Clean Harbors Aragonite, LLC.
11600 N Aptus Road
P.O. Box 1339
Aragonite, UT 84029

August 3, 2017

Mr. Scott T. Anderson, Director
Division of Waste Management & Radiation Control (DWMRC)
Department of Environmental Quality
195 North 1950 West
P.O. Box 144880
Salt Lake City, UT 84114-4880

RE: Complete CPT Plan for Class 3 Modification- 2017 Test Burn
Clean Harbors Aragonite, LLC
EPA Number – UTD 981 552 177

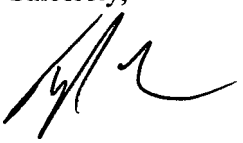
Dear Mr. Anderson:

On May 10, 2017 Clean Harbors Aragonite requested a Class 3 Modification to conduct a Test Burn at the facility during the 4th quarter of 2017, by November 16, 2017. That request included a Test Burn Plan but did not include the appendixes, Table of Contents, and other tables of the CPT Plan. Attached is a copy of the initial request along with a complete copy of the CPT Plan.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Should you have any questions, please call me or Michael Marlowe at (435) 884-8351.

Sincerely,



Tyler Lee
Compliance Manager, Incineration - Aragonite
Clean Harbors Aragonite, LLC
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Grantsville, Utah 84029-1339
(o) 435.884.8122
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Clean Harbors Aragonite, LLC.
11600 N Aptus Road
P.O. Box 1339
Aragonite, UT 84029

May 10, 2017

Mr. Scott T. Anderson, Director
Division of Waste Management & Radiation Control (DWMRC)
Department of Environmental Quality
195 North 1950 West
P.O. Box 144880
Salt Lake City, UT 84114-4880

RE: Request for Class 3 Modification- 2017 CPT
Clean Harbors Aragonite, LLC
EPA Number – UTD 981 552 177

Dear Mr. Anderson:

Clean Harbors Aragonite requests a Class 3 Modification to alter operating parameters during a MACT EEE CPT during the 4th quarter of 2017, by November 16, 2017. Please find attached a copy of the Test Burn Plan. The 60 day public comment period runs from May 15, 2017, through July 15, 2017, with a public meeting scheduled for Friday, June 30, 2017, at 2:00 pm in the Large Public Meeting Room of the Grantsville Public Library, 42 North Bowery St, Grantsville, Utah, 84029

It is expected that several of the operating parameter limits will change from the current limits by small amounts. Some maximum limits may be increased and some minimum limits may decrease. These new operating limits will be higher or lower than the current RCRA Permit limits. This permit modification is submitted to change these operating parameters so that the MACT and RCRA standards will be the same.

It is expected that most of the operating limits will remain very similar to current limits. It is planned for the test to operate the scrubbers at pH inlet levels that are .5 to 1.0 standard units below the current limits. A modest reduction in the operating pH minimums should help reduce pressure drops and related fan horsepower requirements while maintaining overall scrubber performance.

In accordance with Utah Admin Code R315-270-42(e) the facility is also requesting a Class 3 Modification in conjunction with this CPT test and the temporary authorization (DSHW-2016-014950) approved of by the Director and effective from December 7, 2016 to June 5, 2017. The temporary authorization allows for a one-minute delay to the automatic waste feed cutoff system (AWFCO) for the baghouse opacity. This modification will change the condition 5.F.15 requirement in the facilities RCRA Part B permit adding a delay period of 1 minute to the broken bag detector AWFCO parameter. This will allow the facility to continue normal operations while still monitoring for leaks without experiencing unnecessary AWFCOs. Attached is the red line strike out edited version of the 5.F.15 parameter and a final version of this parameter with the modification.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Should you have any questions, please call me or Michael Marlowe at (435) 884-8351.

Sincerely,

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www.cleanharbors.com

cc: Carol Rushin, EPA Region VIII
Bryce Bird, UDEQ-DAQ
Myron Bateman, Tooele County Health Department

Edited Version

PARAMETER	TYPE OF WFCO*	IMMEDIATE CUTOFF LIMIT	DELAYED CUTOFF LIMIT	DELAY PERIOD
13. Pressure drop across the baghouse	1	<1.8" W.C.	N/A	N/A
14. Baghouse compartments on-line	1	<7 compartments	N/A	N/A
15. Baghouse broken bag detector	1	>50% of span	~~N/A~~ >50%	~~N/A~~ 60 seconds
16. Saturator outlet gas temperature	1	>225°F	N/A	N/A
17. Saturator brine flow rate	1	<300 gpm HRA	N/A	N/A
18. 1st stage packed tower liquid feed pH	1	<5.47 HRA	N/A	N/A
19. 1st stage packed tower brine flow rate	1	<1960 gpm HRA	N/A	N/A
20. 1st stage packed tower pressure drop	1	<0.5" W.C. HRA	N/A	N/A
21. 2nd stage packed tower liquid feed pH	1	<6.23 HRA	N/A	N/A
22. 2nd stage packed tower liquid effluent pH	1	<5.8 HRA	N/A	N/A
23. 2nd stage packed tower brine flow rate	1	<2140 gpm HRA	N/A	N/A
24. 2nd stage packed tower pressure drop	1	<0.5" W.C. HRA	N/A	N/A
25. Feed rate of activated carbon	1	<25 lb/hr HRA	N/A	N/A
26. reserved	N/A	N/A	N/A	N/A
27. Combustion gas flowrate as measured at the stack	1	>77,800 acfm HRA	N/A	N/A
28. CO concentration in the stack (corrected to 7% oxygen, dry basis)	1	>100 ppmv HRA	>500 ppmv	60 seconds
29. Feed rate of liquid waste through the waste liquid gun of burner A-104	5	>3090 lb/hr HRA	>90 lb/min	15 seconds
30. Feed rate of liquid waste through the waste liquid gun of burner A-104 (except during 3 minute gun startup)	5	N/A	<1.125 gpm	15 seconds
31. Feed rate of liquid waste through the kiln direct burn lance A-101	5	>1710 lb/hr HRA	N/A	N/A
32. Feed rate of liquid waste through the kiln aqueous lance A-102	5	>1350 lb/hr HRA	>60 lb/min	15 seconds
33. Feed rate of pumpable sludge through the kiln sludge lance A-103	5	>2170 lb/hr HRA	>200 lb/min	15 seconds
34. Feed rate of bulk solids and containerized wastes combined	4	>18,600 lb/hr HRA	N/A	N/A

Final Version

PARAMETER	TYPE OF WFCO*	IMMEDIATE CUTOFF LIMIT	DELAYED CUTOFF LIMIT	DELAY PERIOD
13. Pressure drop across the baghouse	1	<1.8" W.C.	N/A	N/A
14. Baghouse compartments on-line	1	<7 compartments	N/A	N/A
15. Baghouse broken bag detector	1	>50% of span	>50%	60 seconds
16. Saturator outlet gas temperature	1	>225°F	N/A	N/A
17. Saturator brine flow rate	1	<300 gpm HRA	N/A	N/A
18. 1st stage packed tower liquid feed pH	1	<5.47 HRA	N/A	N/A
19. 1st stage packed tower brine flow rate	1	<1960 gpm HRA	N/A	N/A
20. 1st stage packed tower pressure drop	1	<0.5" W.C. HRA	N/A	N/A
21. 2nd stage packed tower liquid feed pH	1	<6.23 HRA	N/A	N/A
22. 2nd stage packed tower liquid effluent pH	1	<5.8 HRA	N/A	N/A
23. 2nd stage packed tower brine flow rate	1	<2140 gpm HRA	N/A	N/A
24. 2nd stage packed tower pressure drop	1	<0.5" W.C. HRA	N/A	N/A
25. Feed rate of activated carbon	1	<25 lb/hr HRA	N/A	N/A
26. reserved	N/A	N/A	N/A	N/A
27. Combustion gas flowrate as measured at the stack	1	>77,800 acfm HRA	N/A	N/A
28. CO concentration in the stack (corrected to 7% oxygen, dry basis)	1	>100 ppmv HRA	>500 ppmv	60 seconds
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31. Feed rate of liquid waste through the kiln direct burn lance A-101	5	>1710 lb/hr HRA	N/A	N/A
32. Feed rate of liquid waste through the kiln aqueous lance A-102	5	>1350 lb/hr HRA	>60 lb/min	15 seconds
33. Feed rate of pumpable sludge through the kiln sludge lance A-103	5	>2170 lb/hr HRA	>200 lb/min	15 seconds
34. Feed rate of bulk solids and containerized wastes combined	4	>18,600 lb/hr HRA	N/A	N/A

Comprehensive Performance Test Plan
Clean Harbors Aragonite, LLC. Incinerator
October 2016

Comprehensive Performance Test Plan
Clean Harbors Aragonite, LLC. Incinerator

By

Scherger Associates
Ann Arbor, MI

And

Waste Pro Engineering, Inc.
Kennett Square, PA

October, 2016
version 0.0

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TABLE OF CONTENTS

TABLES

APPENDICES

LIST OF ACRONYMS

ABC	After Burner Chamber
acfm	Actual Cubic Feet per Minute
APT	Air Pollution Testing, Incorporated
Aragonite	Clean Harbors Aragonite, LLCC
AWFCO	Automatic Waste Feed Cutoff
BACT	Best Achievable Control Technology
BTU	British Thermal Unit
CBO	Control Board Operator
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CEM	Continuous Emission Monitor
CFR	Code of Federal Regulations
cfm	Cubic Feet per Minute
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPT	Comprehensive Performance Test
CPMS	Continuous Parameter Monitoring System
CMS	Continuous Monitoring System
CVAAS	Cold Vapor Atomic Absorption System
cp	Centipoise
DCS	Distributed Control System
dscfm	Dry Standard Cubic Feet per Minute
DOT	Department of Transportation
DRE	Destruction Removal Efficiency
EPA	Environmental Protection Agency
HAP	Hazardous Air Pollutants
HCl	Hydrogen Chloride
HCl/Cl_2	Hydrogen Chloride/Chlorine
HCE	Hexachloroethane
HP	Horsepower
HRA	Hourly Rolling Average
ICB	Initial calibration blank
ICV	Initial Calibration Standard
LCS	Laboratory Control Samples
LSC	Analytical Laboratory Services Coordinator

MACT	Maximum Achievable Control Technology
MCB	Monochlorobenzene
MDL	Method Detection Limit
NBS	National Bureau of Standards
NO_x	Nitrogen Oxides
O_2	Oxygen
OPL	Operating Parameter Limit(s)
PI	Plant Information System
PCB	Polychlorinated Biphenyl
PM	Particulate Matter
POHC	Principal Organic Hazardous Constituents
ppmv	Parts per million, by volume
PVC	Polyvinyl chloride
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
Subpart EEE	National Emission Standard for Hazardous Air Pollutants from Hazardous Waste Combustors.
THC	Total Hydrocarbon
TSCA	Toxic Substances Control Act
UDAQ	Utah Division of Air Quality
UDSHW	Utah Division of Solid and Hazardous Waste
WAP	Waste Analysis Plan
w.c.	Water column

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CERTIFICATION

I hereby certify, based on information and belief formed after reasonable inquiry, that the statements and information in this document are true, accurate, and complete.

_____ _____

Signature Date

Michael Marlowe
General Manager
Clean Harbors Aragonite LLC

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1.0 INTRODUCTION

1.1 Program Summary

[40CFR 63.1207(f) and 63.7(c)(2)(i)-(iii) and (v)]
This document is the Comprehensive Performance Test (CPT) Plan for the rotary kiln incineration system operated by Clean Harbors Aragonite, LLC. (Aragonite) at its Utah site. This plan has been prepared in accordance with the requirements of 40 CFR §63 Subpart EEE – National Emission Standard for Hazardous Air Pollutants from Hazardous Waste Combustors. The Aragonite incinerator treats hazardous waste as defined by 40 CFR §261.3 and currently follows the incineration requirements of 40 CFR §264, Subpart O.

The requirements for the contents of this test plan are contained within 40 CFR §63.1207(f) and 40 CFR §63.7(c)(2)(i)-(iii) and (v).

The Aragonite incinerator is regulated under the United States Environmental Protection Agency's (EPA) final hazardous waste combustor (HWC) Maximum Achievable Control Technology (MACT) standard (40CFR Part 63 Subpart EEE). The facility is a permitted RCRA facility operating under a State of Utah RCRA permit USEPA ID# UTD981552177). The facility also operates under Clean Air Act (CAA) Permit Number 4500048003. The unit is authorized under the Toxic Substances Control Act (TSCA) to burn polychlorinated biphenyl (PCB) wastes. The TSCA authorization is incorporated into the RCRA permit as described in Attachment 17 to the RCRA permit.

Aragonite will conduct the CPT to demonstrate compliance with MACT emission standards for existing hazardous waste incinerators [40CFR 63.1219]. During the CPT, emissions testing will also be conducted to measure parameters specified in the facility RCRA and Air Permits. During the CPT, emissions testing will include CO, THC, PM, HCl/Cl_2, LVM (As, Be, Cr), SVM (Cd, Pb), Hg, Ni, SO_2, NO_x, CO_2, O_2, and PCB-DRE. MACT regulations and the RCRA permit also require a 99.99% DRE demonstration unless waived based on previous DRE testing at the facility. This plan includes a request to waive the DRE test requirements as the facility has demonstrated compliance with the DRE standard during numerous previous tests. If DRE is not waived, then DRE will be determined using two principal organic hazardous constituents (POHC)

CPTs are required by the MACT regulations [40CFR63.12107(d)] to be performed within 61 months following the start of the previous CPT. The most recent CPT was performed starting on October 16, 2012. The next CPT must therefore be started by November 16, 2017. The current target start date for this CPT is October 10, 2017 with setup on October 9. The RCRA Permit requires periodic performance testing every 30 months in accordance with the MACT Comprehensive and Confirmatory Test schedule. The facility Air Permit requires that additional parameters (e.g. NO_x, SO_2, and Ni) be included whenever MACT performance testing is performed.

The 2012 MACT CPT and RCRA Trial Burn serve as the basis for the current operating parameter limits under the MACT regulations as specified in the Notice of Compliance (NOC), May 10, 2013 and updated on July 1, 2015 following the Confirmatory Performance Test (CfPT) at the facility. The 2012 RCRA Trial Burn (combined with the MACT 2012 CPT) serves as the basis for the approved Class 3 Permit Modification that updated the operating parameter limits in the RCRA permit.

This combined CPT and RCRA Performance Test will set new operating parameter limits for the facility. These limits will based on the operating conditions demonstrated during the 2017 CPT. If the DRE waiver is approved, then DRE related operating parameters (minimum kiln and SCC temperature, maximum total kiln and SCC waste feed rates, maximum kiln pumpable waste feed rate, and maximum stack flow rate) will be based on the more conservative limits demonstrated in the 2012 CPT (DRE performed) or in the 2017 CPT. Most conservative is defined as the highest minimum temperature and the lowest maximum total and pumpable waste feed and stack flow rates. The operating parameter limits determined by this CPT will be self-implemented in the air permit under MACT and by a Permit Modification to the RCRA permit.

