top. If there is no alternative to mounting instruments on a stack, the increased turbulence problem [45], must be explicitly resolved to the satisfaction of the permit granting authority.

Atmospheric stability is another key factor in pollutant dispersion downwind of a source. The stability category is a function of static stability (related to temperature change with height), convective turbulence (caused by heating of the air at ground level), and mechanical turbulence (a function of wind speed and surface roughness). A procedure for estimating stability category is given by Turner [46] which requires information on solar elevation angle, cloud cover, ceiling height, and wind speed. The hourly observations at NWS stations include cloud cover, ceiling height, and wind speed. Alternative procedures for estimating stability category may be applied if representative data are available. For example, stability category estimates may be based upon horizontal wind direction fluctuations [47], or vertical gradients of temperature and wind speed [48]. To obtain a representative reading of the air temperature, the temperature sensor should be protected from thermal radiation from the sun, sky, earth, and any surrounding objects, and must be adequately ventilated. Aspirated radiation shields are designed to provide such protection. (Note that ambient temperature data are also commonly required for plume rise estimates used in dispersion model calculations.)

Mixing height is another parameter that can be important in some cases. Mixing height is the distance above the ground to which relatively free vertical mixing occurs in the atmosphere. For estimating long-term average concentrations, it is adequate to use a representative annual average mixing height [49]. However, in many cases, and especially for estimates of short-term concentrations, twice-daily or hourly mixing height data are necessary. Such data can sometimes be derived [49] from representative surface temperatures and twice-daily upper air soundings collected by selected NWS stations.

Precipitation collectors must be located so that obstructions do not prevent the precipitation from falling into the collector opening or force precipitation into the opening. Several collectors may be required for adequate spatial resolution in complex topographic regimes.

Final rule making entitled "Visibility Protection for Federal Class I Areas," was published in the Federal Register on December 2, 1980. The regulations are applicable to 36 States listed in the action. Although these States are not required to establish visibility monitoring networks, they should consult with the Federal Land Managers to determine monitoring needs. Paragraph 51.305 states that the SIP strategies "must take into account current and anticipated visibility monitoring research, the availability of appropriate monitoring techniques and such guidance as is provided by the Agency." Visibility definitions, monitoring methods, modeling considerations and impact assessment approaches are among the subjects of three EPA reports: (1) "Protecting Visibility: An EPA Report to Congress" [50], (2) "Interim Guidance for Visibility Monitoring" [51], and (3) "Workbook for Estimating Visibility Impairment" [52]. Also, since publication of the final rule, the National Park Service has established a visibility monitoring system. The States or permit granting authority should consider these resources when handling visibility new source review questions.

Additional information and guidance on siting and exposure of meteorological instruments is contained in reference 53.

6. METEOROLOGICAL INSTRUMENTATION

6.1 Specifications

Meteorological instrumentation used for PSD monitoring must yield reasonably accurate and precise data. Accuracies and allowable errors are expressed in this section as absolute values for digital systems; errors in analog systems may be 50 percent greater. For example, an allowable error expressed as 5 percent means the recorded value should be within ±5 percent of the true value for digital systems, and ±7.5 percent for analog systems. Records should be dated, and should be accurate to within 10 minutes. Wind speed and direction (or vector components) should be recorded on a digital data logging system at intervals not to exceed 60 seconds for a given variable; data recorded on continuous strip recorders at intervals not exceeding 60 seconds may be used as backup. These specifications apply to the meteorological instruments used to gather the site specific data that will accompany a PSD permit application. When the use of existing representative meteorological data is approved by the permit granting authority, the instrumentation should meet, as a minimum, NWS standards [54-55].

6.1.1 Wind Systems (horizontal wind)

Wind direction and wind speed systems should exhibit a starting threshold of less than 0.5 meter per second (m/s) wind speed (at 10 degrees deflection for direction vanes). Wind speed systems should be accurate above the starting threshold to within 0.25 m/s at speeds equal to or less than 5 m/s. At higher speeds, the error should not exceed 5 percent of the observed speed (maximum error not to exceed 2.5 m/s). The damping ratio of the wind vane should be between 0.4 and 0.65 and the distance constant should not exceed 5 m. Wind direction system errors should not exceed 5 degrees, including sensor orientation errors. Wind vane orientation procedures should be documented.

6.1.2 Wind Systems (vertical wind)

In complex terrain, downwash of plumes due to significant terrain relief may pose a problem. If such a problem potentially exists, it may be necessary to measure the vertical component of the wind at the proposed site, and as close as possible to stack height. The starting threshold for the vertical wind speed component should be less than 0.25 m/s. Required accuracy for the vertical wind speed component is as specified in Section 6.1.1 for horizontal speeds.

6.1.3 Wind Fluctuations

Determination of the on-site standard deviation of wind fluctuations, or derived standard deviations of cross-plume concentrations may be necessary if dispersion parameters are being developed for use at a specific site. Since the analytical framework within which such wind fluctuations measurements/

statistics are to be incorporated is expected to he unique or applied on a case-by-case basis, approval by the permit granting authority is required and no general requirements regarding specifications are outlined in this guideline. Considerable care is required in the selection of wind instruments and data logging systems, especially in the choice of sampling and averaging times. Thus, response characteristics of wind sensors are especially critical [56,57]. Owners or operators designing programs incorporating these capabilities should submit a statement from a qualified consultant identifying the adequacy of such wind system(s) within the context of the overall PSD ambient monitoring program.

6.1.4 Vertical Temperature Difference

Errors in measured temperature difference should not exceed 0.003 °C/m.

6.1.5 Temperature

Errors in temperatures should not exceed 0.5°C if fog formation, icing, etc., due to water spray or water vapor emitted from the facility may be a problem. Otherwise, errors should not exceed 1.0°C.

6.1.6 Humidity

Atmospheric humidity can be measured and expressed in several ways. If the permit granting authority determines that a significant potential exists for fog formation, icing, etc., due to effluents from the proposed facility, error in the selected measurement technique should not exceed an equivalent dewpoint temperature error of 0.5°C. Otherwise, errors in equivalent dewpoint temperature should not exceed 1.5°C over a dewpoint range of -30°C to +30°C.

6.1.7 Radiation - Solar and Terrestrial

The determination of Pasquill stability class may be based on whether the solar radiation is termed strong, moderate, or slight. Stability class can be determined from sun elevation and the presence, height, and amount of clouds [46], or by using a pyranometer and/or net radiometer during the daytime and a net radiometer at night. Such radiation-to-stability relationships are expected to be site-specific, and the responsibility for demonstrating their accuracy lies with the permit applicant. General accuracy for pyranometers and net radiometers used in a PSD monitoring network is expected to be ±5 percent.

6.1.8 Mixing Height

Mixing height data may be derived from NWS upper air data. If available data are determined to be inappropriate by the permit granting authority, such data may be obtained on-site by the permit applicant [58]

The instrument system to be used is not specified in this guideline, but its precision and resolution should not exceed the limits associated with NWS radiosonde systems [54,55].

6.1.9 Precipitation

A recording precipitation collector should have a resolution of 0.25 mm (0.01 inches) liquid precipitation per hour at precipitation rates up to 7.6 cm/hour. Accuracy should be within 10 percent of the recorded value. A heated system should be used to assure proper measurement of frozen precipitation. A suitable windscreen should be used.

6.1.10 Visibility

Visibility can be measured within 5 percent of true over visual ranges of about 80 meters to 3 km with available transmissometers. Estimates can be based upon very short path lengths using other types of equipment such as nephelometers [59]. At this time, the combined use of a multi-wavelength telephotometer, integrating nephelometer and particulate monitor, together with color photography, should prove most helpful in documenting baseline visibility related parameters. These as well as other components of a visibility monitoring program, are discussed in reference 51. Reference 50 also contains much background information.