1.2 Facility/Unit Identification

1.2.1 General

The Clean Harbors Aragonite Incinerator is a commercial, hazardous waste incineration facility located at Aragonite, Utah, a rail siding approximately 60 miles west of Salt Lake City. The incinerator treats hazardous waste solids, sludges, liquids, and gases. The incinerator also treats process vent streams from operations at the site. The incinerator consists of a rotary kiln, afterburner, and gas treatment system. The gas treatment system includes a spray dryer, fabric filter baghouse, and wet scrubber system.

1.2.2 Facility Identification, Mailing Address and Primary Contact

The facility mailing address is:

Clean Harbors Aragonite LLC
P.O. Box 1379
Grantsville, Utah 84029

The facility physical address is:

Clean Harbors Aragonite LLC
11600 North Aptus Road
Grantsville, Utah 84029

The facility I.D. is:

U.S. EPA ID#: UTD981552177

Questions regarding this document should be addressed to:

Mr. Tyler Lee
Compliance Manager
Phone: (435) 884-8122
E-mail: lee.tyler@cleanharbors.com

1.3 Plan Purpose and Organization

1.3.1 Purpose

This document is the CPT Plan for the hazardous waste incinerator, located at the Clean Harbors facility in Aragonite, Utah. The proposed CPT is intended to:

- Demonstrate compliance with the CAA HWC MACT emission standards for existing incinerators, finalized on October 14, 2008 [40 CFR 63.1219];
- Define incinerator operating parameter limits and operating conditions as required by MACT;
- Demonstrate compliance with the facility Air permit and RCRA permit including:
  - State RCRA Permit Condition 5.G.1and 5.G.2;
  - State RCRA Permit, Attachment 17 Delegated TSCA Approval, Condition 2 (iv)(g); and
  - Title V Permit, Conditions II.B.2.a.1(a), II.B.2.b.1(a), II.B.2.c.1(a), II.B.2.d.1(a), II.B.2.e.1, II.B.2.f.1(a), and II.B.2.j.1.

The MACT regulations, RCRA and Air permits contain specific requirements concerning test methods. Unless noted otherwise, these will be followed during this CPT. If there is conflict

between methods, the methods required by the Air permit and Subpart EEE will be used. The test methods to be used are described in Section 5.4 and Tables 5-2 and 5-3.

It should be noted that the 2017 CPT estimated operating conditions represent target values that may or may not be attained during actual testing. The actual operating limits demonstrated during the test will be the basis for establishing the operating limits under MACT and will be the basis for the updated Notice of Compliance.

1.3.2 CPT Plan Organization

The following sections of the CPT Plan provide a description of the incinerator and related control equipment, waste characterization information, provisions for sampling, monitoring, and reporting, and a test protocol in accordance with the MACT requirements for Comprehensive Performance Test Plans [40 CFR 63.1207(f) and (g)]. This information and the procedures referenced follow the regulations and recommended guidelines established by the EPA.

The document consists of seven primary sections and seven appendices:

Section 1:	Description of the background, purpose and objectives of the CPT
Section 2:	Engineering description of the incinerator, air pollution control equipment, and the distributed control system
Section 3:	Characteristics of typical waste received and processed
Section 4:	Operating Parameters Discussion
Section 5:	The Test Design and Protocol.
Section 6:	Test schedule
Section 7:	Test report description
Appendix A:	DRE Waiver Request
Appendix B:	Process and Instrumentation Diagram and Stack Information
Appendix C:	CMS Performance Evaluation and Test Plan
Appendix D:	Quality Assurance and Project Plan
Appendix E:	Startup, Shutdown and Malfunction Plan
Appendix F:	Notice of Compliance July 1, 2015
Appendix G:	Hazardous Waste Residence Time Calculation

1.4 Test Objectives

This test program is intended to demonstrate compliance with the HWC MACT final standards, while operating the incineration train at maximum feed rates, maximum stack flow rate, minimum temperature, and while operating the gas cleaning equipment at maximum/minimum

operating limits. The stack testing objectives are to meet the MACT emission limits RCRA permit limits same as MACT limits where limits overlap), which are:

- Dioxin/furan (DF) emissions $\leq$ 0.4 ng TEQ/dscm (baghouse inlet Temp $\leq$400 ^{o}F)
- Particulate matter (PM) emissions $\leq$ 28 mg/dscm (0.013 grains/dscf)
- Mercury emissions (Hg) $\leq$ 130 µg/dscm
- Semi-volatile metals (SVM) (cadmium and lead) emissions $\leq$ 230 µg/dscm
- Low volatile metals (LVM) (arsenic, beryllium, chromium) emissions $\leq$ 92 µg/dscm
- Hydrogen chloride (HCl) + chlorine (Cl_2) emissions $\leq$ 32 ppmv
- Carbon monoxide (CO) emissions < 100 ppmv, over an hourly rolling average
- Total Hydrocarbon (THC) emissions < 10 ppmv, over an hourly rolling average
- 99.99% DRE

In addition, to demonstrating compliance with the MACT standards, the CPT includes testing to demonstrate compliance with the emission limits in the facility air permit and RCRA permit. The additional emissions monitoring requirements are as follows:

- Oxide of Nitrogen (NO_x) $\leq$44.18 lbs/24hrs (Air Permit)
- Oxides of Sulfur (SO_x) $\leq$91 ppmv (Air Permit)
- Nickel $\leq$5090 ug/dscm (Air Permit)
- Beryllium $\leq$9.18 grams/24 hours; (Air Permit)
- Chlorine (Cl_2) $\leq$8.5 ppmv (Air Permit)
- Total PCB (RCRA/TSCA Permit – 99.9999% DRE)

All concentrations measured will be corrected to 7% oxygen and a dry weight basis in keeping with the standard. CO and hydrocarbon (THC) will be continuously monitored. The incineration system will be operated at extremes of the operating parameters while these tests are underway. This will demonstrate compliance even while the system is at those extremes and establish new MACT operating limits.

1.5 Overview of Test Plan Approach

1.5.1 CPT Test Runs

The comprehensive performance test will be performed as one set of three test runs demonstrating the normal mode of operation for the incinerator. Aragonite previously demonstrated operating limits under two modes of operation, the normal mode with the baghouse inlet temperature $\leq$400 ^{o}F and an alternate mode with the baghouse inlet temperature > 400 ^{o}F. Aragonite does not plan to use the alternate mode in the future and therefore is not re-demonstrating performance for the alternate mode. The test will be performed using EPA and

ASTM approved methods in accordance with the MACT regulations. A Quality Assurance Project Plan has been prepared with data quality objectives (see Appendix D).

The three test runs will be performed with the incinerator operating in normal mode with all MACT, and RCRA and Air Permit emission parameters being tested (dioxin/furan, PM, HCl/Cl_2, LVM, SVM, Hg, CO, THC, NO_x, SO_2, Ni, and PCB-DRE. POHC-DRE will be performed if the waiver is not approved as part of this plan. During these test runs, operating conditions, as described later in Section 4, will represent the extremes of operation for all feed systems and constituents that generate emissions. The conditions will also represent minimum operating criteria for the emission control equipment. The results, therefore, will define an operating envelope to ensure the incinerator meets the MACT, RCRA permit, and Air permit emissions standards during normal operating mode.

Both total hydrocarbon (THC) and carbon monoxide (CO) will be monitored during all test runs. Aragonite normally uses THC as the emission standard and as the CEM-based AWFCO. CO CEMs are also operated by the facility and can be selected for MACT compliance [40 CFR 63.1219 (a)(5)(i) and (a)(5)(ii)].

1.5.2 Waste Feed Rates

The total waste feeds (pounds per hour) and total pumpable waste feed (pounds per hour) to the unit will be maximized during all test runs. Total waste feed of specific constituents, chlorine and the MACT metals (LVM, SVM, mercury) will be spiked as needed to establish maximum limits. PCB-DRE will be confirmed by burning waste with PCB to verify the organic destruction capability of the system at the extreme operating conditions. If POHC-DRE is required, it will be demonstrated by the inclusion of two Principal Organic Hazardous Constituents (POHC) in the feed. The POHCs will be Monochlorobenzene (MCB) and Hexachloroethane (HCE). These POHCs have been used in all previous CPT and RCRA trial burn tests, as mandated by the RCRA permit.

1.5.3 Operating Limits

The operating parameters discussed further in Section 4, which are the automatic waste feed cutoff (AWFCO) parameters established under the 2012 CPT and by the NOC, will be documented during the test in sufficient detail to create specific operating limits that ensure compliance with the MACT and RCRA standards. The current operating parameters for the normal operating mode are tabulated in Section 4.

1.5.4 Other Emission Monitoring

The Aragonite CAA permit and the RCRA permit also require certain emission monitoring to be performed. These emission tests are being incorporated into the CPT. In the case of the air permit, the permit conditions specify that these emission tests will be performed when the MACT CPT tests are run. The RCRA permit also provides for demonstration of performance to coincide with the MACT CPT.

Many of the emission requirements of the air permit and RCRA permit are the same as for the MACT CPT emission test. However, there are a few parameters listed in the Air and RCRA permit that are not required by the MACT regulations. Therefore, the following additional parameters will measured in the stack gas:

- Oxide of Nitrogen (NO_x) $\leq$44.18 lbs/24hrs (Air Permit)
- Oxides of Sulfur (SO_x) $\leq$91 ppmv (Air Permit)
- Nickel $\leq$5090 ug/dscm (Air Permit)
- Beryllium $\leq$9.18 grams/24 hours; (Air Permit)
- Chlorine (Cl_2) $\leq$8.5 ppmv (Air Permit)
- Total PCB (RCRA/TSCA Permit – 99.9999% DRE)

1.5.5 RCRA DRE Waiver

Aragonite has requested that DRE testing using the POHCs MCB and HCE be waived for this performance test and that PCB be the only DRE performance test. This waiver request is based on the fact that the previous five performance tests have all demonstrated that DRE performance is at least 80 to 100 times better than the required 99.99% DRE based on MCB and HCE testing. Further, PCB DRE performance requires that a DRE of 99.9999% be demonstrated for PCB, and thus, PCB DRE data, as required under Attachment 17 of the RCRA Permit, will provide data for assessing the system DRE performance. On-going DRE performance testing is not required under the MACT rules and is a provision in the RCRA permit that can be waived by the State of Utah. This CPT Plan and QAPP is written to include MCB and HCE spiking and analysis of air emissions to assess DRE using these POHCs (MCB and HCE). However, if the State of Utah approves the CPT Plan and this waiver request, sampling and analysis for MCB and HCE will not be required and those samples (air and waste feed) will not be collected and analyzed during the performance test. All members of the CPT team and sub contactors will be notified before the start of the test, if the waiver has been approved.

A copy of the DRE waiver request is attached as Appendix A.

1.5.6 RCRA Permit Operating Parameter Limit Changes

It is expected that many of the operating parameter limits will change from the current limits by small amount. Some maximum OPLs may be increased and some minimum OPLs may decrease. These new operating limits will be higher or lower than the current RCRA permit limits. In order to simplify compliance and maintain consistency among the various AWFCO requirements, a RCRA permit modification will be prepared to change these operating parameters so that the MACT and RCRA standards will be the same. Table 1-1 lists the expected operating parameters that might be addressed in a permit modification. It is expected that many of these will be small changes based the actual CPT results.

Table 1-1. Possible RCRA Permit Operating Parameters needing Modification

Operating Limit	Current Subpart EEE Limit	Current RCRA Permit Limit	Test Target Limits
Kiln Exit Gas Temperature (°F,HRA)	>1,800	≥ 1,800	1,750-1,800
Afterburner Exit Gas Temperature (°F,HRA)	>2,020	≥ 2,018	1,980 - 2,020(1)
First Stage Scrubber Flow Rate (gpm, HRA)	>1,882	≥1,882	1,850-1,890
First Stage Scrubber Inlet pH (HRA)	>5.47	≥5.47	4.5-5.4
Second Stage Scrubber Flow Rate (gpm, HRA)	>1,996	≥1,996	1,950-2,000
Second Stage Scrubber Inlet pH (HRA)	>6.36	≥6.23	5.0-6.0
Second Stage Scrubber Outlet pH (HRA)	NA(2)	≥5.8	4.0-5.2
Activated Carbon Feed Rate	>25.6	≥25.	24-26
Total Waste Feed of SVMs (lb/hr, 12 Hour RA) (Pb + Cd)	<811	≤811	820(3)
Total Waste Feed of LVMs (lb/hr, 12 Hour RA) (As +Be +Cr)	<501	≤501	510(3)
Pumpable Waste Feed of LVMs (lb/hr, 12 Hour RA) (As +Be +Cr)	<501	≤501	510(3)
Total Mercury Feed Rate (lb/hr, 12 Hour RA)	<0.76	≤0.76	0.76(3)
Total Chlorine Feed Rate (lb/hr, 12 Hour RA)	<2,319	≤2,319	2,200-2,500

(1) TSCA has minimum 1980 F on a one minute average.
(2) Outlet scrubber pH is not a Subpart EEE limit; RCRA only
(3)Based on extrapolation of allowable metals feed rates. Actual feed rates during the CPT will not exceed the current allowable metals feed rate limits.

2.0 DETAILED ENGINEERING DESCRIPTION OF COMBUSTION SYSTEM

The Clean Harbors Aragonite (Aragonite) Hazardous Waste Treatment facility is located near the rail siding of Aragonite in Tooele County, Utah approximately 60 miles west of Salt Lake City. The incinerator consists of waste feeding equipment, a horizontal rotary kiln with an afterburner chamber, and a gas conditioning and air emissions control train.

The incinerator is designed to process liquid, sludge, solid, and gaseous waste. Liquids and sludge are bulked up into tankage and then fed to the incinerator, or alternatively, fed directly from tank truck or container. Solids are bulked up into tankage and fed to the kiln through a drop chute. Gases are fed to the afterburner chamber from a cylinder feed station. Containers of liquids sludge and solids can be transferred and fed from tankage. Containers can also be fed directly to the kiln by a container feed system.

The air pollution control system consists of a spray dryer, followed by a baghouse, a saturator, a wet scrubber, and an induced draft fan. The spray dryer evaporates the scrubber blow-down and there is no liquid effluent from the facility.

Slag and residue from the kiln, baghouse and spray dryer discharge into rolloff boxes where they are removed to an off-site hazardous waste landfill.

Appendix B provides process flow drawings of the system. A full suite of drawings are available on line at the UDEQ website as part of the RCRA Permit.

2.1 Combustor Design Specifications

The Aragonite incinerator consists of two combustion chambers – a rotary kiln and a stationary rectangular afterburner. Solid wastes and sludge are fed to the front of the kiln. In the kiln the organic waste content is destroyed and its combustion products join the gas stream. Ash remains solid, often melts to form a molten slag, and discharges into a deslagger that cools the residue and empties the residue into a roll-off. Liquid is also fed to the front of the kiln both through burners and feed nozzles. The organic content in the waste feed provides most of the heat required for combustion. At times used fuel oil and/or propane are fed to provide additional heat. Combustion gases discharge from the kiln above required temperatures.

The combustion gases flow into the entrance of the afterburner. The afterburner stands vertically at the discharge end of the kiln. Waste organic liquid and aqueous liquid are fed to the

afterburner in order to maintain the gas temperature at or above the minimum required temperature. Combustion gases discharge from the afterburner to a hot duct. This refractory lined duct is fitted with an emergency safety vent, and connects the afterburner with the gas conditioning and air emissions control train.

2.1.1 Rotary Kiln

The rotary kiln is refractory lined and the refractory varies in type and depth along its length. The refractory gradually wears away as waste is fed. By experience, refractory is used that is most economical while lasting for an appropriate length of time. The kiln shell is 14 feet 5 1/4 inches in diameter at the feed end and 13 feet 5 3/8 inches in diameter at the discharge end. The kiln is rotated by an electric motor that drives the unit through a girth gear. The kiln is set on trunnions at a 4% slope.

The kiln face (or front wall) is stationary, and the joint between the face and the rotating drum is equipped with a close fit, counter-weighted seal. The kiln discharges into the afterburner chamber through a similar rotating-to-stationary connection. Each primary seal is fitted with a second, similar seal, with a shroud encapsulating the space between the two seals. A blower puts slight positive pressure into this sealed space. This ambient air will enter the combustion system if the primary seal leaks, and vent to the atmosphere if the secondary seal leaks. Various interlocks on the shroud pressure and actual process pressure ensure that no combustion gases leak to the atmosphere at this key point in the system.

Bulk waste solids are conveyed into a feed hopper at the kiln front wall and enter the kiln through the solids feed chute. Drummed wastes are fed to the kiln through the container feed elevator and feed chamber inlet gate. Cooled liquid recirculates through jacketed surfaces to cool the metal face of portions of the feed chute and container inlet.

Waste liquids, sludge, and fuels are fed to the kiln through burners or nozzles at the kiln operating face (front wall). The kiln burner, A-104, is located on the South side and top of the front wall. The burner consists of a pilot lance that burns propane and lances that burn used fuel oil, propane, and waste liquid. The lances are enclosed in a cylindrical burner can that penetrates the front wall refractory. Combustion air, furnished by a fan, flows into the burner can around the lances and also directly into the kiln. Compressed air is used to atomize the liquids. Each lance is equipped with a safety shutoff system that requires fuel pressure, atomizing air pressure, and flame presence in order to keep fuel flowing.

The front wall also includes three nozzles that enter the kiln but do not use the burner. The first of these is the direct burn port, A-101. Waste pumped directly to the kiln from tanks, trucks, or containers is fed to this port. The second nozzle is the kiln aqueous waste liquid port, A-102. Wastewater, usually containing low organic content, can be fed through this port, however this feed system is normally inactive. If this port is used, it is supplied from the aqueous feed tanks. The current plan does not call for the use of this port for aqueous waste feed. The plan is to use this feed port for the aqueous metals spiking solutions, which are fed from totes or containers by a pumping system. The third port is the sludge port, A-103. This port can also be supplied from specially designed tankage or the direct burn system. Each nozzle is provided with plant air for atomization, and safety shutoff systems.

Instantaneous kiln operating temperatures typically range from about 1,600°F up to as much as 2,400°F. The kiln permit limit on an hourly rolling average basis is 1,800°F. The kiln is operated under a slight vacuum in order to assure that there is no escape of untreated combustion off-gases to the atmosphere. Normal operation of the kiln front wall burner requires only a nominal auxiliary fuel rate to maintain a stable flame. Auxiliary fuels (on-spec used fuel oil and propane) are used for preheating, controlled shutdown, and for supplementing waste fuels to assure that the kiln temperature is maintained above the AWFCO limit.

Direct burn material is pumped to the kiln burners directly from containers, or from over-the-road tankers. The direct burn mode is used to process corrosive or chemically reactive materials.

2.1.2 Afterburner

The afterburner chamber is a steel structure lined with refractory. The cross-sectional area of the afterburner chamber is 324.4 ft^2 and the internal dimensions are 17 feet 3 3/8 inches x 18 feet 9 1/4 inches x 36 feet 5 inches high. The kiln combustion gases flow through the afterburner. Liquid organic wastes from tankage and/or auxiliary fuel are fed to the afterburner chamber through two burners located on the North and South sides. Each burner consists of a pilot lance that burns propane and liquid lances that burn fuel oil or other waste liquids. The lances are enclosed in a cylindrical burner can that penetrates the afterburner refractory. Secondary air, furnished by a combustion air fan, flows into the burner can around the lances.

Aqueous waste injection nozzles are also located in the afterburner chamber. Both the burner lances and aqueous waste nozzles are air atomized. Although the compressed gas feed system is not currently in service or planned for use during the test, waste gases from compressed gas cylinders can also be fed to the chamber through nitrogen-powered eductor using one of the

South burner lances, if the system is placed back into service. Used fuel oil and propane are fed for supplementary heating when the wastes being incinerated have insufficient heating value.

The afterburner chamber provides sufficient volume so that combustion gases attain the required residence time for Polychlorinated Biphenyl (PCB) incineration (TSCA regulations require a minimum of 2.0 seconds for incineration of PCBs). Liquid waste is used to heat the combustion gases as they flow through the afterburner. The afterburner chamber is maintained above minimum demonstrated AWFCO temperature on an Hourly Rolling Average (HRA) basis.

2.1.3 Hot Duct and Emergency Vent

Combustion gases flow from the afterburner chamber into the hot duct. The duct is 8 feet in internal diameter and is configured with a steep upward segment, then a mitred turn into a steep downward segment. A relief vent is located at the highest elevation of this duct, which activates to vent the system and shut down waste feed under certain plant upset conditions. Under vented conditions there is a net inflow through all unsealed openings. Auxiliary fuel can be fired to continue the combustion process of solid waste material still located in the kiln during any cutoff of waste feed or shutdown.

2.1.4 Location of Combustion Zone Temperature Devices

Three infrared sensors aimed at the kiln discharge measure kiln gas temperature. One sensor (A) is looking from the north side of the afterburner at the kiln gas temperature, and the other 2 sensors (B and C) are looking from the south side of the afterburner at the kiln gas temperature. Sensor C is currently not in service but is still part of the system and could be reactivated if properly calibrated. The average of two measurements (Sensor A and B or Sensor A and C) is used to report kiln gas temperature. The current operating limit is a minimum temperature of 1800 ^{o}F, HRA. The current Resource Conservation and Recovery Act (RCRA) permit also includes a provision that if one sensor fails, the measurement from the sensor still operating can be used if the temperature measured is at or above 1940 °F.

Three conventional thermocouples are suspended through the ABC "ceiling" to monitor the ABC gas temperature.

2.2 Feed System Descriptions

2.2.1 Bulk Solids

Bulk solid waste is received by the facility in dump and roll-off trucks. The waste is sampled and analyzed before being emptied into one of three receiving tanks. A clamshell bucket removes waste from the receiving tanks and delivers it to the Apron Feeder hopper. The waste flows from the hopper onto an Apron feeder conveyor. This conveyor is made of overlapping metal tracks and meters waste into a top flop gate in the kiln feed chute where the waste is weighed. The apron feeder and flop gate scale work together with the feeder running intermittently to feed the amount of weight programmed to the scale. When that amount has been fed to the scale, the apron feeder stops and the top flop gate opens. Opening the top flop gate drops the waste to a second gate, which will open only after a slide gate below it has opened. The weight measured by the flop gate scale is transmitted to the plant's computer system for tracking feed limits.

2.2.2 Bulk Liquids

There are a total of sixteen permitted bulk storage tanks in the tank farm for receiving, storing, and feeding liquids to the unit. Bulk liquid waste is delivered by over-the-road tank trucks and offloaded at the truck unloading building. Pumps deliver the bulk liquid waste from the truck unloading building to one of twelve approximately 30,000-gallon capacity storage tanks. From the storage tanks the waste is delivered to one of four approximately 30,000-gallon blend tanks where differing waste streams are mixed in order to make the best possible blend for feed to the incinerator. The blended waste is pumped to either the kiln burner or one of the ABC burners. Alternatively waste can be pumped directly from a storage tank to the burners.

Each burner blend feed line includes a control valve and a flow meter. The flow meter is a "Coriolis" mass flow meter that measures directly in pounds per minute. The feed rate measured by each flow meter is transmitted to the plant's computer system. The Control Board Operator (CBO) adjusts control settings to obtain the desired liquid feed rates.

Aqueous waste with little organic content is handled in the same manner and uses the same tank system described above, but is fed to different points in the incineration system. Aqueous and organic waste liquids are kept separate throughout the unloading and storage systems to ensure optimal feed characteristics.

Design capacities for the various burner and aqueous nozzles are listed below.

Design Capacity for Burners and Aqueous Nozzles		
Nozzle	**Stream**	**Design capacity**
A-101	Kiln Direct Burn	70 lb/min
A-102	Kiln Aqueous	60 lb/min
A-103	Kiln Sludge and Drum Educt	200 lb/min
A-104	Kiln Waste Liquid	90 lb/min
A-104	Kiln Fuel Oil	54 lb/min
A-105A	ABC Aqueous	60 lb/min
A-105B	ABC Aqueous	60 lb/min
A-106A	ABC Waste Liquid	90 lb/min
A-106B	ABC Waste Liquid	90 lb/min
A-106A	Fuel Oil	28 lb/min
A-106B	Fuel Oil	28 lb/min

Sludge waste is liquid waste that contains significant amounts of solids. Because the solids can settle out and plug the piping, bulk sludge waste is handled in a separate system. Bulk sludge waste is received in tank trucks. Sludge is emptied directly into a receiving tank or alternatively pumped from the tanker to a dedicated storage tank. From the receiving or storage tank the sludge is pumped through a re-circulation loop. A portion of the re-circulating sludge is fed through a flow meter to the kiln front wall A-103 nozzle.

Alternatively, the same nozzle can be used to inject liquids and sludges "educted" directly out of drums to the kiln. The flow meter for flow to this nozzle is a "Coriolis" type meter that records directly in pounds per minute. The feed rate measured by the flow meter is transmitted to the plants computer system.

2.2.3 Direct Liquid Feed Systems

The Aragonite facility has equipment that allows liquids to be fed directly to the incinerator without passing through a storage tank.

Both the slag pad drive-thru station and the East bay of the truck unloading building are equipped with direct burn equipment that allow tank truck contents to be fed directly to the kiln. In each case pumps and valves are used to control the flow rate. The flow rate is measured by in-line flow meters as it is fed. Valves can allocate the flow toward either the direct burn nozzle or the sludge nozzle.

The direct burn systems are designed to supply the nozzle they are feeding at design capacity.

2.2.4 Containers

Containers are received at the facility in trucks and off-loaded onto one of the waste receiving docks. Aragonite personnel remove the containers from the vehicle to a scale where the container weight is recorded. Container piece count and container integrity are confirmed before additional movements. A representative number of containers are sampled to confirm the waste can be accepted. A bar code acceptance marking is placed upon the drum before it is moved to storage or sent for processing or incineration. The bar code is used to correlate laboratory analysis to the container, as it is processed through the plant.

Containers that can be fed directly to the kiln are placed upon a roller conveyor. The roller conveyor delivers the container to a scanning station where an operator scans its unique barcode. Each container has a unique barcode that allows the computer system to know its location, chemistry and weight. Scanning the container lets the computer know which container is about to be fed to the kiln. An elevator lifts the container to the entrance of the kiln where it is pushed through the kiln front wall and drops inside the kiln. The computer system records the drum as incinerated when it is dropped into the kiln. Lab data is retrieved from a container database to track the weight and chemistry (constituent/contaminants) fed.

Containers may also be processed before being fed to the incinerator. Processing methods include:

- Removing solids from containers and placing the solids into the bulk solids tanks. This waste is then fed to the kiln through the bulk solid waste feed system.
- Decanting liquid drums into a bulk liquid storage tank, tank trucks or direct burn vessels. The bulked up liquid waste is then fed to the kiln through the bulk liquid feed system or through a direct burn feed system.
- Repackaging containers into other containers. This is done to avoid feeding too much energetic material or metals in one charge. Repacked containers are fed to the kiln through container feed system.

Liquid containers may also be pumped directly into the kiln, as noted, through the sludge nozzle.

2.2.5 Compressed Gas Cylinders

Compressed gas cylinders are delivered to Aragonite by truck and offloaded for storage in an outdoor storage location. The cylinders are assigned a unique barcode and tracked in the same manner as containers. Weights and chemistry are included in the tracking.

Compressed gas cylinders are fed to the afterburner chamber. Each cylinder is connected to tubing and placed upon a scale. The scale records the loss in weight from the cylinder as the cylinder gas flows out. There are two scales at this station, one for larger cylinders and the other for lab size cylinders.

The cylinder system is designed to feed 10 pounds per minute.

2.2.6 Waste Handling and Blending Operations

Feed schedulers at Aragonite direct how waste is handled, processed and blended. The schedulers also direct how quickly a given waste will be fed and which feed port will be used. The feed schedulers prepare a Daily Production Plan that directs the incinerator operators on what will be fed during the day.

Dump and roll-off trucks containing bulk solid wastes are emptied into one of three open-top bulk solids tanks or bins. The tanks are contained inside a building that is ventilated to the kiln when that unit is operating, or alternatively, to backup carbon canisters when the kiln is not operating. The air purge from the building is used as combustion air for various burners. The building contains a crane equipped with a clamshell bucket that can be used to move waste between tanks, to the apron feeder for feed to the incinerator, or to a shredder located inside the building above the tanks. Waste is moved between tanks, and shredded from one tank to another as directed by the feed schedulers. A mobile track hoe is sometimes used to mix bulk solid waste in the bins.

The feed schedulers also manage movements of waste liquids in the storage system. Tank trucks containing bulk liquids are pumped into a storage tank selected on the basis of compatibility, available space, and transfer plans. Bulk liquids from different storage tanks are mixed in one of four blend tanks in order to prepare a waste mixture with the desired heat content and chemistry. Blend waste from the blend tank(s) are pumped to the incinerator.

Bulk Sludge waste may be blended in the receiving tank or in the sludge storage tank.

The facility foremen direct the processing of container waste. They review container compatibility and chemistry and assemble groups of containers that can be processed in a similar

fashion. For instance, containers of waste that are emptied into the bulk solids tanks must have an LEL below 25% and not contain large amounts of metals having feed rate limits.

2.2.7 Procedures for Rapidly Stopping Hazardous Waste Feed During Equipment Malfunction

In general any equipment malfunction will result in an Automatic Waste Feed Cut-Off (AWFCO) because of some operational parameter being outside of control limits. For liquid streams the control valve is closed. For bulk solids, the apron feeder shuts down. For direct feed containers the elevator is stopped. Feed mechanisms and other equipment can also be stopped if the Control Board Operator pushes the manual stop button on the control board.

2.3 Air Pollution Control System

2.3.1 Spray Dryer

The spray dryer cools the hot combustion gases so that they can be filtered in the baghouse. Combustion gases are cooled by evaporating brine solution blown down from the wet scrubbing system. This process design also eliminates the need for process liquid disposal. Some of the dried solids from the brine solution are collected by the screws at the bottom of the spray dryer, and discharged to roll-off boxes for off-site disposal. Most of the dried solids continue on with the combustion gases to the baghouse. The evaporated water joins the combustion gas stream.