7. QUALITY ASSURANCE FOR METEOROLOGICAL DATA

All equipment should receive an appropriate examination and calibration prior to initial installation to assure the acquisition of the maximum amount of usable data within the error limits specified herein. Inspection, servicing, and calibration of equipment must be scheduled throughout the measurement program at appropriate intervals to assure at least 90 percent data retrieval for each variable measured at sites where continuous air quality monitors are being operated. At remote sites, data retrieval for measured variables should not fall below 80 percent. In addition, the joint frequency for the recovery of wind and stability data should not fall below 90 percent on an annual basis; missing data periods must not show marked correlation with the various meteorological cycles.

Calibration of systems should be accomplished no less frequently than once every 6 months. In corrosive or dusty areas, the interval should be reduced to assure adequate and valid data acquisition.

If satisfactory calibration of a measuring system can be provided only by the manufacturer or in special laboratories, such as wind-tunnel facilities, arrangements should be made for such calibrations prior to acquisition of the equipment. A parts inventory should be maintained at a readily accessible location to minimize delays in restoring operations after system failures.

An independent meteorological audit (by other than one who conducts the routine calibration and operation of the network) should be performed to provide an on-site calibration of instruments as well as an evaluation of (a) the network installation, (b) inspection, maintenance, and calibration procedures, and logging thereof, (c) data reduction procedures, including spot checking of data, and (d) data logging and tabulation procedures. The on-site visit (requiring as little as 1 day in many cases) should be made within 60 days after the network is first in full operation, and a written audit/evaluation should be provided to the owner. This report should be retained by the owner. Any problems should be corrected and duly noted as to action taken in an addendum to the audit report. A reproducible copy of the audit report and the addendum should be furnished with the source construction permit application.

Such independent meteorological audit-evaluations should be performed about each 6 months. The last such inspection should be made no more than 30 days prior to the termination of the measurement program, and while the measurement operation is in progress.

The 1983 publication "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements" [60] should be consulted for more information. Major sections in this volume address (1) quality assurance of the measurement process, (2) methods for judging the suitability of sensor siting, and (3) meteorological data validation.

8. DATA REPORTING

8.1 Air Quality Data Reporting

A summary of the air quality data, the raw air quality data, and the quality assurance data discussed in Section 4.1.6 must be submitted to the permit granting authority at the time of submittal of the PSD application. There should be a prior agreement between the source and the permit granting authority as to whether the raw data should be submitted in addition to a summary of the data. Some sources may also desire to submit data periodically to the permit granting authority for review to identify any problems in the data as they occur. Note that this is not a requirement. The applicant and the permit granting authority should have a prior agreement as to the format and procedure for the data submission. The air quality data should preferably be submitted in SAROAD format and in a machine readable form. A printout of the contents of the tape or cards should also be included. All raw data not previously submitted (i.e., calibration data, flow rates, etc.) should be retained for 3 years and submitted upon request to the permit granting authority.

For continuous analyzers, at least 80 percent of the individual hourly values should be reported by the source in any sampling period. For manual methods (TSP and particulate pollutants), 80 percent of the individual 24-hour values should be reported in any sampling period. This capture rate is important because of the short duration of a PSD monitoring program. In addition, there should not be a correlation between missing data periods and expected highest concentrations.

8.2 Meteorological Data Format and Reporting

Because of the different data requirements for different types of analyses that might be used to evaluate various facilities, there is no fixed format that applies to all data sets. However, a generalization can be made: all meteorological parameters must be collated in chronological order and tabulated according the observation time, and be furnished to the permit granting authority upon request. All meteorological variables that have a SAROAD parameter code should be submitted in SAROAD format. All units should be in the SI system (International System of Units) [61]. All input data (in the format required by the analytical procedures selected) used in, and all results of, the air quality analyses must be furnished to the permit granting authority upon request.

VSI Meteorological System Performance Audit at the ATI Titanium Facility, North Skull Valley, Utah
April 2014

REPORT

METEOROLOGICAL SYSTEM
PERFORMANCE AUDIT
at the
ATI Titanium Facility

REPORT

METEOROLOGICAL SYSTEM PERFORMANCE AUDIT
at the
ATI Titanium Facility

for

ERM-West, Inc.

April 2014

by

VSI

April 24, 2013

ERM
7272 East Indian School Road
Suite 100
Scottsdale, AZ 85251

Attn: Robert W. Farmer, PE, PhD

Report: Meteorological System Performance Audit
at the ATI Titanium Facility
North Skull Valley, Utah

Dear Mr. Farmer:

Enclosed please find three copies of the report on the performance audit of the meteorological monitoring system at the ATI Titanium Facility conducted on April 21, 2014; a PDF file of the report will be supplied separately. This report describes the audit activities performed by VSI, the results of the audit, and instrumentation accuracies; included in the appendices are copies of the certificates of traceability for the audit devices and copies of the completed audit forms.

Thank you for the opportunity to work with your organization. I hope the work performed by VSI during this audit has been to your satisfaction. Please call me if you have any questions.

Sincerely,

Dennis Haase
VSI
vsienv@cox.net
www.vsi-environmental.com

729 West Lynwood Avenue • Phoenix, Arizona • 85007 • Telephone 602/252-4010

EXECUTIVE SUMMARY

A performance audit of the meteorological monitoring system at the ATI Titanium Facility west of Salt Lake City, Utah was accomplished on April 21, 2014; personnel from VSI performed the audits. Results of the audit indicated compliance with the Environmental Protection Agency (EPA) Guidelines/Tolerances or Manufacturer's Recommendations for the meteorological sensors. Details of the audit results are discussed in latter sections of this report.

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Appendices

INTRODUCTION

A performance audit of the meteorological monitoring system at the ATI Titanium Facility west of Salt Lake City, Utah was accomplished on April 21, 2014; personnel from VSI performed the audits. The location of the monitoring site is presented in Figures 1 and 2. The parameters monitored, sensor height, sensor manufacturer, and model numbers are provided in Table 1.

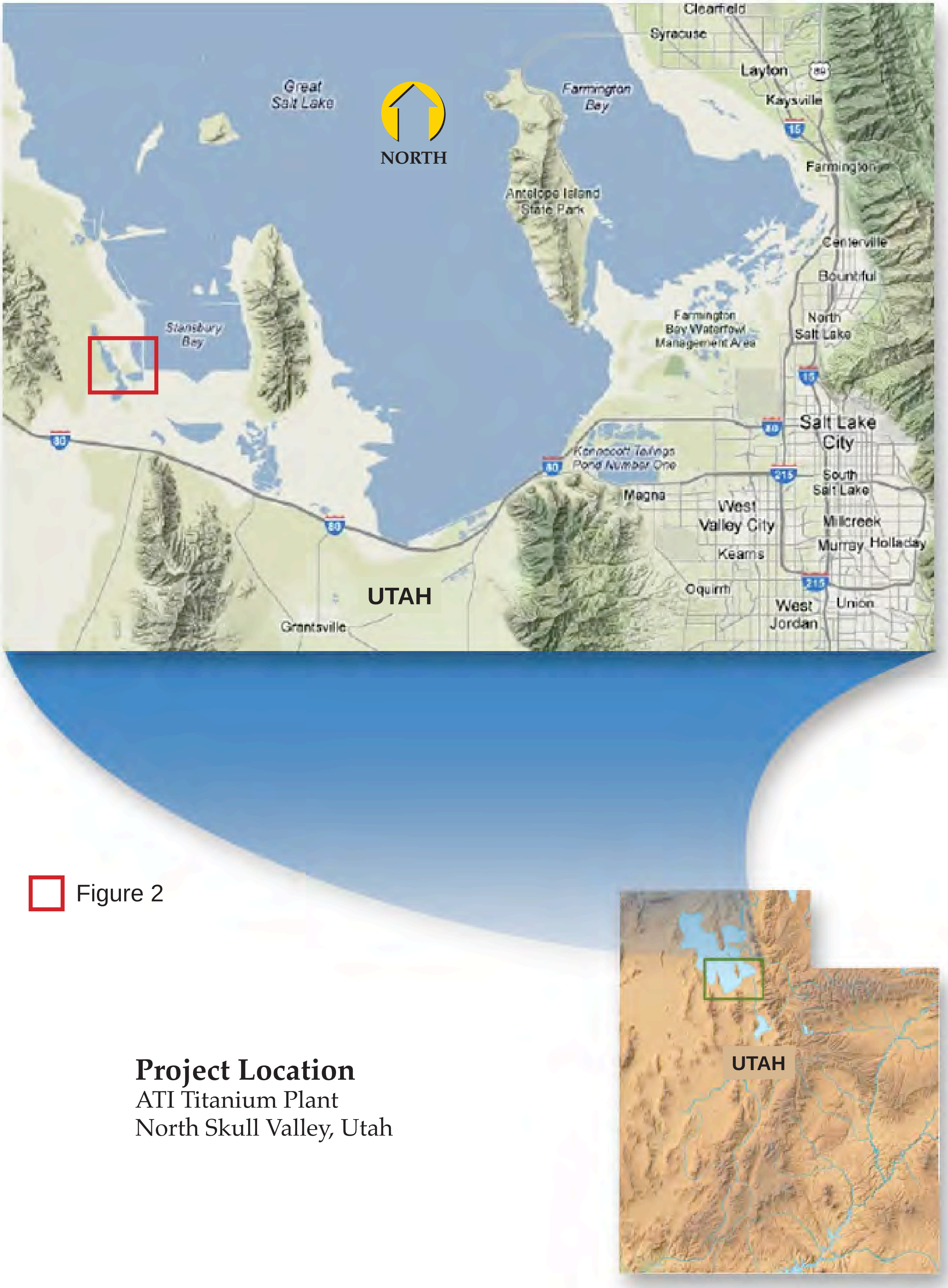
Table 1

Meteorological Monitoring System
ATI Titanium Facility

Parameter	Sensor Height	Sensor Manufacturer	Model
Wind Speed	10 and 50 Meters	RM Young	5305-AQ
Wind Direction	10 and 50 Meters	RM Young	5305-AQ
Vertical Wind Speed	10 and 50 Meters	Climatronics	102236G0
Ambient Temperature	2, 10 and 50 Meters	RM Young	41342
Delta Temperature	2-10 / 10 – 50 Meters	RM Young	41342
Net Solar Radiation	2 Meters	Kipp & Zonen	NR Lite
Total Solar Radiation	2 Meters	LI-COR	LI200X
Barometric Pressure	1 Meter	Vaisala	PTB110
Relative Humidity	2 Meters	Vaisala	HMP45AC
Precipitation	1.5 Meters	Met One	385

The procedures and tolerances used during the audit followed the general guidelines of:

- *EPA-454/B-08-002, Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV*
- *Meteorological Measurements; EPA-450/4-87-007, Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)*
- *EPA-454/R-99-005, Meteorological Monitoring Guidance for Regulatory Modeling Applications*
- *Manufacturer recommendations*



Project Location
ATI Titanium Plant
North Skull Valley, Utah

Figure 1

Figure 2

● **Monitoring Site**
40° 54′ 36.47″ N
112° 44′ 38.32″ W

Meteorological Monitoring Site
ATI Titanium Plant
North Skull Valley, Utah

All equipment and forms required for the audit were provided by VSI; a list of the audit devices is provided Table 2. Copies of the certificates of traceability to the National Institute of Standards and Technology (NIST) for the audit devices are included in Appendix A; copies of the completed audit forms are provided in Appendix B.

Table 2
VSI Audit Devices

Parameter	Audit Device Manufacturer	Model No.
Wind Speed	R. M. Young	18802 Anemometer Drive
	R. M. Young	18310 Torque Disk
Wind Direction	CST Compass	17-651
	R. M. Young	18212 Vane Angle Fixture
	R. M. Young	18331 Vane Torque Gauge
Vertical Wind Speed	R. M. Young	18802 Anemometer Drive
	R. M. Young	18310 Torque Disk
Temperature	Cole Parmer	93210-50 Digital Thermometer
Net Solar Radiation	Kipp & Zonen	NR Lite
	Fluke	8060A Multimeter
Total Solar Radiation	Licor	LI-200
	Fluke	8060A Multimeter
Ambient Pressure	Garmin	Etrex GPS
Relative Humidity	NovaLynx	Assmann Psychrometer
Precipitation	Pyrex	125 ml Graduated Burette

The discussions that follow describe those activities performed by VSI in the completion of the audit, the associated results, and instrumentation accuracies.

AUDIT ACTIVITIES AND RESULTS

WIND SPEED-Horizontal (10 and 50 meters)

The audit of the horizontal wind speed systems was performed by rotating the sensor shaft at known rates and recording the data acquisition system (DAS) responses. Shaft rotations corresponding to speeds of 0.0, 1.02, 2.05, 4.10, 6.14, 12.29, and 20.48 meters per second (mps) were applied to the sensor. Responses of the DAS were within the PSD Tolerances at both levels.

The sensors' propellers were inspected and found to be in good condition with no deformities. Sensor bearing wear was checked by measuring the force necessary to initiate rotation of the propeller shaft. The manufacturer indicates that the propeller shaft should begin rotation with a force of less than 1.0 gm-cm, corresponding to a starting threshold of 0.4 mps. Measurement with a torque-wheel indicated that the sensors' bearing torques were within the manufacturer's recommendations; copies of the audit forms are included in Appendix B.

WIND DIRECTION (10 and 50 meters)

The wind direction systems were audited by checking the orientation of the sensors' vanes when aligned parallel with the sensors' supporting cross-arms and when aligned to a distant reference point. The alignment of the cross-arms and orientation of the reference point were checked with a compass corrected for the magnetic declination of the area. The declination, approximately 12.0^0 east, was obtained from the National Geophysical Data Center (www.ngdc.noaa.gov/geomag-web/#declination. Following this check, the sensors were placed on a degree wheel and the sensors' responses checked at thirteen directions, spaced around the compass. This continuity check and the sensors' orientation indicated the sensors and DAS responses were within PSD Tolerances at both levels. The sensors' vanes were inspected and found to be in good condition with no deformities. Sensor bearing wear was checked and met the manufacturer's recommendations; copies of the audit forms are included in Appendix B.

WIND SPEED-Vertical (10 and 50 meters)

The audits of the vertical wind speed systems were performed by rotating the sensor shaft clockwise and counter-clockwise at known rates and recording the data acquisition system (DAS) responses. Shaft rotations corresponding to speeds of 0.0, 1.250, 1.875, 2.50, 3.75, 5.000, 7.500, and 15.000 mps were applied to the sensor. Responses of the DAS were compared with the PSD Tolerances for horizontal wind speeds; DAS responses were within PSD Tolerance at both levels.

The sensors' propellers were inspected and found to be in good condition with no deformities. Sensor bearing wear was checked by measuring the force necessary to initiate rotation of the propeller shaft. The manufacturer indicates that the propeller shaft should begin rotation with a force of less than 0.3 gm-cm. Measurement with a torque-wheel indicated that the sensors' bearing torques were within the manufacturer's recommendations; copies of the audit forms are included in Appendix B.

AMBIENT TEMPERATURE (2, 10, and 50 meters)

The audits of the ambient temperature systems were accomplished by sequentially placing the temperature probe in a water bath at multiple temperatures between 0^0C and 35^0C (32^0 - 95^0F) and recording the outputs of the DAS. Monitoring of the water temperature was accomplished using a NIST-certified digital thermometer with a 0.01^0C resolution. Results of the audit indicated that the DAS responses were within PSD Tolerances for the ambient temperature at all levels; copies of the audit forms are included in Appendix B.