Combustion gases flow downward through the spray dryer. The dryer is 72 feet 8 1/2 inches high. The internal diameter at the top entrance is 8 feet and the top thimble internal diameter is 11 feet 1 inch and about 10 feet high. The main section varies in internal diameter between 27 feet 2 ¼ inches to 28 feet 2 ¼ inches and is approximately 37 feet high. The dryer has a funnel shaped bottom equipped with screw conveyors to discharge solids to roll-off boxes.

The spray dryer is equipped with 40 nozzles that can be used to spray brine into it. Sixteen nozzles spray into the top of the main section and twenty-four nozzles spray below those. The number of spray nozzles used varies with the heat content of the combustion gases. Some of the spray nozzles are equipped with remotely activated valves that can be used to turn them on or off. The nozzles are high-pressure single fluid nozzles.

Combustion gases exit the dryer at a temperature less than 400°F.

2.3.2 Carbon Injection System

The carbon injection system delivers a weighed amount of activated carbon into the duct between the spray dryer and baghouse. The system consists of a storage bin that feeds two carbon-feeding trains. Each train has a rotary valve that periodically feeds carbon from the bin to a hopper mounted on a loss-in-weight scale. The scale feeds an eductor and piping that pneumatically conveys the weighed carbon to the duct. The eductor manufacturer recommends a minimum airflow rate of 80 actual cubic feet per minute (acfm) for this unit.

2.3.3 Baghouse

The baghouse is a steel-cased fabric filter consisting of eight compartments with 240 filter bags in each compartment. The filter bags are 6 inches in diameter and 14 feet long. The bags are made from 16-ounce fiberglass and may be Teflon coated. Each compartment contains approximately 5,280 ft^2 of filter area.

The bags are cleaned by a pulse jet system that may be operated with the compartment on-line or off-line. On-line cleaning starts automatically when differential pressure across the baghouse reaches an adjustable set point. Both the inlet and outlet compartment valves remain open. Off-line cleaning starts at a higher set point. In this case, during pulsing both the inlet and outlet dampers are closed. The number of cleaning cycles is tracked by the DCS. The DCS records the start and stop time for each cleaning cycle. A cleaning cycle can involve one or more compartments. The average number of cleaning cycles for a six month period was calculated to set the minimum number of cleaning cycles per hour for each test run.

Dust removed from the fabric by pulsing drops to hoppers in the bottom of each compartment. Each compartment contains a screw conveyor that moves the dust from the bottom of the compartment to a roll-off box discharge point for disposal at a hazardous waste facility.

2.3.4 Wet Scrubber

The wet scrubber consists of a saturator and two beds of packing separated by a chimney tray.

Gas from the baghouse at less than 400°F enters the saturator, where a brine solution is sprayed into the hot gas stream to reduce its temperature to saturation (about 175°F). Brine that is not evaporated drains into the wet scrubber neutralization tank and is re-circulated. The purpose of the saturator is to cool the combustion gases from the baghouse temperature down to about 175°F while saturating the gas with moisture to improve the mass transfer rate in the packed beds. This temperature is crucial, as downstream equipment is not designed to resist temperatures above 225°F. The saturator is 15 feet 3 inches high and consists of a bottom

cylindrical section 5 feet 4 inches internal diameter by 11 feet 2 inches long. On top of this is mounted a short conical section. A short inverted conical section is mounted on top of that. About 300 gallons per minute of liquid are sprayed into the top of the unit through eight spray nozzles that are aimed toward the center.

The saturated gas flows into the two-staged packed bed design wet scrubber where the upward flow of gas comes into contact with downward flow of neutralized and cooled brine solution. Brine that drains from each packed bed of the scrubber flows into separate conditioning loops. Each loop contains neutralization tanks, pumps and a heat exchanger. The circulating solution is alkaline and reacts with the acid content of the gases. Alkaline solution is added to the brine to maintain pH above AWFCO settings. The temperature of the gas stream is further reduced in the wet scrubber, which condenses the majority of the water in the gas stream. The amount of condensation depends upon controls associated with each loop's heat exchanger.

Each packed bed contains a six-foot layer of 3-inch Intalox saddles or, when alternative packing is used, a mass transfer equivalent depth of packing. Liquid is introduced at the top of the lower bed using a launder distribution system. Liquid is distributed at the top of the unit using a system of distribution pipes. The tower is 14 feet 6 inches internal diameter and approximately 51 feet 10 inches high.

2.3.5 Induced Draft Fan

Gas exiting the wet scrubber passes through an obsolete and de-energized wet electrostatic precipitator, then through ductwork to the suction of the induced draft fan. This ductwork is long enough to allow gas sampling to be done within EPA guidelines for up- and down-stream dimensions. The induced draft fan provides the suction necessary to move combustion gases through the kiln, afterburner and gas treatment equipment. The fan is sized to deliver 90,000 acfm at 20 inch W.C. inlet pressure and 400 horsepower (HP). The fan is driven by a variable speed drive. The pressure measured in the afterburner chamber controls the speed of the fan.

2.3.6 Stack

Off-gases are discharged through a 60-inch internal diameter by 149-foot high fiberglass stack. The stack provides appropriate ports for Continuous Emission Monitor (CEM) sampling and additional ports for reference method sampling during performance tests.

2.3.7 Air Pollution Control Equipment Maintenance Practices

The Control Board Operator and Wet System Operators monitor the equipment in the air emissions control system closely. The Control Board Operator watches key indicators that signal problems for the different air emission control equipment as described below.

Air Emission Control Equipment	Key Indicator
Spray Dryer	• Outlet temperature
Baghouse	• Opacity meter reading • Pressure drop
Saturator	• Outlet temperature
Wet Scrubber	• Brine Flow Rate 1st Stage • Brine Inlet pH 1st Stage • Brine Flow Rate 2nd Stage • Brine Inlet pH 2nd Stage • Brine Outlet 2nd Stage
Induced Draft Fan	• Flow Rate • VFD Controls

In addition the area operator inspects the air emission control equipment during the shift looking for indications that maintenance may be needed. For example, should the area operator observe that the spray dryer residue is wet; action would be taken to determine which spray dryer nozzle is bad and replace it. The operator uses inspection checklists to identify key areas to inspect. Should the operator find a problem that needs maintenance or repair a work order is written and repairs are completed at the earliest appropriate time.

The plant Preventative Maintenance Program schedules preventative maintenance work orders for the air emissions control system. Much of this work is done during plant maintenance turnarounds when the equipment is not operating. Typical tasks would include changing baghouse bags, and removal and replacement of scrubber packing. More details on this aspect of the plant operation can be found in the Startup, Shutdown and Malfunction Plan in Appendix E.

2.4 Process Monitoring

The incineration system is equipped with a computer-based distributed control system (DCS) to provide the process information necessary for efficient plant operation and safety. The DCS transfers data to a plant information system that records process information in a database to be used to prepare reports and to review past history.

The DCS is used to monitor process flows, temperatures, and pressures and collect signals transmitted to the control room. The system has the capabilities of controlling valves, motors, fans, and dampers as well as initiating automatic waste feed cutoffs if permit operating limits are not maintained. Most of the equipment in the incinerator area is started and stopped by the DCS. The Continuous Monitoring System (CMS) performance evaluation test plan lists the incinerator instruments required by Subpart EEE and is found in Appendix C.

2.5 Automatic Waste Feed Cutoff System and Testing

The primary function of the Automatic Waste Feed Cut-Off (AWFCO) system is to stop the feed of hazardous waste if incineration conditions fall outside of permit limits. An AWFCO will occur whenever the proven operating parameter limits, or an emission standard monitored by a CEM, are exceeded. An AWFCO will also occur when a CMS instrument, except a CEM, exceeds its span, or a component of the AWFCO system fails. Tables in the CMS performance evaluation test plan (Appendix C) list the instruments that measure parameters that can cause a waste feed cutoff.

The AWFCO system is tested weekly (once every 168 operating hours on waste). Once the test is started, a total waste feed cutoff is initiated by each simulated cause. The effects of this condition are field verified and documented. The control system simulates signals for each waste feed cutoff and generates an alarm printout to indicate that each AWFCO operated properly. A detailed Waste Feed Cutoff System Protocol is kept as part of the plant operating record. Completed forms and print outs are also kept in the operating record.

2.6 Stack Exit Gas Monitoring Equipment

The stack gases are sampled and monitored for Total Hydrocarbon and for oxygen. The oxygen value is used to correct the THC value to 7% O_2. Aragonite uses a calculated moisture content to correct the THC to 7% Oxygen dry basis, since the instrument (by regulation) measures the THC content of the wet gases. CO, NO_x and SO_2 are also measured in the stack gases to satisfy conditions in the RCRA/TSCA requirements and Clean Air Act Title V Permit.

Appendix C of this plan – CMS Performance Evaluation and Test Plan contains details regarding CEM design and operation.

3.0 INCINERATOR FEED DESCRIPTIONS

This section provides a description of the hazardous waste streams that are handled at the Aragonite site. Information is also provided on typical waste characteristics, metals and chlorine feed rates, and selection of the Principal Organic Hazardous Constituents (POHCs) for DRE determination.

3.1 Waste Streams Treated in the Incinerator

The Aragonite facility is a commercial hazardous waste incinerator and processes many types of hazardous waste available in the marketplace. The facility is permitted to process both Resource Conservation and Resource Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) waste. The facility may accept the RCRA codes listed in 40 CFR §261.21, §261.22, §261.23, §261.24, §261.33, §261.32 and §261.33 as revised July 1, 1999 with the exception of the following:

- Water reactive wastes or materials (defined as DOT Division 4.3, and in R315-2-9(f)(1)(ii)-(iv)). However, small quantities (less than four liters) may be accepted in lab packs.
- Pyrophoric wastes or materials (defined as DOT Division 4.2(1)).
- Explosive wastes or materials (defined as DOT Forbidden, DOT Division 1.1, 1.2, and 1.3 explosives, DOT Division 4.1(2) Type A and Type B materials, and defined in R315-2-9(f)(1)(vi)-(viii)).
- Shock sensitive wastes or materials.
- Radioactive wastes or materials (defined as having a count rate greater than three times the background value).
- Any waste or material exhibiting the property of reactivity as defined in Utah Hazardous Waste Management rules R315-2-9 (f)(1)(i).
- Any waste or material containing anthrax.
- Compressed gas cylinders containing any of the following as defined by the International Fire Code: explosives and blasting agents, flammable and combustible liquids, flammable solids, oxidizers, organic peroxides,

pyrophorics, unstable (reactive) materials, water reactives, and highly toxic and toxic materials.

- Dioxin waste codes F020, F021, F022, F023, F026, F027, and F028.

The facility is also permitted to accept Utah waste code F999, infectious waste, industrial waste, household hazardous waste, site generated waste, and non-regulated wastes.

3.2 Waste Stream Characterization

The wastes treated at the facility include liquids, solids, gases, cylinders, and aerosol cans. If these wastes are not directly burned, they are stored in bulk tanks or permitted warehouse buildings.

The liquid wastes may include aqueous materials, oils, petroleum products, organic solvents, and other miscellaneous liquids. These wastes are accepted in drums, bulk tankers, and other suitable containers. The liquid wastes are pumped to tanks or directly incinerated.

Solids processed in the incineration system may include contaminated soils, debris, sludges, spill cleanup materials, or other miscellaneous solid materials. These wastes may be packaged in drums, roll-off boxes, or other suitable containers.

Wastes processed at the facility also include gases, cylinders, and aerosol cans. Pressurized gases that are received in suitable tanker trucks, portable tanks, or containers may be processed by direct feed to the SCC.

The analysis of the waste fed to the incinerator varies greatly depending upon the industry where it originated. Waste generation varies by the industry type and analysis varies with it. It is therefore difficult to summarize detailed analytical data as a result. Typical waste feed analytical values are tabulated in Table 3-1.

Table 3-1. Typical Waste Feed Analytical Values

Stream	Heating Value (Btu/lb)	Ash (%)	Physical Form
Solid	0-8,000	20-99	Solid
Waste Blend	5,000 to 20,000	0–3	Liquid
Waste Aqueous	0 to 5,000	0-6	Liquid
Bulk Sludge	0-10,000	0-20	Slurry

3.3 Historical Metals Feed

The amount of metals (LVM, SVM, mercury) and chlorine present in the waste vary greatly from generator to generator and industry to industry. The Aragonite Production engineers prepare a daily burn plan that specifies the quantity of various waste streams to be incinerated to make the best use of the plant's permitted capacity. Their analysis is intended to optimize feed of waste in general, while keeping operations within total waste feed limits and those for chlorine, mercury, semi-volatile and low-volatile metals. The burn plan is constrained by the operating limits previously established and sets the maximum chlorine and metals feed rates below these limits. If a feed rate for a constituent were to reach the established OPLs, then an automatic waste feed cutoff would be initiated by the plant control system to ensure the feed limit would not be exceeded.

Data from the facility computer system was retrieved for the period September 2015 through August 2016 to characterize the typical chlorine and metals feed rates to the incinerator. Table 3-2 shows the average and maximum hourly rolling average for the past year.

Table 3-2. Chlorine and Metals Feed Rates

September 2015 through August 2016

Parameter	Average (lbs/hr HRA)	Maximum (lbs/hr HRA)
Chlorine	423	1800
LVM (As, Be, Cr)	10	587
SVM (Cd, Pb)	7.6	332
Mercury	0.21	0.79

Note: Values presented are hourly rolling averages. LVM, SVM, mercury feed limits are based on 12 hr rolling averages, therefore maximum hourly values can exceed the limits for the hour, but 12 hr rolling averages were not exceeded.

3.4 Principal Organic Hazardous Constituents (POHCs)

The wastes handled by Aragonite encompass a wide range of waste codes and hazardous constituents. Because of the wide range of materials handled, Aragonite does not analyze the feed materials for specific hazardous air pollutants as defined by Section 112 of the Clean Air Act. Under 40 CFR §63.1207(f)(1)(ii)(D), the Administrator is allowed to approve on a case-by-case basis a reduced analysis if that analysis is sufficient to ensure that the Principal Organic Hazardous Constituents (POHCs) demonstrates the Destruction Removal Efficiency (DRE) standard of Subpart EEE. The POHCs that have been used for DRE testing at Aragonite have been selected to demonstrate DRE for the most difficult organic content of the waste the facility is permitted to receive.

The POHCs that have been selected for this test and that have been used historically at Aragonite for the previous CPT and RCRA trial burn demonstration of DRE are Hexachloroethane (HCE), Monochlorobenzene (MCB) and PCBs. The EPA evaluates the difficulty of incinerating organics based on heats of combustion and also on theories of the thermal stability of compounds. Under the heat of combustion approach, compounds with low heat of combustion are considered to be difficult to destroy. For this reason highly chlorinated compounds are considered to be difficult to destroy. The thermal stability approach, developed at the University of Dayton, is based upon gas-phase thermal stability under oxygen-starved conditions. Compounds are ranked on the basis of the temperature required for 99 percent destruction at a residence time of two seconds. Thus compounds ranked high on the list (Class 1, 1-34) are judged the most difficult to incinerate.

HCE was selected as a POHC based upon heat of combustion theory. HCE ranks sixth on the heat of combustion list. MCB was selected based upon thermal stability considerations. MCB is ranked 20th on the Class1 Dayton list. PCB was also selected as a POHC since it is necessary to demonstrate the Toxic Substance Control Act performance standard for PCB under the RCRA permit (Attachment 17) and TSCA authorization

Table 3-3 shows relevant properties of the selected POHCs.

Table 3-3. Relevant Properties for Selected POHCs

Criteria	HCE	MCB	PCBs
Thermal Stability	Class 5, Rank 209/210	Class 1, Rank 20	N/A
Heat of Combustion Ranking	6	190	39-224 (depends on specific congener)
Heat of Combustion, kcal/g	0.46	6.60	2.31 – 7.75 (depends on specific congener)
Physical State	Solid	Liquid	Liquid
Melting Point, °C	187 (sublimes)	- 45	depends on specific congener
Boiling Point, °C	N/A	132	340 – 375 (depends on specific congener)
Gas Sampling Method	Method 0010	Method 0030	Method 0010

Waste containing the POHCs will be sought as the CPT date approaches. However, MCB and HCE are generally not present in waste materials at concentrations high enough to ensure demonstration of 99.99% DRE. Therefore it is expected that MCB and HCE will be purchased for the test. MCB will be a liquid in totes or drums fed to the kiln burner or afterburner chamber (ABC) and HCE will be a solid in bags fed to the kiln. PCB liquid waste will be accumulated starting well in advance of the test. High concentration PCB waste liquids are becoming rare in the market place. Aragonite will work with its customers and other Clean Harbors facilities to find appropriate high concentration PCB liquids for this test.

The MCB product will be injected into one of the existing liquid waste lines downstream of the liquid flow meter, so the that waste feed rate of the waste material can be tracked separately from

the MCB feed rate. A scale recording the loss in weight over time will monitor the MCB feed rate. The output from the scale will be read directly by the DCS, which accumulates the feed rate data.

HCE will be purchased and packaged into bags that will be weighed (usually either 10 or 20 lbs per bag) in advance of the test. The bags will be placed on top of the drums that are being fed to the kiln. The drum line operator will record in a log each time a bag is fed to the kiln. The log will then be used to calculate the feed rate for HCE.

PCB liquids will be accumulated prior to the test. PCB will be fed from the tank farm from the normal PCB blend feed tanks. The PCB concentration of the waste will be known from the samples collected during the test. The mass feed rate will be recorded using the mass flow meters on the feed lines and recorded in the DCS.

DRE will be calculated by the conventional method, using the equation:

$$DRE\ (\%) = 100 \times (M_{in} - M_{out}) / M_{in}$$

M_{in} and M_{out} represent the mass feed rate, and stack emission rate, for the designated DRE compound. The MACT minimum DRE is 99.99% as calculated. The TSCA requirement for PCB DRE is 99.9999%.

Table 3-4 shows the planned feed rate and minimum feed rate for each POHC that is required to demonstrate the DRE. These feed rates are based on emission sampling volumes and analytical detection limits for MCB, HCE, and PCB. The target feed rates provide sufficient POHC feed to demonstrate the required DRE with at least a factor of 10 contingency (99.999% for MCB and HCE, and 99.99999% for PCB) in case of an interference in the analytical method that increases the detection limit or a lower POHC feed rate during the test.

Table 3-4. DRE Calculations Using Detection Limits and Stack Sample Volume

POHC Analytical Parameter	Sampling Train	Feed Rate (lb/hr)	Assumed DRE	Stack Emissions (g/hr)	Total Collected	
MCB - minimum	M 0030	50	99.999%	0.23	68	ng
MCB - target	(VOST)	200	99.999%	0.91	268	ng
HCE – minimum	M 0010	50	99.999%	0.23	11	µg
HCE - target	M 0010	100	99.999%	0.45	22	µg
Total PCBs - minimum	M 0010	100	99.99999%	0.005	0.22	µg
Total PCBs - target	M 0010	300	99.99999%	0.015	0.66	µg

Stack Gas Assumptions:	**Value**	**Units**		
M0010 Sample Volume	115	dscf		
VOST Sample Volume	20	dsL		
	0.7063	dscf		
Stack Gas Flow rate	40,000	dscfm	**Total**	
Analytical Assumptions:	**MCB**	**HCE**	**PCBs**	
Reporting Limit	60 ng - tubes 43 ng condensate **(a)**	0.4 µg **(b)**	0.02 µg **(c)**	

(a) – The 60 ng value is the sum of the 10 ng reporting limits for the three sets of front tube and back tubes which will be analyzed separately. All tubes and condensate are summed for total MCB. If any are below the detection limit, the detection limit is used in the calculation.

(b) – The 0.4 µg reporting limit for HCE is achieved with SIM analysis. A 4x dilution factor is included for the split train.

(c) – A 4x dilution factor is included for the split train.

3.5 Process Vent Streams

Three process vent streams are fed to the incinerator.

- The tank farm vents to the afterburner under normal operating conditions (a backup carbon system is available when the kiln is not operating or should flow be abnormally high). Flow and organic content vary greatly depending upon the waste in the tanks and whether liquid is being pumped in or out of the tank.
- The bulk solids storage building and sludge storage tanks are vented to the kiln. The ventilated gases are used as part of the kiln secondary air. Organic content is typically below 5 parts per million (ppm) volatile organic content. Flow is on the order of 12,000 standard cubic feet per minute.
- The Roberoller vacuum truck is used to combine containers of waste liquid. A truck mounted vacuum pump sucks liquid from the containers into the truck. While the vacuum pump is being used, the vacuum pump exhaust is vented to the kiln. Organic content varies greatly depending upon the waste being sucked into the truck. Flow is combined with the bulk solids storage building ventilation and fed to the kiln secondary air system.

3.6 Supplemental Fuels

On-spec used fuel oil and propane are used to supplement the heat in the waste and for heat up and cool down. These non-hazardous fuels are used as auxiliary fuel during startup and shutdown and during normal operation to help maintain an adequate temperature for waste processing. The propane is not expected to contain any HWC NESHAP regulated constituents in greater than trace quantities. The used fuel oil may contain concentrations of HWC NESHAP regulated constituents. These levels will be determined, and any contributions will be considered when determining the total feed rates of metals and chlorine.

4.0 OPERATING PARAMETERS

4.1 Introduction

AWFCOs are established for the suite of operating parameters, defined in the MACT standard, necessary to ensure compliance with the various emissions limits in the standard. The parameters relevant to the CH-AG facility are tabulated in Table 4-1 that follows. These have been established through testing over the last ten plus years, and for the most part these limits will be replicated during the proposed CPT. It is expected that most of the operating parameter limits will remain very similar to the current limits. The test target rates are shown in Table 4-1 in most cases bracket the current operating limits. It is planned for this test to operate the scrubbers at pH inlet levels that are 0.5 to 1.0 standard units (S.U.) below the current limits. The chlorine-hydrogen chloride scrubbing efficiency has always far exceeded the requirements and the emission rates are well below the standards. A modest reduction in the operating pH minimums should help reduce cumulative system pressure drop (due to solids build-up on the packing material) and related fan horsepower requirements, while maintaining overall scrubber performance.

Assuming the DRE waiver is approved, as requested in this plan, the operating minimum temperatures for the kiln and SCC will be set based on the highest minimum temperature of the 2012 test (when DRE was performed) and this test. The minimum temperatures are related to both DRE (measured in 2012) and dioxin/furans (measured in this test). MACT requires the most conservative results (highest in the case of minimum temperature) be used when an operating parameter applies to more than one constituent. Therefore, the target for this test is to operate just below the current limits, so that the 2012 minimum temperature will remain as the operating parameter limit. If for any reason, the actual measured minimum temperatures are higher than the 2012 temperatures, then the operating temperatures measured in this test will become the new minimum temperature limits for the kiln and/or the SCC.

Similarly, the maximum stack flow rate limit and maximum total and pumpable waste feed rate limits are related to both DRE and dioxin/furan. Therefore, the test targets are to operate just above the maximum rates of the 2012 test when DRE was measured. If for any reason, the actual measured maximum stack flow rate or maximum total and/or pumpable waste feed rates achieved for this test are lower than the 2012 test, then stack flow rate, total waste feed rates or pumpable waste feed rate measured in this test will become the new operating parameter limit(s).

The current MACT and RCRA permit operating limits are shown in Table 4-1. Target operating conditions for this CPT are also listed. As allowed under MACT and under RCRA trial burns,

temporary adjustments to the AWFCO system will be made during the test period to allow for the targets to be achieved. The temporary AWFCO limits for testing purposes are shown in the Table 5-4.

The RCRA Permit developed under the RCRA regulations also specified operating parameter limits to ensure compliance with emission standards. Most of the basic RCRA OPL's for the combustion process and air pollution control system established in the RCRA permit have been updated to be the same as the MACT limits by an approved Class 3 permit modifications. There are a few additional OPLs related to TSCA and some instantaneous maximum limits established in the original RCRA permit. The additional parameters are shown in Table 4-2. There are no expected changes that will occur to the RCRA operating parameters that are not overlapping with the MACT OPLs except for scrubber #2 outlet pH. It is expected that the outlet pH will be lower when the inlet pH is lowered for this CPT. Therefore, it is expected that a new scrubber outlet pH will be established during this performance test. The change in outlet pH along with changes to other MACT-RCRA redundant OPLs will be requested as part of a RCRA permit modification when the test report is completed and submitted.

4.2 Good Combustion Practices

Each individual burner is equipped with instrumentation that is standard for safe operation and defined by industry standards, NFPA requirements, and even insurance industry recommendations. These include:

- Flame detection that shuts off fuel if flame is lost
- Pressure interlocks to assure that fuel is within safe operating range, and properly atomized in the case of liquids.
- Combustion air interlocks to prevent excessive fuel build up in the system.

These devices are maintained in keeping with good practice as well.

Table 4-1. Target Operating Conditions for the Test

Operating Parameter Limit	Units	Averaging Period	Subpart EEE Limits based on 2012 CPT	RCRA Permit Limits	Test Target Limits
Kiln Exit Gas Temperature	°F	HRA	>1800	≥ 1800	1,750-1,800
Afterburner Exit Gas Temperature	°F	HRA	>2020	≥ 2018	1,980-2,020
Spray Dryer Exit Temperature	°F	HRA	< 393	≤ 400	385-395
Activated Carbon Feed Rate	lb/hr	HRA	>25.6	≥ 25	24-26
Saturator Flow Rate	gpm	HRA	N/A	≥300	300-350
First Stage Scrubber Feed pH	SU	HRA	>5.47	≥5.47	4.5-5.4
First Stage Scrubber Flow Rate	gpm	HRA	>1882	≥1882	1,850-1,890
Second Stage Scrubber Feed pH	SU	HRA	>6.36	≥6.23	5.0-6.0
Second Stage Scrubber Flow Rate	gpm	HRA	>1996	≥1996	1,950-2,000
TMT-15 Feed Rate	lb/hr	HRA	>2.47	none	2.4-2.6
Stack Flow	acfm	HRA	<77,147	≤77,800	77,200-77,800
Total Waste to Kiln	lb/hr	HRA	<24,198	By port	24,200-24,500
Pumpable Waste to Kiln	lb/hr	HRA	<6,731	By port	6,740-6,900
Total Waste to ABC	lb/hr	HRA	<8,678	By port	8,700-9,000
Total Waste Feed of SVMs (Pb + Cd)	lb/hr	12 Hour RA	<811	≤811	50*
Total and Pumpable Waste Feed of LVMs (As +Be +Cr)	lb/hr	12 Hour RA	<501	≤501	50*
Total Mercury Feed Rate	lb/hr	12 Hour RA	<0.76	<0.76	<0.10*
Total Chlorine Feed Rate	lb/hr	12 Hour RA	<2,319	≤2,319	2,200-2,500
Carbon Monoxide @7% O_2	Ppmv	HRA	100	100	na
Total Hydrocarbons (THC) @7% O_2	ppmvd	HRA	10	na	na
Combustion chamber pressure	in w.c.	5 or 10 seconds	(1)	(2)	na

* Spiking will allow calculation of feed limits corresponding to these limits as described in the extrapolation procedure, section 5.5

(1) Combustion chamber negative pressure is an alternative monitoring approach using kiln seals. See Section 3 of NOC for specifications and Section 4.4 of this plan.

(2) The RCRA permit has a 5 second time delay.

Table 4-2. Additional RCRA Operating Parameters

OPERATING PARAMETER	UNITS	AVERAGING PERIOD	RCRA FINAL OPERATING LIMIT	TARGET RANGE OR MIN/MAX
2nd stage scrubber pH effluent water	SU	HRA	>5.8	4.0-5.2
Spray dryer outlet/Baghouse inlet temperature	°F	instant	>250	>250
Spray dryer outlet/Baghouse inlet temperature	°F	15 min	>350	>350
Baghouse outlet temperature	°F	instant	<520	<520
Brine Nozzle Pressure to spray dryer	psi	instant	>300	>300
Oxygen	ppm	2 min	>3	>3
Oxygen	ppm	15 sec	>2	>2
Stack Carbon Monoxide	ppm	1 min	<500	<500
BTU to total system	BTU	HRA	$<140 \times 10^6$	$<140 \times 10^6$
Kiln rotational speed	rpm	instant	>0.15	>0.15
Kiln combustion air pressure	"w.c.	instant	>2	>2
Aqueous waste lances atomizing air pressure A-104;A-106-A/B	psig	instant	>10	>10
Atomizing air pressure; A-102; A-105A/B	psig	instant	>30	>30
Atomizing air pressure. A-101; A-103	psig	instant	>5	>5

4.3 Carbon Specifications

[40CFR 63.1207(f)(1)(xx)(B)]

The facility has tested product from two different powdered activated carbon vendors in its history. These products, and any alternative supplier's product, must meet the PAC specifications tabulated below.

Carbon Product Specifications:

Molasses decolorizing efficiency	80 min
Moisture, % as packed	8 max
Mesh Size (U.S. Sieve Series) less than 325 mesh(45μm), %	95 min

Carbon Typical Properties
(For general information, not to be used as purchase specifications.)