DELTA TEMPERATURE (2-10 meters / 10-50 meters)

The audits of the delta temperature systems were accomplished by sequentially placing the paired temperature probes in a water bath at multiple temperatures between 0^0C and 40^0C and recording the outputs of the DAS. Monitoring of the water temperature was accomplished using a NIST-certified digital thermometer with a 0.01^0C resolution. Results of the audit indicated that the DAS responses were within PSD Tolerances for the delta temperature at both intervals; copies of the audit forms are included in Appendix B.

RELATIVE HUMIDITY

The audit of the relative humidity sensor involved comparing the relative humidity derived from the wet and dry bulb temperatures of a psychrometer with the relative humidity displayed by the data logger. The response of the data logger was within PSD Guidelines; a copy of the audit form is included in Appendix B.

BAROMETRIC PRESSURE

The audit of the barometric pressure sensor involved comparing the DAS values with a collocated transfer standard (CTS); the sensor was within the EPA Guidelines of ±3.0 mb. A copy of the audit form is included in Appendix B.

SOLAR RADIATION (NET / TOTAL)

The audit of the solar radiation sensors and data logger began by covering the sensors to block all light and recording the data logger response. Following this, a collocated transfer standard was used to compare the output of the solar radiation system to the transfer standard; a number of collocated readings were taken. The average of those readings obtained from the two sensors was within the PSD tolerance of ±5%; a copy of the audit forms are included in Appendix B.

PRECIPITATION

The audit of the tipping bucket rain gauge began by introducing water into the bucket to “wet” the collection cylinder and tipping buckets. A graduated cylinder was used to slowly introduce water into the bucket. The quantity of water required to actuate the bucket tips was recorded and used to evaluate the sensor response. The audit was repeated five times to verify the results. The responses of the sensor and data logger were within the PSD Tolerance of ±10% of the observed value or 0.5mm; a copy of the audit form is included in Appendix B.

INSTRUMENTATION ACCURACIES

Previously each of the parameters was reported as either meeting or exceeding a given tolerance. This section lists the accuracies for each parameter and the corresponding tolerance; the accuracies are for the audited range, not necessarily for the total range of the sensor.

WIND SPEED-HORIZONTAL-10 METERS (MPS)

Range	Data Logger	Tolerance
≤ 5 mps	+0.00 / -0.00 mps	±0.25 mps
> 5 mps	+0.00% / - 0.00%	±5.0% NE 2.5mps

WIND SPEED-HORIZONTAL-50 METERS (MPS)

Range	Data Logger	Toleranc
≤ 5 mps	+0.00 / -0.00 mps	±0.25 mps
> 5 mps	+0.00% / - 0.00%	±5.0% NE 2.5mps

WIND DIRECTION-10 METERS (Deg)

Range	Data Logger	Tolerance
0-360^0	+2.0^0 / -2.2^0	±5.0^0

WIND DIRECTION-50 METERS (Deg)

Range	Data Logger	Tolerance
0-360^0	+4.8^0 / -2.3^0	±5.0^0

VERTICAL WIND SPEED-10 METERS (MPS)

Range	Data Logger	Tolerance
≤ 5 mps	+0.093 / -0.076 mps	±0.25 mps
> 5 mps	+0.00% / - 5.8% (-0.87mps)	±5.0% NE 2.5mps

VERTICAL WIND SPEED-50 METERS (MPS)

Range	Data Logger	Tolerance
≤ 5 mps	+0.107 / -0.023 mps	±0.25 mps
> 5 mps	+0.48% / - 0.59%	±5.0% NE 2.5mps

AMBIENT TEMPERATURE (^{0}C) @ 2 M

Range	Data Logger	Tolerance
0 to +40^{0}C	+0.27 / -0.09^{0}C	±0.5^{0}C

AMBIENT TEMPERATURE (^{0}C) @ 10 M

Range	Data Logger	Tolerance
0 to +40^{0}C	+0.07 / -0.03^{0}C	±0.5^{0}C

AMBIENT TEMPERATURE (^{0}C) @ 50 M

Range	Data Logger	Tolerance
0 to +40^{0}C	+0.01 / -0.09^{0}C	±0.5^{0}C

DELTA TEMPERATURE 2-10 M (^{0}C)

Range	Data Logger	Tolerance
0 to +35^{0}C	+0.043 / -0.053 ^{0}C	±0.1^{0}C

DELTA TEMPERATURE 10-50 M (^{0}C)

Range	Data Logger	Tolerance
0 to +40^{0}C	+0.000 / -0.075 ^{0}C	±0.1^{0}C

RELATIVE HUMIDITY (%)

Range	Data Logger	Tolerance
Ambient- Collocated	+2.6 / -0.0%	±7%

BAROMETRIC PRESSURE (mb)

Range	Data Logger	Tolerance
Ambient-Collocated	+0.5/-0.0 mb	± 3 mb

NET SOLAR RADIATION (W/m^2)

Range	Data Logger	Tolerance
Ambient-Collocated	+0.0 / -1.2%	±5.0%

TOTAL SOLAR RADIATION (W/m^2)

Range	Data Logger	Tolerance
Ambient-Collocated	+0.0 / -0.7%	±5.0%

PRECIPITATION (inches)

Range	Data Logger	Tolerance
Ambient	-5.3% / -0.068 mm	±10% Observed Value ±0.5mm

DATA INVALIDATION PERIODS

The audit of the meteorological monitoring system was performed on April 21, 2014; data invalidation periods are listed below.

Wind speed, Wind direction, and Temperature (All): 0800-1200 MST
Precipitation: 0800-0900 MST

APPENDIX A

CERTIFICATES OF TRACEABILITY

CERTIFICATE OF CALIBRATION AND TESTING

R. M. Young Company certifies that the equipment listed below was inspected and calibrated prior to shipment in accordance with established manufacturing and testing procedures. Standards established by R.M. Young Company for calibrating the measuring and test equipment used in controlling product quality are traceable to the National Institute of Standards and Technology.

MODEL: **18802 / 18811** SERIAL NUMBER: CA02194
(18802 Comprised of Models 18820A Control Unit & 18830A Motor Assembly)
(18811 Comprised of Models 18820A Control Unit & 18831A Motor Assembly)

Nominal Motor RPM	27106D Output Frequency (Hz) - (1)	Calculated Rpm (1)	Indicated Rpm (2)
18802	-	☑ CW / CCW rotation verified	
300	50	300	300
2700	450	2700	2700
5100	850	5100	5100
7500	1250	7500	7500
10,200	1700	10200	10200
12,600	2100	12600	12600
15,000	2500	15000	15000
18811	-	☒ CW / CCW rotation verified	
30.0	5	30.0	30.0
150.0	25	150.0	150.0
300.0	50	300.0	300.0
450.0	75	450.0	450.0
600.0	100	600.0	600.0
750.0	125	750.0	750.0
990.0	165	990.0	990.0

(1) Measured frequency output of RM Young Model 27106D standard anemometer attached to motor shaft - 27106D produces 10 pulses per revolution of the anemometer shaft.
(2) Indicated on the Control Unit LCD display.
* Indicates out of tolerance

☐ New Unit(s)	☒ Service / Repair Unit ☒ No Calibration Adjustments Required	☐ As Found ☐ As Left