Iodine number, mg/g	550
Total Sulfur, %	1.8
Bulk density, tamped, g/ml	0.51
Bulk density, tamped, lb/ft^3	32
Surface Area, m^2/g	600
Ignition Temperature, °C	450

4.4 Alternative Monitoring

Through the years since MACT was first implemented, Aragonite has applied for (and had approved several applications for alternative monitoring under the MACT regulations. These alternative monitoring methods have been reviewed and approved by the agencies. These alternatives are:

- Wet scrubber solids monitoring – This requirement has been waived given the unique baghouse/wet scrubber design which provides for zero waste water discharge and optimal solids removal from the flue gases as well. This air pollution control (APC) system is state-of-the-art.
- Ash feed limit – This requirement, for an AWFCO, is waived given the statistically demonstrable fate of ash as simple slag removed from the kiln, never entering the APC system in the first place.
- Activated carbon injection – Continuous measurement of the carbon injection rate is interrupted whenever the weigh scale, by which this monitoring is accomplished, is filled. The programmed (automatic) filling occurs up to twice an hour, for less than one minute per occurrence. While feed continues during the process, the scale loss-in-weight output is erroneous and presumed to be zero during the process. This in effect penalizes the plant and depresses the rolling average carbon feed calculated.
- THC CEM sampling temperature – Regulations mandate a sample line temperature of >300°F for measurement of THC. With a stack temperature of

only 160°F, this is difficult to achieve. The heated sample line is maintained, but if the sample temperature drops below 300°F, compliance is assured because no condensation will occur from the gas that had already been controlled at a much lower temperature.

- Combustion system pressure instantaneous interlock – A time delay of 10 seconds is allowed on this required AWFCO, so long as pressure in the kiln seal "shroud" is maintained at least 0.2"wc greater than the SCC pressure. This prevents combustion gas leakage from this point. The time delay AWFCO further ensures that fugitive emissions are minimized. [Note: The RCRA permit requirements is that pressure in the combustion zone shall not be equal to or greater than atmospheric pressure for more than 5 seconds.]
- Approved to use stack temperature to define moisture content for calculation of THC dry

5.0 TEST DESIGN AND PROTOCOL

5.1 Introduction

Clean Harbors Aragonite operates a commercial hazardous waste incinerator in Aragonite, Utah. The incinerator is subject to 40 CFR §63 Subpart EEE – the Hazardous Waste Combustor MACT. This Comprehensive Performance Test (CPT) Plan has been prepared to meet the directive that a CPT plan be submitted twelve months before re-demonstration is required. It is designed to consist of a single set of three runs, to demonstrate a single set of operating conditions.

5.2 Test Condition

The comprehensive performance test (CPT) will be performed as one set of three test runs demonstrating the normal operation of the incinerator. Aragonite previously demonstrated operating limits under two mode of operation, the normal mode with the baghouse inlet temperature $\leq$400 ^{o}F and an alternate mode with the baghouse inlet temperature > 400 ^{o}F. Aragonite does not plan to use the alternate mode in the future and therefore is not re-demonstrating performance for the alternate mode. The test will be performed using EPA and ASTM approved methods in accordance with the MACT regulations. A Quality Assurance Project Plan has been prepared with data quality objectives (see Appendix D).

The three test runs will be performed with the incinerator operating in normal mode with all MACT, RCRA and Air permit emission parameters being tested (dioxin/furan, PM, HCl/Cl_2, LVM, SVM, Hg, CO, THC, NO_x, SO_2, Ni, and PCB. DRE will be performed is the DRE waiver is not approved as part of this CPT Plan. During these test runs, operating conditions, as shown in Table 4-1, will represent the extremes of operation for all feed systems and constituents that generate emissions. The conditions will also represent minimum/maximum operating criteria for the emission control equipment. The results, therefore, will define an operating envelope to ensure the incinerator meets the MACT and RCRA and Air Permit emissions standards during normal operating mode.

Both total hydrocarbon (THC) and carbon monoxide (CO) will be monitored during all test runs. Aragonite normally uses THC as the emission standard and as the CEM-based AWFCO. CO CEMs are also operated by the facility and can be selected for MACT compliance [40 CFR 63.1219 (a)(5)(i) and (a)(5)(ii)].

The total waste feeds (pounds per hour) and total pumpable waste feed (pounds per hour) to the unit will be maximized during the all test runs. Total waste feed of specific constituents, chlorine

and the MACT metals (LVM, SVM, mercury) will be spiked as needed to establish maximum limits. DRE will be demonstrated, if required, by the inclusion of two Principal Organic Hazardous Constituents (POHC) in the feeds. PCB waste will be fed during the test to verify the organic destruction capability of the system at the extreme operating conditions. The POHCs will be Monochlorobenzene (MCB) and Hexachloroethane (HCE). These POHCs have been used in all previous CPT and RCRA trial burn tests, as mandated by the RCRA permit.

The operating parameters shown in Table 4-1 are the automatic waste feed cutoff (AWFCO) parameters established based on the previous CPT and by the NOC and will be documented during the test in sufficient detail to create specific operating limits that ensure compliance with the MACT standards. Additional RCRA Permit related operating parameters are shown in Table 4-2.

5.3 Description, Preparation and Delivery of Feeds for the CPT

With the exception of the spiked materials discussed in 5.3.1, typical waste materials processed at the incinerator will be processed during the CPT. Typical waste materials are those commonly available to the facility.

Table 5-1. Typical Composition of CPT Feed Materials

Feed Material	Heating Value (BTU/lb)	Chlorine Content (%)	Ash Content (%)
Kiln -			
Blended Liquid	12,000	5%	0.5%
Direct Burn Liquid	6,000	40%	1%
Aqueous Liquid	500	2%	3%
Bulk Solids	2,000	.5%	75%
Containers	4,000	1%	50%
Afterburner -			
Blended Liquid	8,500	5%	0.5%
Aqueous Liquid	500	2%	3%

The actual waste composition for each of type of waste described above will vary based on the actual waste available at the time of the test and as needed to feed at the target maximum feed rates while demonstrating minimum operating temperatures.

5.3.1 Waste Feed Spiking

As detailed below, POHCs will be spiked into the wastes during the test to provide sufficient feed rates to demonstrate the required DRE. A DRE of 99.9999% will be demonstrated for PCBs; 99.99% will be demonstrated for MCB and HCE. Metals will be spiked into the wastes during the test to provide the target feed rates of metals. The forms of the metals, use of metals extrapolation and activities for metals spiking are discussed below.

5.3.2 POHC Addition Methodology

If DRE testing is required for this performance test, the POHCs selected are Hexachloroethane and Monochlorobenzene. The physical characteristics and a description of HCE and MCB are provided in Section 3.4. PCB is required for the TSCA authorization and as described in Attachment 17 to the RCRA permit.

Solid HCE will be fed to the incinerator with the containerized waste stream. To accomplish this, pre-weighed 10 to 20 pound bags of HCE will be placed onto the top of or into containers fed to the incinerator during the CPT.

Aragonite intends to feed the liquid MCB with the liquid blend waste. MCB will be fed into the liquid blend waste fed to the rotary kiln using a spiking system. PCBs will be present (and measured) in the liquid blend waste fed to both the rotary kiln and ABC at sufficient concentrations to demonstrate DRE. Alternatively, the PCB's may be present in a tanker of waste that will be feed through the direct burn line.

The metering system for the liquid MCB, will consist of a metering pump, and a scale. The scale output will feed to a data logger or alternatively to the incinerator distributed process control system with recording by the data historian. The system will be tied into the blended liquid G header at the front wall of the kiln upstream of the block valve. The system will be shut down in the event of a waste feed cutoff. Waste feed sampling of the blended liquid G header will occur upstream of the MCB injection point.

Sufficient quantities of POHCs will be added to the waste feed streams to ensure that detection limits in the stack gas sample enable demonstration of the required DRE. Table 3-4 details the minimum and maximum required POHC additions based on anticipated analytical detection limits and the required DRE. The "minimum" and "maximum" calculations pertain to desired values based on the range for calibration of the analytical instrumentation. Note that the calculations shown for PCBs assume DREs greater than 99.9999% based on actual results from previous CPTs. MCB and HCE will not be analyzed in the waste feeds unless there is reason to believe the concentration of MCB or HCE is high. For wastes not analyzed, the concentration will be assumed to be zero. Spiking levels will suffice to allow the DRE calculation, and any of these POHCs present at low levels in the actual waste feeds will simply add conservatism to the calculation. PCB

liquids from the incoming waste will be stored to allow sufficient feed levels. Solid feeds will not be analyzed for any POHC including PCBs, adding conservatism to that calculation as well.

5.3.3 Metal Addition Methodology

The target feed rates of lead (surrogate for SVM), chromium (surrogate for LVM), and mercury will be accomplished by spiking metal solid or solutions into the incinerator. With ample history to document system removal efficiency (SRE) for these and other metals, spiking levels have been chosen to run at rates at or above normal feed rates or these constituents.

The target feed rate of lead (50 lb/hr) will be spiked as a solid and fed with the containerized waste into the kiln. Pre-weighed packages containing known amounts of PbO (lead oxide) will either be placed in or fastened upon the waste containers.

Chromium will be spiked into the kiln at the target feed rate of 50 lb/hr. This will all be fed into the kiln in a pumpable form as a solution of chromium (III) acetate, or chromic chloride.

Mercury will be fed into the kiln in a pumpable form as a solution of mercuric acetate or mercury chloride or similar mercury material, at a feed rate of 0.10 lb/hr. This material will be pumped into the kiln through the aqueous feed line. Due to the smaller quantities involved, this liquid may alternatively be fed in small plastic jars filled with solution and placed in the waste containers.

The metering systems for the liquid metal solutions will each consist of a metering pump, and a scale. The scale output will be configured identical to the system used for MCB.

5.3.4 Chlorine Addition Methodology

Effort will be made to use "real waste" for the bulk of the chlorine feed. If the target rate of chlorine (2200 to 2500 lb/hr) is not available in waste streams and POHCs, concentrated hydrochloric acid and/or chloride salt solution may be purchased and fed to the kiln. If hydrochloric acid is added, an acid tanker or portable acid tank will be connected to the drum pump station pump and Teflon coated feed line and fed to the kiln through either the sludge or direct burn nozzle. Flow will be measured using the flow meter installed in the drum pump system. Salt solution may be made up on site, but fed through the same port. Another alternative will be the purchase of a chlorinated solvent, (e.g. as TCE, PCE or other highly chlorinated solvent) and feeding the solvent as a waste material on the direct burn line.

5.4 Sampling & Monitoring Program

Gases will be sampled at the scrubber outlet. Sample ports are available on the stack as well, if needed

5.4.1 Sampling Methods

Table 5-2 lists the sampling methods that will be used for the sampling of stack gases. Aragonite's continuous emission monitoring system (CEMS) will be used to measure CO, CO_2, NO_x, O_2, SO_2 and THC in the stack gas exhaust stream. As required by facility permits, these instruments will operate under current Relative Accuracy Test Audit, Calibration Gas Audit, and Calibration Error tests.

Table 5-2. Overview of Test Parameters and Gaseous Sampling Methods

Parameter	Sampling Method
Particulate Matter	EPA Method 5
Hydrogen Chloride and Chlorine	EPA Method 26/26A
Hexachloroethane and polychlorinated biphenyls	SW- 846 Method 0010
Monochlorobenzene	SW-846 Method 0030
PCDDs/PCDFs (dioxins/furans)	Method 0023A
As, Be, Cd, Cr, Pb, Hg, Ni	EPA Method 29
CO, CO_2, O_2, NO_x, SO_2, THC	Facility CEMS

Sampling trains Method 5 and 26A will be combined
Sampling trains Method 0010/0023A will be combined

Details on these methods are found in the QAPP, Appendix D.

5.4.2 Waste Sampling

Aragonite personnel will sample the waste feed streams. The Quality Assurance Project Plan (Appendix D) provides the details on the streams to be sampled, the laboratories performing the analyses, parameters to be measured, sampling frequency and number of samples to be analyzed, and sampling and analytical methods to be used. All labs to be used for this program are certified by the State of Utah.

Neither the bulk solids nor the containerized waste will contain capacitors or high concentrations of MCB, HCE, or PCB liquids. They will mostly be soils that may contain the small amounts of POHCs, or ash with residual POHCs. Therefore, the solids will not be analyzed for POHC (MCB, HCE). By ignoring the contribution of the POHCs from these feed streams, any POHCs present will increase the DRE, thus making the reported DRE more conservative.

Bulk solids will be sampled at the apron feeder access port above the bulk solids flop gates. The pumpable sludge line will be sampled from a tap in the sludge feed line at the front wall. ABC aqueous liquid waste will be sampled from a tap in the aqueous feed line at the afterburner. Blend liquid to the kiln will be sampled from a tap in the blend liquid line at the front wall. Blend liquid to the ABC will be sampled from a tap in the blend liquid line at the ABC, if that blend feed is from a different source than the kiln blend feed. Direct burn trailers will be sampled from a tap in the direct burn feed line to the kiln or ABC. If used during a test run, fuel oil will be sampled at a tap near the kiln front wall.

Grab samples of the liquid streams will be collected during each run from sample taps in accordance with Method S004 ("Sampling and Analysis Methods for Hazardous Waste Incineration", February 1982). The sample tap is opened and the line is flushed with the material being collected. The flush is then discarded into a container and managed appropriately, then the specified sub-sample is collected. This ensures that the actual material collected is representative of the stream. At the prescribed frequency of once every 30 minutes, liquid is collected into a large beaker or sample jar. An aliquot of the sample will then be transferred into a larger sample bottle. This composite sample will be analyzed for nonvolatile parameters. If required, a separate 20-mL or 40-mL VOA vial will be filled with material for determination of volatile organics. VOA sample bottles will be composited at the laboratory.

Samples of the apron feed solids will be obtained by compositing sub-samples collected at the prescribed frequency of once every 30 minutes. A 250-mL beaker (or sample jar) will be filled, and the material will be transferred into a larger sample container. The resulting composite will be analyzed for non-volatile parameters. If volatile analyses are required, a separate 4-oz. sample jar will be filled at the required frequency; these samples will be composited at the laboratory.

The containers to be fed during the CPT will be prepared prior to the test. Containers will be prepared by re-packing contaminated soil, debris, etc. into drums. Each waste stream or material being used will be characterized prior to re-packing. Each roll-off of contaminated soil will be sampled and analyzed on a roll-off basis. The debris will be characterized using the Matrix Protocol defined in the facility WAP. As the CPT containers are prepared, the amount of each material added will be determined by weighing each container as re-packing occurs. The analysis of each waste stream or material combined with the weight of the material in each drum will be used to calculate the content of each drum. The POHC content in containerized waste will not be sampled and analyzed.. A concentration of zero will be assumed for calculating DRE.

Liquid POHC (MCB) and metal spiking solutions will only be analyzed prior to the test, if a certificate of analysis is unavailable or if the material is diluted or otherwise changed to prepare the material during feed preparation. Lead solid and HCE solid spiking materials will be characterized based on the certificate of analyses or vendor supplied purity certification.

Table 5-3. Overview of Waste Feed Analyses and Methods

Parameter	**Analytical Method**
Total Chlorine	EPA Method 5050/9253
Metals (As, Be, Cd, Cr, Pb, Ni)	EPA Method 6010C
Mercury	EPA Method 7470A/7471B
Viscosity (liquids only)	ASTM D 2983
Heat Content	ASTM D 240
HCE (liquids only if needed)	EPA Method 8270C
MCB (liquids only if needed)	EPA Method 8260C
PCB (liquids only)	EPA Method 8082A
Ash	EPA Method D482

5.5 Metals Extrapolation Methodology

Subpart EEE allows extrapolation of mercury feed rates and emission rates as described in 40 CFR §63.1209(l)(v) and n(vii). Aragonite will use low volatile metal (LVM) feed rates and emission rates, semi volatile metal (SVM) feed rates and emission rates, and mercury (Hg) feed rates and emission rates determined during testing to extrapolate to higher feed rates and emission rates. This procedure will be the same straight line extrapolation that has been used in all previous CPTs. The Notice of Compliance (Appendix F) shows the extrapolation procedure and results for the 2012 CPT, which set the current feed rate limits.