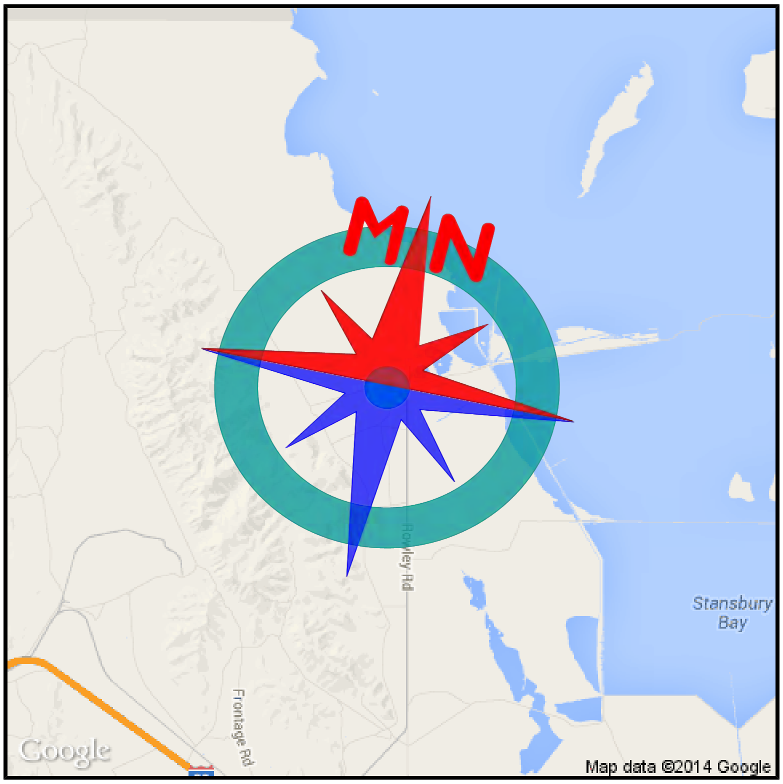
Traceable frequency meter used in calibration Model: 34405A SN: 53020093

Date of inspection 4-3-13
Inspection Interval One Year

Tested By RP

NGDC Declination

Date	2014-04-21
Latitude	40.90725° N
Longitude	112.73836° W
Elevation	0.0 km
Model Used	WMM 2010
Declination	12.11° E changing by 0.13° W per year



Compass shows the approximate bearing of the magnetic north (MN)

Magnetic declination is the angle between true north and the horizontal trace of the local magnetic field. In general, the present day field models such as the IGRF and World Magnetic Model (WMM) are accurate to within 30 minutes of arc for the declination. However, local anomalies exceeding 10 degrees, although rare, do exist.

Document created: 2014-04-22 23:09 UTC

Questions: geomag.models@noaa.gov

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Report No: 252545

Order No: 52021-132678

Report of Calibration

- PREPARED FOR -

VSI

729 W. Lynwood St. · Phoenix, AZ 85007

Equipment Type:	Force Gauge	**Calibration Date:**	07/08/2013
Make:	Correx	**Recall Date:**	07/08/2014
Model:	0-3 g	**Ambient Temperature:**	72°F
Asset Number:	4160	**Relative Humidity:**	29%
Serial Number:		**Received:**	In Tolerance
Procedure:	33K6-4-18-1	**Returned:**	In Tolerance
Technician:	Gatza, Jason	**Received Condition**	Fair
		Authorized By:	Steve Ambrose

Standards Used

Traceability #	Make	Model	Description	Cal Date	Due Date
7000509	Troemner	S Weight Set	Class 1 Weights	06/07/2013	6/7/2014

The accuracy of this instrument has been verified under the conditions stated above in ANSI/ISO/IEC 17025:2005 and Z540-1-1994. National Calibration Inc. is an accredited laboratory. Our standards have traceability to NIST or an international, or intrinsic standard and evidence is on file at our Metrology Laboratory. Unless stated otherwise, the collective uncertainty of the measurement process does not exceed 25% of the tolerance allowed for the individual characteristics measured. The stated uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. The results relate only to the item being calibrated. This certificate shall not be reproduced, except in full, without the written approval of National Calibration Inc.

Technician: ______________

Manager: Steven Ambrose

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Report No: 251415

Order No: 52021-132678

Report of Calibration

- PREPARED FOR -
VSI
729 W. Lynwood St. · Phoenix, AZ 85007

Equipment Type: Precision Digital Thermometer
Make: Cole Parmer
Model: 93210-50
Asset Number: K02002908
Serial Number: K02002908
Procedure: NA17-20ST-132
Technician: Pikey, Glenn

Calibration Date: 06/25/2013
Recall Date: 06/25/2014
Ambient Temperature: 72°F
Relative Humidity: 30%
Received: In Tolerance
Returned: In Tolerance
Received Condition Fair
Authorized By: Robert V. Halloran

Standards Used

Traceability #	Make	Model	Description	Cal Date	Due Date
7002667	Hart Scientific	1502A	Digital Thermometer Readout	05/14/2013	5/14/2014
7002668	Hart Scientific	5628	Platinum Resistance Thermometer	05/22/2013	5/22/2014

The accuracy of this instrument has been verified under the conditions stated above in ANSI/ISO/IEC 17025:2005 and Z540-1-1994. National Calibration Inc. is an accredited laboratory. Our standards have traceability to NIST or an international, or intrinsic standard and evidence is on file at our Metrology Laboratory. Unless stated otherwise, the collective uncertainty of the measurement process does not exceed 25% of the tolerance allowed for the individual characteristics measured. The stated uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. The results relate only to the item being calibrated. This certificate shall not be reproduced, except in full, without the written approval of National Calibration Inc.

Technician: Glenn P Pikey

Manager: Robert V Halloran

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NOVA LYNX

Calibration Certificate

We hereby certify that the following instrument has been duly calibrated and inspected by us in accordance with our specification criteria.

Identification

Item	: Mercury Filled Thermometer for Spring-wound type Assmann Psychrometer
Serial No.	: 8524
Measuring Range	: -20 to 130 °F
Resolution	: 0.5 °F
Accuracy	: ±0.5 °F

Test Result

Correct value (°F)	50 °F	70 °F	90 °F
Difference (°F)	-0.30 °F	-0.30 °F	-0.50°F

Actual value: Value shown minus each difference.

* The serial number of the calibrator for the above thermometer: 7669
(The thermometer is traceable to the National Standard.)

Calibration Certificate

We hereby certify that the following instrument has been duly calibrated and inspected by us in accordance with our specification criteria.

Identification

Item	: Mercury Filled Thermometer for Spring-wound type Assmann Psychrometer
Serial No.	: 8513
Measuring Range	: -20 to 130 °F
Resolution	: 0.5 °F
Accuracy	: ±0.5 °F

Test Result

Correct value (°F)	50 °F	70 °F	90 °F
Difference (°F)	0.00 °F	+0.20 °F	0.00°F

Actual value: Value shown minus each difference.

* The serial number of the calibrator for the above thermometer: 7669
(The thermometer is traceable to the National Standard.)

CERTIFICATE of CALIBRATION for LI-COR SENSOR

Pyranometer
Model Number: LI-200

Serial Number: **PY79092**

Calibration Date: **March 06, 2012**
Manufacture Date: **March 06, 2012**

Calibration Constant:

Output: **91.09** microamps per 1000 watts m^{-2}

For use with LI-COR handheld meters:

Multiplier: **-10.98** watts m^{-2} per microamp

For use with LI-COR 2220 (147 ohm) Millivolt Adapter:

Multiplier: **-74.68** watts m^{-2} per millivolt

109.8 Ω for -100.0

If this is an SL sensor:

Multiplier: **-100.0** watts m^{-2} per millivolt

IMPORTANT: Read the appropriate instruction manual (http://www.licor.com/TSM) before using this sensor.

IMPORTANT: It is recommended that sensors be recalibrated every two years.

Calibration Technician: ____________________

LI-COR Biosciences
LI-COR Biosciences • Environmental • 4421 Superior Street • P.O Box 4425 • Lincoln, NE 68504 USA
Phone: (1) 402-467-3576 • Fax: 402-467-2819 • Toll-free: 800-447-3576 (USA & Canada)
envsales@licor.com • envsupport@licor.com • www.licor.com
Manual: http://www.licor.com/TSM

KIPP & ZONEN
SINCE 1830

CERTIFICATE OF CALIBRATION

NET RADIOMETER

MODEL **NR LITE**

SERIAL NUMBER **093454**

SENSITIVITY **13.0** **μV/W/m²** of upper sensor at normal incidence

CALIBR. PROCEDURE Exact interchange of test NR LITE and reference NR LITE in a horizontal parallel beam of light from a Xenonlamp. Full collimation angle of beam is 1.0°. Irradiance is 500 ±50 W/m². Roomtemperature is 22 ±2 °C.
Only the upper sensors are compared. Secondly is checked whether the lower sensor sensitivity is within ±15% from the upper sensor sensitivity.
Because test and reference radiometer are of the same model, the indoor conditions have at principle less influence on the transfer of calibration. The above sensitivity is theoretically best for conditions as during the calibration of the reference NR LITE outdoors (see below).

REFERENCE NR LITE FT006, active from June 8, 2011

hierarchy of traceability The reference NR LITE FT006 has been compared against a reference pyrheliometer CH 1 sn930025 with the sun as source under clear sky conditions. This reference CH 1 on his turn has been calibrated in Davos against the World Standard Group in summer 2009.

The instruments were placed side by side on a tracking platform in such a way that the direct radiation was always normal incident. The reference NR LITE was built in a box with collimation tube, so having a field of view comparable with the pyrheliometer.
The calibration periods were on July 19, 2010, from 10:51 to 16:51 (civil time, summertime).
For this periods the Airmass passed by the sunbeam ranged from 1.17 to 1.5.
The sky was clear with some jetstreams and small cirrus fields.
The instrument temperatures ranged from 29 to 35°C.

The sensitivity is determined from three measurement series consisting of one minute instantaneous voltage readings for both NR LITE and CH 1 and taking into account the "zero-offset" of the NR LITE.
The three measurement series were chosen from a continuous log file by selecting periods with direct irradiance continuously >700 W/m². NR LITE zero-offset is measured between series 1 and 2 at 13:15 by shading the NR LITE during a period of >2 min. A rather stable zero-offset (+120 ±10 μV) was found and subtracted from all NR LITE voltages.
Momentaneous sensitivities for every reading (sampling interval 1 min) are calculated from corrected NR LITE voltages and CH1 irradiance signals.
The mean sensitivities, calculated for each measurement series, were 13.12, 13.13 and 13.00
Averaged value is 13.10 μV/W/m² with a standard deviation of 0.13 μV/W/m².

IN CHARGE OF TEST P. van der Heijden
DATE 30 August 2012 Kipp & Zonen, Delft, Holland

Notice

The calibration certificate supplied with the instrument is valid from the date of shipment to the customer. Even though the calibration certificate is dated relative to manufacture or recalibration the instrument does not undergo any sensitivity changes when kept in the original packing. From the moment the instrument is taken from its packaging and exposed to irradiance the sensitivity will deviate with time. See also the 'non-stability 'performance (max. sensitivity change / year) given in the radiometer specification list.

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Report No: 251708

Order No: 52021-132678

Report of Calibration

- PREPARED FOR -

VSI

729 W. Lynwood St. · Phoenix, AZ 85007

Equipment Type:	Multimeter	**Calibration Date:**	06/27/2013
Make:	Fluke	**Recall Date:**	06/27/2014
Model:	8060A	**Ambient Temperature:**	68°F
Asset Number:	4515375	**Relative Humidity:**	20%
Serial Number:	4515375	**Received:**	In Tolerance
Procedure:	Metcal; Per Mfg. Spec	**Returned:**	In Tolerance
Technician:	Linaberry, Jackie	**Received Condition**	Poor
		Authorized By:	Robert V. Halloran

Standards Used

Traceability #	Make	Model	Description	Cal Date	Due Date
7000399	Fluke	5520A/PQ6	Multi-calibrator	07/06/2012	8/6/2013

The accuracy of this instrument has been verified under the conditions stated above in ANSI/ISO/IEC 17025:2005 and Z540-1-1994. National Calibration Inc. is an accredited laboratory. Our standards have traceability to NIST or an international, or intrinsic standard and evidence is on file at our Metrology Laboratory. Unless stated otherwise, the collective uncertainty of the measurement process does not exceed 25% of the tolerance allowed for the individual characteristics measured. The stated uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. The results relate only to the item being calibrated. This certificate shall not be reproduced, except in full, without the written approval of National Calibration Inc.

Technician: ______________ **Manager:** Robert V. Halloran

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CHECK OF BAROMETRIC PRESSURE SENSOR

Manuf./Model: Garmin/Etrex GPS
Serial No.: 79524134

DATE	READING	NWS-El PASO	Garmin GPS
04/17/02	Station Prs.	873 mb	873 mb
10/20/02	Station Prs.	872 mb	873 mb
04/14/03	Station Prs.	873 mb	873 mb
07/14/03	Station Prs.	873 mb	873 mb
01/26/04	Station Prs.	877 mb	877 mb
07/27/04	Station Prs.	875 mb	875 mb
01/24/05	Station Prs.	883 mb	882 mb
07/18/05	Station Prs.	872 mb	871 mb
10/24/05	Station Prs.	881 mb	880 mb
01/30/06	Station Prs.	876 mb	875 mb
07/17/06	Station Prs.	878 mb	877 mb
01/29/07	Station Prs.	872 mb	873 mb
07/16/07	Station Prs.	873 mb	872 mb
01/21/08	Station Prs.	874 mb	873 mb
07/21/08	Station Prs.	874 mb	873 mb
03/11/09	Station Prs.	876 mb	875 mb
05/04/09	Station Prs.	870 mb	869 mb

BARchk.doc

DATE	READING	NWS-El PASO	Garmin GPS
10/04/09	Station Prs.	870 mb	869 mb
04/05/10	Station Prs.	869 mb	868 mb
07/26/10	Station Prs.	874 mb	873 mb
04/18/11	Station Prs.	868 mb	867 mb
07/27/11	Station Prs.	871 mb	870 mb
10/26/11	Station Prs.	867 mb	866 mb
06/21/12	Station Prs.	873 mb	872 mb
01/08/13	Station Prs.	870 mb	869 mb
05/01/13	Station Prs.	873 mb	872 mb
07/28/13	Station Prs.	873 mb	872 mb

DATE	READING	ATL-PHX	Garmin GPS
10/04/10	Station Prs.	981 mb	980 mb
03/10/11	Station Prs.	980 mb	979 mb

APPENDIX B

AUDIT FORMS

PERFORMANCE AUDIT: WIND SPEED - 10M

SENSOR:
Manuf./Model: RMY/5305AQ
Serial No.: 86934
Range: 0-50m/s

OWNER: U.S. Magnesium
LOCATION: ATI Titanium
DATE: 4/21/14
BY: VSI

PROPELLER:
Manuf./Model: RMY/08254
Serial No.: 73503

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
WS(mps)=(RPM*0.00512)
WS(mph)=mps*2.2369

AUDIT DEVICE:
Manuf./Model: RMY/18802
Serial No.: CA02194

PROPELLER CONDITION: GOOD
BEARING CONDITION: GOOD (<1.0 gm-cm)

INPUT:	SPEED		DATA ACQUISITION			
RPM	(mph)	(mps)	(mph)	(mps)	DIFF.(mps)	%
0	0.00	0.00	0.00	0.00	0.00	-
200	2.29	1.02	2.29	1.02	0.00	-
400	4.58	2.05	4.58	2.05	0.00	-
800	9.16	4.10	9.16	4.10	0.00	-
1200	13.74	6.14	13.74	6.14	0.00	0.00
2400	27.49	12.29	27.49	12.29	0.00	0.00
4000	45.81	20.48	45.81	20.48	0.00	0.00

PSD TOLERANCES (mps)

SPEED	DAS
≤5 mps	±0.25
>5 mps	±5.0% (≤ 2.5mps)

PERFORMANCE AUDIT: WIND SPEED - 50M

SENSOR:
Manuf./Model: RMY/5305AQ
Serial No.: 86935
Range: 0-50m/s

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

PROPELLER:
Manuf./Model: RMY/08254
Serial No.: 72699

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
WS(mps)=(RPM*0.00512)
WS(mph)=mps*2.2369