The feed rate of lead, chromium and mercury in each feed will be measured during each test run and used to calculate an average feed rate for each stream. The feed rates for each stream will be summed along with the metal spiking feed rates to produce a total lead, total and pumpable chromium and total mercury feed rate for each run.

For each metal or metal group (LVM, SVM, Hg) the total run feed rate for that metal or metal group will be placed on the x-axis and the average metal emission rate for that metal will be placed on the y-axis. The average total metal feed rates will have units of pounds per hour. The average metal emission rates will have units of µg/dscm @ 7%O_2 (µg/dscm @ 7%O_2 are the units used in the Subpart EEE emission standards). A horizontal line will be added to each graph that will represent the Subpart EEE emission standard. A line will be drawn through the origin and the plotted and emission rate values. The line will be extended through the horizontal line representing the Subpart EEE emission standard. The metal feed rate on the x-axis that is associated with the intersection of the line and the Subpart EEE emission standard represents the maximum allowable metal feedrate for the incinerator for that metal based upon extrapolation methodology.

5.6 Conditioning Time Needed to Reach Steady State

[40 CFR § 63.1207 (f)(1)(xii)]
There are three conditioning times that will be used during the CPT:

1. Waste feed, metal spike fed as solid, any HCl salt spike if needed and used will be fed to the incinerator for at least one and ½ hours before gas sampling begins. The one and ½ hour period is based upon the residence time calculations made to evaluate the incinerator emergency shutdown procedure that indicate waste residence time is the longest of the time that it takes a lump of waste to travel through the kiln assuming that the lump does not adhere to the side and the time necessary for a lump of waste to reach a temperature where all of the

organic would evaporate. At a kiln rotation speed of 0.25 rpm, the residence time is approximately 42 minutes. During the emergency shutdown procedure the travel time for a lump is increased to 55 minutes by decreasing kiln speed to 0.19 rpm. At the lowest permitted kiln speed of 0.15 rpm this calculation gives a residence time of 70 minutes.

2. Activated carbon will be fed to the crossover duct between the spray dryer and bag house at the CPT feed rate for at least twelve hours prior to the CPT. Carbon needs to be fed well in advance of the CPT in order to have the amount of carbon in the filter cake that is coating the filter bags at steady state.

3. Metals and POHC spikes fed as a liquid will be added to the blend stream for at least 15 minutes before gas sampling begins. Since the liquid pumpable waste and pumpable metals and POHC are entering at the burner, these spikes will be immediately volatilized and travel through the incinerator and emissions control train with the combustion gas stream. The residence time for the gas stream is on the order of 3 minutes.

5.7 Request for 720 Hours Pretesting Operation

40 CFR § 63.1207(h) states that all current OPLs established under 40 CFR § 63.1209 are waived during subsequent CPTs. For the purpose of the waiver, operating time of the CPT will include operations to reach steady-state prior to stack testing and operations during stack testing. In addition, OPLs are waived during pretesting prior to executing the CPT for an aggregate time not to exceed 720 hours of operation (renewable at the discretion of the Administrator) under an approved test plan.

With the approval of this CPT Plan, Aragonite is requesting 720 operating hours of pre-testing operation and CPT testing time potentially outside of current permit limits to adequately prepare for and execute the CPT. It is expected that the pre-testing operating hours will be used in a sequence of campaigns rather than one continuous period.

Aragonite will be performing some pretesting in advance of the CPT in order to evaluate the operation of the scrubbers at lower pH set points. An objective for this CPT is to demonstrate operation of the scrubber system at lower inlet scrubber water pH. It may be necessary to add acid to the inlet water for scrubbers in order to achieve a lower pH during the CPT runs. The acid addition system, if needed, will be tested as part of the 720 hour pre-test. The AWFCO limits for inlet and outlet pH and for scrubber water flow rates will be lowered during these pre-test periods. Some pre-testing will also be performed in advance of the CPT to ensure the APC system can be operated at the extreme minimums or maximums under the test conditions required and targeted during this CPT. These pre-tests will include increasing stack flow rate to

the maximum that can be achieved while running the APC system near minimum conditions (scrubber water flow rate, pH) and at near maximum spray dryer outlet/baghouse inlet temperature of 400 ^{o}F.

Table 5-4 lists the AWFCO limits that will be used during the 720-hour pre-test period and during the CPT. These higher/lower AWFCO limits allow the flexibility needed to demonstrate the target limits can be achieved and to demonstrate the target limits during the test run.

The kiln and ABC temperatures, activated carbon and TMT feed rates, waste feed rates (total and pumpable), the chlorine feed rate AWFCO changes will only occur beginning the day before and during the actual CPT test, including the time to achieve steady state conditions and perform the actual test. The stack flow rate and spray dryer exit temperature (baghouse inlet temperature) will only be changed during the APC system checks that typically occur a few days before the CPT test to demonstrate that the APC can be operated at the test target conditions of maximum/minimum APC operating conditions. The AWFCO limits for pH and water flow rates for the scrubbers will adjusted during the pre-test periods when the lower pH targets and possible need for acid addition to the inlet water for each scrubber are being evaluated. These tests will most likely occur 2-5 weeks before the CPT is performed.

Table 5-4. Target Operating Conditions for the Test and AWFCO Limits

Operating Parameter Limit	UNITS	AVERAGING PERIOD	Subpart EEE Limits based on 2012 CPT	RCRA Permit Limits	Test Target Limits	AWFCO Limits during Pretest and CPT 720 hr period
Kiln Exit Gas Temperature	°F	HRA	>1800	≥ 1800	1,750-1,800	1,700
Afterburner Exit Gas Temperature	°F	HRA	>2020	≥ 2018	1,980-2,020	1,980
Spray Dryer Exit Temperature	°F	HRA	< 393	≤ 400	385-395	400
Activated Carbon Feed Rate	lb/hr	HRA	>25.6	≥ 25	24-26	20
Saturator Flow Rate	gpm	HRA	N/A	≥300	300-350	300
First Stage Scrubber Feed pH	SU	HRA	>5.47	≥5.47	4.5-5.4	4.0
First Stage Scrubber Flow Rate	gpm	HRA	>1882	≥1882	1,850-1,890	1,800
Second Stage Scrubber Feed pH	SU	HRA	>6.36	≥6.23	5.0-6.0	4.0
Second Stage Scrubber outlet pH	SU	HRA	na	≥5.8	4.0-5.2	3.0
Second Stage Scrubber Flow Rate	gpm	HRA	>1996	≥1996	1,950-2,000	1,850
TMT-15 Feed Rate	lb/hr	HRA	>2.47	none	2.4-2.6	2.0
Stack Flow	acfm	HRA	<77,147	≤77,800	77,200-77,800	79,000
Total Waste to Kiln	lb/hr	HRA	<24,198	By port	24,200-24,500	26,000
Pumpable Waste to Kiln	lb/hr	HRA	<6,731	By port	6,740-6,900	8,000
Total Waste to ABC	lb/hr	HRA	<8,678	By port	8,700-9,000	11,000
Total Waste Feed of SVMs (Pb + Cd)	lb/hr	12 Hour RA	<811	≤811	50*	No Change
Total and Pumpable Waste Feed of LVMs (As +Be +Cr)	lb/hr	12 Hour RA	<501	≤501	50*	No Change
Total Mercury Feed Rate	lb/hr	12 Hour RA	<0.76	<0.76	<0.10*	No Change
Total Chlorine Feed Rate	lb/hr	12 Hour RA	<2,319	≤2,319	2,200-2,500	2,700
Carbon Monoxide @7% O_2	ppmv	HRA	100	100	na	No Change
Total Hydrocarbons (THC) @7% O_2	ppmvd	HRA	10	na	na	No Change
Combustion chamber pressure	in w.c.	5 or 10 seconds	(1)	(2)	na	No Change

* Spiking will allow calculation of feed limits corresponding to these limits as described in the extrapolation procedure, section 5.5

(1) Combustion chamber negative pressure is an alternative monitoring approach using kiln seals. See Section 3 of NOC for specifications and Section 4.4 of this plan.

(2) The RCRA permit has a 5 second time delay.

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6.0 ANTICIPATED TEST SCHEDULE

The CPT entails one test condition comprised of three test runs. Aragonite anticipates that the CPT will be performed over a period of approximately three days of testing. The tentative schedule for the CPT is presented in Table 6-1. Note that this schedule is based on the performance of one run per day. Should the situation arise that more than one run can be conducted in a single day; the overall program would be shortened.

As nearly as possible, all gaseous sampling trains will operate simultaneously. The minimum sampling time for the longest train is 180 minutes, but considering port changes, coordination of all sampling activities, and contingency, four to six hours are allowed for each sampling run. An example of the anticipated daily schedule is also presented in Table 6-1.

Every attempt will be made to follow the anticipated schedule, although some delays are inevitable. As a guideline, the latest that a sampling run will be initiated will be 15:00 hours so that it can be assured that the run will be completed by 19:00 hours. This will allow the samples to be collected and recovered and the sampling team to prepare for the next day's test. This guideline will also be used on interrupted testing, such that interrupted trains will be restarted so as to finish by 19:00 hours. This schedule is considered flexible and may be changed or extended depending on the daily activities. As an example if the last run (run 3) on the last day can be completed and the CPT finished, then the ending time guideline could be extended to continuing testing later into the evening (e.g. 21:00 or even 22:00).

The system will be conditioned with solid wastes being fed for one and 1/2 hours before initiating testing. Liquid wastes will be fed for at least 15 minutes before testing is started. If there is a waste feed interruption, the following guidelines will be followed:

- Sampling will be stopped as quickly as possible after the interruption.
- If the interruption is less than five minutes, there will be no line out period, and testing will recommence as soon as possible.
- If the interruption is between five and 20 minutes, there will be a 15-minute line out period, and then sampling will recommence.
- If the interruption is between 20 and 60 minutes, there will be a 30-minute line out period and sampling will recommence.

- If the interruption exceeds 60 minutes, there will be a one-hour line out period.

No test run will proceed without representatives from UDSHW on site unless a written exemption is obtained. Any deviation from the waste feed interruption conditioning guidelines will be approved by the UDSHW onsite representative.

Table 6-1. Anticipated CPT Schedule - General Overview

Activity	Schedule
Mobilization, site safety training and equipment set-up	Day 1
Site setup, preliminary traverses, planning meetings and collection of any field blank trains	Day 1
Conduct Run 1	Day 2
Conduct Run 2	Day 3
Conduct Run 3	Day 4
. Equipment Demobilization, ship samples, depart site	Day 5

Example of Detailed Daily Schedule

Test Activity	Time
Plant executed daily CEM calibration	06:00
Incinerator on test solids wastes and start switch over to test liquid wastes	07:00
Begin organic and metal spiking as applicable	08:15
Initiate all stack and waste feed stream sampling	09:00
Approximate end time for sampling run	12:30
Second run (when appropriate)	13:30 – 17:00
Depart Site	19:00

7.0 CPT REPORT AND NOTIFICATION OF COMPLIANCE

The MACT/RCRA/Air CPT results will be submitted to the following agencies within 90 days after completion of the field test program:

- Utah Department of Environmental Quality, Division of Air Quality (UDAQ); and
- Utah Department of Environmental Quality, Division of Solid and Hazardous Waste (UDSHW).

The report will include summaries of all test results, discussions of any instances where the CPT Plan or any specified methods were not followed, determination that the Quality Assurance (QA) and other test objectives were met or a discussion of the impact of any deviations on the test results, determination of test results, etc.

For purposes of calculating constituent feed rates and feed rate limits (LVM, SVM, mercury, chlorine), a zero value will be used where analytical results are reported as not present at detectable levels. Similarly, for purposes of calculating DRE for POHC (MCB, HCE) and PCB, a zero value will be used for the feed concentration where analytical results are reported as not present at detectable levels or analysis were not performed.

The CPT report will include a detailed discussion of all QA and quality control (QC) activities conducted in support of the CPT. Specifically, the QA/QC section will discuss the conformance (and/or exceptions) with the QAPP and any other QA section requirements of methods used during the testing and analysis. Sections of the final report will include:

- Program summary
- Quality and Quality Assurance Results Program Overview
- Process Operating Conditions
- Sampling and Analytical Methods Description
- Results of Analysis
- Derived Quantities

Appendices will provide facility process data, POHC and metal feed rate data, field data sheets, equipment calibration data, CEM calibration data, and analytical data reports. In addition, example calculations will be provided for "derived" quantities. Also, the laboratories will be requested to provide data in electronic format to facilitate data review by the regulatory agencies.

A notification of compliance as required by 40 CFR §63.9 (h) and 40 CFR §63.1207(j)(1) will be submitted with the CPT report.

APPENDIX A

CLEAN HARBORS ARAGONITE LLC.

CPT PLAN

RCRA DRE WAIVER REQUEST FOR POHCs - MCB AND HCE

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Request for Approval of Testing a Subset of the RCRA Performance Standards (Waiver of DRE Testing using HCE and MCB)

Introduction

The Clean Harbors Aragonite facility (AG) is in the process of developing the test plan for the NESHAPS 40 CFR Part 63 Subpart EEE, NESHAPS for Hazardous Waste Combustors (MACT) Comprehensive Performance Test (CPT) and the RCRA Permit Performance Test. These performance tests will be executed concurrently in October 2017. Per the Subpart EEE regulations, the CPT plan is to be submitted one year in advance of the test. Per the RCRA permit, the test plan must be submitted to the regulatory agencies 6 months in advance of the start for the performance test.

The MACT requirement for the CPT (40 CFR 63.1207(b)(1)) requires testing to demonstrate compliance with the emission standards (dioxin/furan, PM, LVM, SVM, mercury, Cl_2/HCl) and carbon monoxide (CO) and hydrocarbons (THC). Operating parameters limits are established as provided at 63.1209. The test will also include a demonstration of compliance for the continuous monitoring systems (CMS).

Under the MACT regulations, after the first DRE test, additional DRE testing is only required when there is change to the combustion process or a change in related operating parameter limits [63.1206(b)(7)]. Aragonite has performed DRE testing many times over the years. Further Aragonite has not made any changes to the combustion process and does not plan to make changes in the DRE related operating parameters limits. Therefore, DRE testing is not required for the MACT CPT.

The RCRA permit (Module 5 5.G.1) states: "*The permittee shall conduct periodic sampling and analysis of the waste and exhaust emissions to verify that the operating requirements established in the permit achieve the performance standards or a subset of the performance standards.*" The performance standards in the permit include: particulate (PM), hydrochloric acid (HCl) and chlorine (Cl_2) , CO, semivolatile metals (SVM), low volatile metals (LVM), mercury, dioxins and furans (D/F), and DRE (2- POHCs - HCE and MCB). Further, the TSCA PCB Authorization is incorporated into the facility RCRA permit under Module 17 and therefore, PCB DRE is part of the performance standards in the permit.