AUDIT DEVICE:
Manuf./Model: RMY/18802
Serial No.: CA02194

PROPELLER CONDITION: GOOD
BEARING CONDITION: GOOD (<1.0 gm-cm)

INPUT:	SPEED		DATA ACQUISITION			
RPM	(mph)	(mps)	(mph)	(mps)	DIFF.(mps)	%
0	0.00	0.00	0.00	0.00	0.00	-
200	2.29	1.02	2.29	1.02	0.00	-
400	4.58	2.05	4.58	2.05	0.00	-
800	9.16	4.10	9.16	4.10	0.00	-
1200	13.74	6.14	13.74	6.14	0.00	0.00
2400	27.49	12.29	27.49	12.29	0.00	0.00
4000	45.81	20.48	45.81	20.48	0.00	0.00

PSD TOLERANCES (mps)

SPEED	DAS
≤5 mps	±0.25
>5 mps	±5.0% (≤ 2.5mps)

PERFORMANCE AUDIT: WIND DIRECTION - 10M

SENSOR:		OWNER:	U.S. Magnesium
Manuf./Model:	RMY/05305AQ	LOCATION:	ATI Titanium Plant
Serial No.:	86934	DATE:	4/21/14
Range:	0-360 Degrees	BY:	VSI

VANE CONDITION: GOOD
BEARING CONDITION: GOOD (<11.0 gm-cm)

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

SENSOR ALIGNMENT CHECK

	X-ARM ALIGNMENT (Degrees)	SENSOR ALIGNMENT (Degrees)	DIFFERENCE (Degrees)
AS FOUND	180	179.4	-0.6
AS LEFT	180	178.5	-1.5

RFERENCE DIRECTION (Degrees)	SENSOR ALIGNMENT (Degrees)	DIFFERENCE (Degrees)
108	107.5	-0.5
288	290.0	2.0

INPUT: COMPASS POINT (Degrees)	DATA ACQUISITION (Degrees) CW	CCW	DIFFERENCE (Degrees) CW	CCW
5	6.3	6.4	1.3	1.4
30	30.7	30.7	0.7	0.7
60	59.9	59.5	-0.1	-0.5
90	89.7	88.9	-0.3	-1.1
120	119.4	118.7	-0.6	-1.3
150	149.6	148.7	-0.4	-1.3
180	179.7	177.8	-0.3	-2.2
210	211.1	209.6	1.1	-0.4
240	241.5	240.6	1.5	0.6
270	270.8	270.3	0.8	0.3
300	301.9	300.6	1.9	0.6
330	331.7	330.6	1.7	0.6
355	354.7	354.7	-0.3	-0.3

PSD TOLERANCES (Degrees) DAS
±5.0

PERFORMANCE AUDIT: WIND DIRECTION - 50M

SENSOR:		OWNER:	U.S. Magnesium
Manuf./Model:	RMY/05305AQ	LOCATION:	ATI Titanium Plant
Serial No.:	86935	DATE:	4/21/14
Range:	0-360 Degrees	BY:	VSI

VANE CONDITION: GOOD
BEARING CONDITION: GOOD (<11.0 gm-cm)

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

SENSOR ALIGNMENT CHECK

	X-ARM ALIGNMENT (Degrees)	SENSOR ALIGNMENT (Degrees)	DIFFERENCE (Degrees)
AS FOUND	175	179.8	4.8
AS LEFT	175	179.4	4.4

RFERENCE DIRECTION (Degrees)	SENSOR ALIGNMENT (Degrees)	DIFFERENCE (Degrees)
109	113.2	4.2
289	293.0	4.0

INPUT: COMPASS POINT (Degrees)	DATA ACQUISITION (Degrees)		DIFFERENCE (Degrees)	
	CW	CCW	CW	CCW
5	8.3	8.7	3.3	3.7
10	14.0	13.5	4.0	3.5
30	33.3	33.2	3.3	3.2
60	62.4	61.7	2.4	1.7
90	92.07	91.5	2.1	1.5
120	122.4	121.4	2.4	1.4
150	151.2	151.3	1.2	1.3
180	180.6	181.1	0.6	1.1
210	210.5	210.9	0.5	0.9
240	239.8	240.9	-0.2	0.9
270	270.5	271.1	0.5	1.1
300	301.0	302.0	1.0	2.0
330	331.8	332.0	1.8	2.0
355	354.7	352.7	-0.3	-2.3

PSD TOLERANCES (Degrees)
DAS

±5.0

PERFORMANCE AUDIT: VERTICAL WIND SPEED - 10M

SENSOR:
Manuf./Model: Climatronics/102236G0
Serial No.: 219
Range: 0-49 mps

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

PROPELLER:
Serial No.: 66786

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
WS(mps)=(RPM*0.00625)
WS(mph)=mps*2.2369

AUDIT DEVICE:
Manuf./Model: RMY/18802
Serial No.: CA02194

PROPELLER CONDITION: GOOD
BEARING CONDITION: GOOD (<0.3 gm-cm)

INPUT: RPM	SPEED (m/s)	DATA ACQUISITION (CW)	DATA ACQUISITION (CCW)	ABS DIFF.(m/s)	
0	0.000	-0.005	-0.006	0.005	0.006
200	1.250	1.226	-1.291	-0.024	0.041
300	1.875	1.850	-1.923	-0.025	0.048
400	2.500	2.504	-2.518	0.004	0.018
600	3.750	3.741	-3.844	-0.009	0.094
800	5.000	4.924	-5.093	-0.076	0.093
				DIFFERENCE (%)	
1200	7.500	7.385	-7.614	-1.53	1.52
2400	15.000	14.761	-14.126	-1.59	-5.83

PSD TOLERANCES (m/s)

SPEED	DAS
≤5 m/s	±0.25
>5 m/s	±5.0% (≤ 2.5)

PERFORMANCE AUDIT: VERTICAL WIND SPEED - 50M

SENSOR:
Manuf./Model: Climatronics/102236G0
Serial No.: 201
Range: 0-49 mps

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

PROPELLER:
Serial No.: 66717

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
WS(mps)=(RPM*0.00625)
WS(mph)=mps*2.2369

AUDIT DEVICE:
Manuf./Model: RMY/18802
Serial No.: CA02194

PROPELLER CONDITION: GOOD
BEARING CONDITION: GOOD (<0.3 gm-cm)

INPUT: RPM	SPEED (m/s)	DATA ACQUISITION (CW)	DATA ACQUISITION (CCW)	ABS DIFF.(m/s)	
0	0.000	0.005	-0.002	0.005	0.002
200	1.250	1.277	-1.249	0.027	-0.001
300	1.875	1.874	-1.882	-0.001	0.007
400	2.500	2.486	-2.553	-0.014	0.053
600	3.750	3.730	-3.857	-0.020	0.107
800	5.000	4.977	-5.029	-0.023	0.029
				DIFFERENCE (%)	
1200	7.500	7.456	-7.536	-0.59	0.48
2400	15.000	14.911	-15.060	-0.59	0.40

PSD TOLERANCES (m/s)

SPEED	DAS
≤5 m/s	±0.25
>5 m/s	±5.0% (≤ 2.5)

PERFORMANCE AUDIT: AMBIENT TEMPERATURE - 2M

SENSOR:		OWNER:	U.S. Magnesium
Manuf./Model:	RMY/41342	LOCATION:	ATI Titanium Plant
Serial No.:	14287	DATE:	10/21/13
Range:	-50 to + 50°C	BY:	VSI

CALIBRATOR:		DATA ACQUSITION:	
Manuf./Model:	Cole-Parmer/93210-50	Manuf./Model:	CS/CR3000
Serial No.:	K02002908	Serial No.:	2743

INPUT TEMPERATURE		DATA ACQUISITION		DIFF. (Deg. C.)
(Deg. F)	(Deg. C.)	(Deg. F)	(Deg. C.)	(DAS)
37.0	2.80	37.5	3.07	0.27
69.6	20.91	69.6	20.90	-0.01
82.7	28.17	82.5	28.08	-0.09
94.7	34.85	94.8	34.89	0.04

PSD TOLERANCES (Deg. C.)

DAS

±0.5

PERFORMANCE AUDIT: AMBIENT TEMPERATURE - 10M

SENSOR:
Manuf./Model: RMY/41342
Serial No.: 14288
Range: -50 to + 50°C

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

CALIBRATOR:
Manuf./Model: Cole-Parmer/93210-50
Serial No.: K02002908

DATA ACQUSITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

INPUT TEMPERATURE		DATA ACQUISITION		DIFF. (Deg. C.)
(Deg. F)	(Deg. C.)	(Deg. F)	(Deg. C.)	(DAS)
38.9	3.83	39.0	3.87	0.04
69.9	21.04	69.8	21.01	-0.03
83.5	28.63	83.5	28.63	0.00
95.4	35.20	95.5	35.27	0.07

PSD TOLERANCES (Deg. C.)

DAS

±0.5

PERFORMANCE AUDIT: AMBIENT TEMPERATURE - 50M

SENSOR:		OWNER:	U.S. Magnesium
Manuf./Model:	RMY/41342	LOCATION:	ATI Titanium Plant
Serial No.:	10231	DATE:	4/21/14
Range:	-50 to + 50°C	BY:	VSI

CALIBRATOR:		DATA ACQUSITION:	
Manuf./Model:	Cole-Parmer/93210-50	Manuf./Model:	CS/CR3000
Serial No.:	K02002908	Serial No.:	2743

INPUT TEMPERATURE		DATA ACQUISITION		DIFF. (Deg. C.)
(Deg. F)	(Deg. C.)	(Deg. F)	(Deg. C.)	(DAS)
38.9	3.83	38.9	3.83	0.00
69.9	21.04	69.7	20.95	-0.09
83.5	28.63	83.5	28.61	-0.02
95.4	35.20	95.4	35.21	0.01

PSD TOLERANCES (Deg. C.)

DAS

±0.5

PERFORMANCE AUDIT: DELTA TEMPERATURE (2-10M)

SENSOR (Upper):
Manuf./Model: RMY/41342
Serial No.: 14288
Range: -50 to + 50ºC

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

SENSOR (Lower):
Manuf./Model: RMY/41342
Serial No.: 14287
Range: -50 to + 50ºC

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIBRATOR:
Manuf./Model: Cole-Parmer/93210-50
Serial No.: K02002908

INPUT TEMPERATURE (Deg. F)	INPUT TEMPERATURE (Deg. C.)	DIFF. (Deg. C.) (DAS)
37.0	2.80	-0.001
69.6	20.91	0.001
82.7	28.17	0.043
94.7	34.85	-0.053

PSD TOLERANCES (Deg. C.)

DAS

±0.1

PERFORMANCE AUDIT: DELTA TEMPERATURE (10-50M)

SENSOR (Upper):		OWNER:	U.S. Magnesium
Manuf./Model:	RMY/41342	LOCATION:	ATI Titanium Plant
Serial No.:	10231	DATE:	4/21/14
Range:	-50 to + 50ºC	BY:	VSI

SENSOR (Lower):		DATA ACQUISITION:	
Manuf./Model:	RMY/41342	Manuf./Model:	CS/CR3000
Serial No.:	14288	Serial No.:	2743
Range:	-50 to + 50ºC		

CALIBRATOR:
Manuf./Model: Cole-Parmer/93210-50
Serial No.: K02002908

INPUT TEMPERATURE (Deg. F)	INPUT TEMPERATURE (Deg. C.)	DIFF. (Deg. C.) (DAS)
38.9	3.83	-0.004
69.9	21.04	-0.012
83.5	28.63	-0.002
95.4	35.20	-0.075

PSD TOLERANCES (Deg. C.)

DAS

±0.1

PERFORMANCE AUDIT: RELATIVE HUMIDITY

SENSOR:
Manuf./Model: Vaisala/HMP45AC
Serial No.: F16400131
Range: 0 to 100%

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
Deg. C = 0.5556(Deg. F - 32)

CALIBRATOR:
Manuf./Model: NovaLynx/Assman
Serial No.: 8524/8513

AMBIENT READING (%)	DATA ACQUISITION (%)	DIFFERENCE (DAS)
31	33.6	2.6

PSD STANDARD (%)

±7%

PERFORMANCE AUDIT: AMBIENT PRESSURE

SENSOR:
Manuf./Model: Vaisala/PTB110
Serial No.: E2810049

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

CALIBRATOR:
Manuf./Model: Garmin/Etrex GPS
Serial No.: 79524134

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
1013.25 mb = 29.92 in. Hg. = 760.0 mm Hg.

Time (MST)	AMBIENT PRESSURE (mb)	DATA ACQUISITION (mb)	DIFF. (mb) (DAS)
0810	876.1	877.3	1.2
0900	876.0	877.3	1.3
1005	875.9	876.8	0.9
Average	876.0	877.1	1.1

EPA GUIDELINES (mb)

DAS

±3.0

PERFORMANCE AUDIT: SOLAR RADIATION (NET)

SENSOR:
Manuf./Model: Kipp & Zonen/NR-LITE-15
Serial No.: 82916
Range: 0-2000 W/m^2

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

COLL. STD:
Manuf./Model: Kipp & Zonen/NR-LITE-2
Serial No.: 93454
Calib. Factors:
mV/Wm-2: 0.013000 Date: 8/31/12

Record the output of the Collocated Standard and the Sensor.

Time (MST)	Coll. Std.	DAS	% Difference DAS
0824	168	162	-3.6
0930	262	257	-1.6
1030	345	346	0.2
Average	258	255	-1.2

PSD TOLERANCES
DAS
±5.0%

PERFORMANCE AUDIT: SOLAR RADIATION (TOTAL)

SENSOR:
Manuf./Model: Licor/LI200X
Serial No.: PY58271
Range: 0-3000 W/m^2

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

COLL. STD:
Manuf./Model: Licor/LI200SZ
Serial No.: PY79092
Calib. Factors:
mV/Wm-2: 0.010000 Date: 3/6/12

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

Record the output of the Collocated Standard and the Sensor.

Time (MST)	Coll. Std.	DAS	DAS
0830	403	397	-1.5
0905	480	477	-0.6
1008	754	751	-0.4
Average	546	542	-0.7

PSD TOLERANCES
DAS
±5%

PERFORMANCE AUDIT: PRECIPITATION

SENSOR:
Manuf./Model: MetOne/385
Serial No.: H4856
Resolution: 0.01 inch

OWNER: U.S. Magnesium
LOCATION: ATI Titanium Plant
DATE: 4/21/14
BY: VSI

CALIBRATOR:
Manuf./Model: Graduated Cyl.
Serial No.: NSN

DATA ACQUISITION:
Manuf./Model: CS/CR3000
Serial No.: 2743

CALIB. FACTORS:
1 tip = 0.01 inch = 18.53 ml = 0.254 mm

		INPUT		DATA ACQUISITION		DIFF. (% / mm)
	H_2O (ml)	(in. H_2O)	(mm H_2O)	(in. H_2O)	(mm H_2O)	(DAS)
	96	0.052	1.316	0.050	1.270	-3.5% /- 0.046
	96	0.052	1.316	0.050	1.270	-3.5% /- 0.046
	101	0.055	1.384	0.050	1.270	-8.9% / -0.110
	99	0.053	1.357	0.050	1.270	-7.0% / -0.087
	96	0.052	1.316	0.050	1.270	-3.5% /- 0.046
Average	97.6	0.053	1.338	0.050	1.270	-5.3% / -0.068

PSD TOLERANCES (% / mm)

DAS

±10% Observed Value / ±0.5 mm

Appendix G
Sampling and Analysis Plan Modification and Field Modification Request Forms