In accordance with the RCRA permit language, AG is requesting that DRE (2- POHCs - HCE and MCB) be waived for this performance test, in accordance with language allowing for testing a *subset of the performance standards*. All other performance standards will be included in the CPT. All of the RCRA performance standards except PCB overlap with the MACT requirements. PCB is being included to demonstrate performance for the RCRA permit.

Request for Waiver of DRE Testing with HCE and MCB

AG is requesting that the UDSHW waive the DRE performance testing requirement using the two POHCs, HCE and MCB. PCB DRE, which has a higher DRE requirement (99.9999% versus

99.99%), will be performed and will verify that the combustion process is achieving both the RCRA DRE and PCB (TSCA) DRE performance standards. As discussed below, this request for a waiver of part of the RCRA permit DRE testing requirement is based on:

- The historical DRE data from five (5) sets of performance testing data in the past 15 years) demonstrating typical DRE of >99.9999% for HCE and >99.9998% for MCB, which are 80 to more than 100 times lower than the performance standard of 99.99% ,
- The fact that there have been no significant changes to the combustion process that would impact DRE performance,
- The recognition in the MACT regulations that additional DRE testing is only required when there is change to the combustion process or a change in related operating parameter limits is to be demonstrated, and
- The significant costs associated with purchasing large quantities of HCE and MCB to perform the test and costs of emissions testing for these POHCs..

AG has performed DRE testing for HCE, MCB, and PCB five times in the past 15 years (2001, 2003, 2007, 2010, and 2012). Table 1 shows the results of these DRE tests. Four of these tests were Comprehensive Performance Tests and/or Trial Burns conducted at maximum/minimum operating conditions (e.g. maximum waste feed rates, minimum combustion temperatures, maximum exhaust gas flow rate), which established the operating parameter limits related to DRE performance. These DRE tests were performed at the most extreme operating conditions (maximum or minimum), well above or below normal operating conditions. The 2010 RCRA performance test was at normal operating conditions (between the average and the maximum/minimum operating parameter limits). These DRE performance results clearly demonstrate that the AG incineration system significantly exceeds the required 99.99% RCRA and MACT DRE requirement under the operating parameter limits established in the RCRA permit and the MACT Notice of Compliance. These data clearly demonstrate that the AG system has consistently exceeded the DRE performance standards over many years. Therefore, additional DRE testing is not needed during the 2017 performance test. PCB material will be accumulated and PCB DRE will be demonstrated, which will provide sufficient DRE data to verify compliance with the lower RCRA DRE performance standard.

There have been no significant changes to the combustion process (kiln and afterburner) at the facility since the 2012 Comprehensive Performance Test and Trial Burn established the DRE related operating parameter limits. The kiln and SCC equipment is the same, feed systems are basically the same, and overall operating procedures for the combustion process have remained similar over the past several years. Therefore, there is no reason to believe that the DRE performance has changed and no need to perform full DRE testing with the two POHCs in addition to the PCB DRE testing.

The MACT regulations were developed in the 1990's and reviewed all of the pertinent factors that impact DRE and regulated emissions, such as dioxin/furan, chlorine/hydrochloric acid, and metals emissions. The MACT regulations established operating parameter limits related to all of these performance standards and also established testing requirements and frequency of testing. The MACT regulations require comprehensive performance testing every 5 years for all emission standards at the most stringent operating conditions (maximum/minimum), except for

DRE. Confirmatory testing for dioxin and furan while operating under normal operating conditions is required once in between the 5 year Comprehensive Performance Test. DRE testing however is required only one time (40 CFR 63.1206(b)(7)(i)(A-B)), unless a significant change is made to the combustion system or new applicable operating parameter limits are to be established. Given the long detailed development for the MACT regulations, they provide a sound technical basis demonstrating that DRE testing is not required on a frequent basis, but rather only when there is a change to the combustion process or DRE related new operating parameter limits are being established. Therefore, given that there have been no significant changes to the AG combustion process and the large amount of DRE data available, AG believes there is a sound basis for waiving the DRE testing during the 2017 performance test.

Finally, in order to perform the HCE and MCB DRE testing, Aragonite needs approximately 6000 lbs of MCB and 3200 lbs of HCE for the performance test. These chemicals are no longer typically present in waste materials at high enough concentrations and in sufficient volume to meet the feed rate requirements for DRE testing. Therefore, AG must purchase virgin material from chemical suppliers. The cost to purchase these pure chemicals is in the range of $20,000 to $25,000. Further emissions sampling for MCB requires that a Method 30 VOST sampling train be operated during the test and analyses for both MCB by GCMS and HCE by GCMS SIMS be performed. The additional VOST sampling train requires additional staffing during the test. The additional cost for sampling and analysis is in the range of $7,000 to $9,000. Therefore the cost to perform the MCB and HCE DRE performance testing is in the range of $27,000 to $36,000.

Aragonite believes that there is a sound technical basis for the UDSHW to grant a waiver of the DRE testing using HCE and MCB during the 2017 RCRA performance test based on the past performance tests demonstrating excellent DRE performance well above the RCRA DRE performance standard, the fact that there have been no significant changes to the combustion system, and recognition in the MACT regulations that less frequent DRE testing is appropriate for waste combustors. AG is requesting that testing a subset of the performance standards (all performance standards including PCB DRE with exception of MCB and HCE DRE) be approved for the 2017 performance test and that DRE testing be waived for this performance test.

Table 1 Summary of Aragonite DRE Performance Test Results for 2001 through 2012

Year	HCE DRE (%) Ave of 3 Runs	MCB DRE (%) Ave of 3 Runs	PCB DRE (%) Ave of 3 Runs
2012	99.99993	99.99983	99.999999
2010	99.99996	99.99993	99.999999
2007	99.999997	99.99986	99.9999997
2003	>99.9993	>99.9995	>99.999999
2001	>99.999995	>99.99992	>99.999999

DRE Individual Run Results - HCE

Year	Run 1	Run 2	Run 3	Average
2012	99.9993	99.99992	99.99994	99.99993
2010	99.99998	99.99995	99.99996	99.99996
2007	99.999997	99.999998	99.999997	99.999997
2003	>99.9997	>99.9997	>99.9985	>99.9993
2001	>99.999995	>99.999995	>99.999996	>99.999995

DRE Individual Run Results - MCB

Year	Run 1	Run 2	Run 3	Average
2012	99.9998	99.9998	99.9999	99.99983
2010	99.99996	99.99990	99.99993	99.99993
2007	99.99987	99.99986	99.99985	99.99986
2003	>99.9996	>99.9995	>99.9994	>993.9995
2001	>99.99996	>99.999923	>99.99989	>99.99992

DRE Individual Run Results - PCB

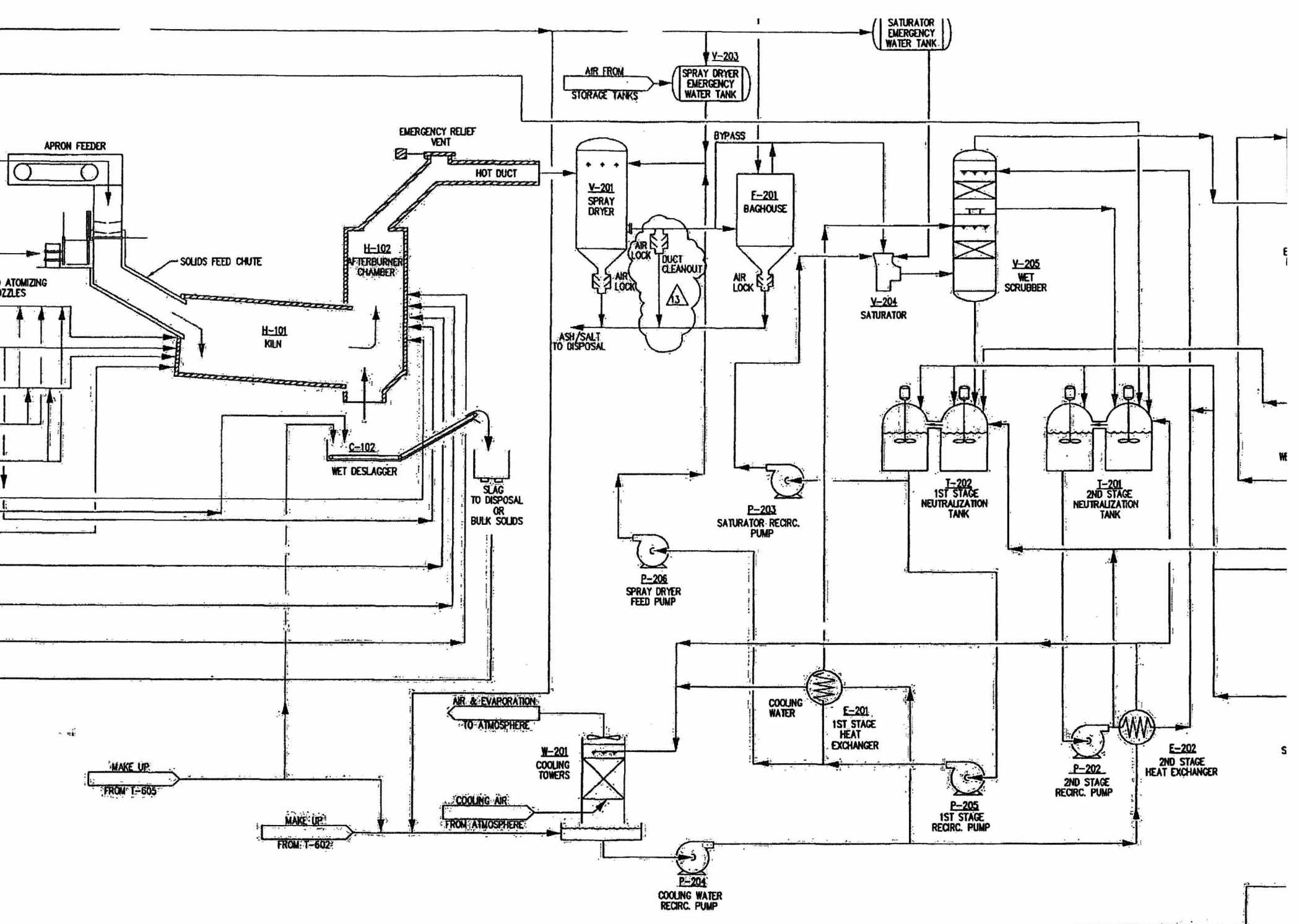
Year	Run 1	Run 2	Run 3	Average
2012	99.999999	99.999999	99.999999	99.999999
2010	99.999998	99.9999994	99.9999994	99.999999
2007	99.9999997	99.9999998	99.9999997	99.9999997
2003	>99.999999	>99.999999	>99.999999	>99.999999
2001	>99.999999	>99.999999	>99.999999	>99.999999

APPENDIX B

PROCESS DRAWINGS

Drawing: D-034-PF-100 rev13 April 16, 2003
WESP Sampling Location for stack testers
Stack Sampling Locations for stack testers

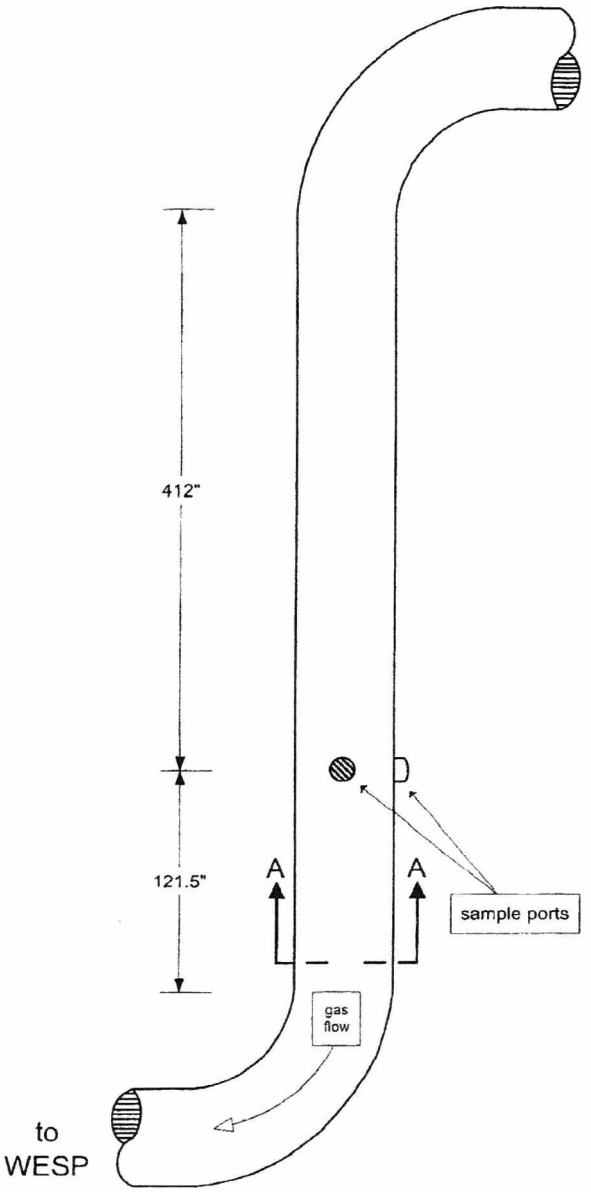
Other Process Drawings in plant files - not reproduced here -
Also available on the State of Utah website under the RCRA Permit for Aragonite

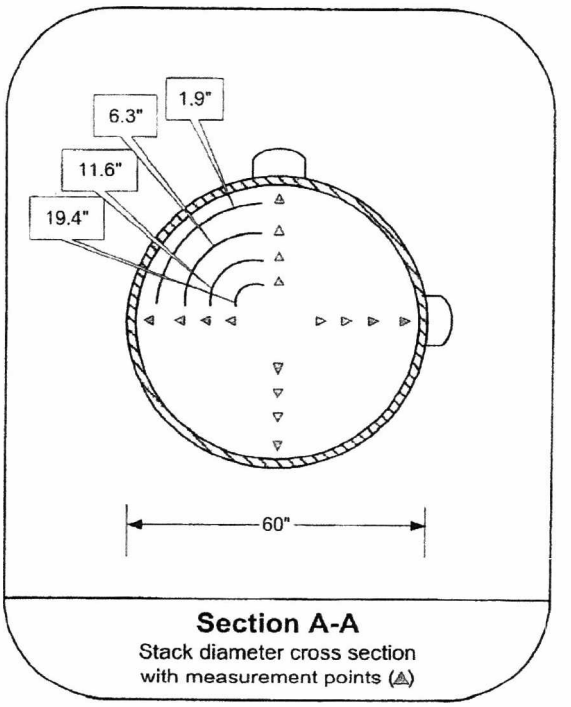


APPROVALS	BY	DATE
DRAWN	DGP	03-12-98
CHECKED		

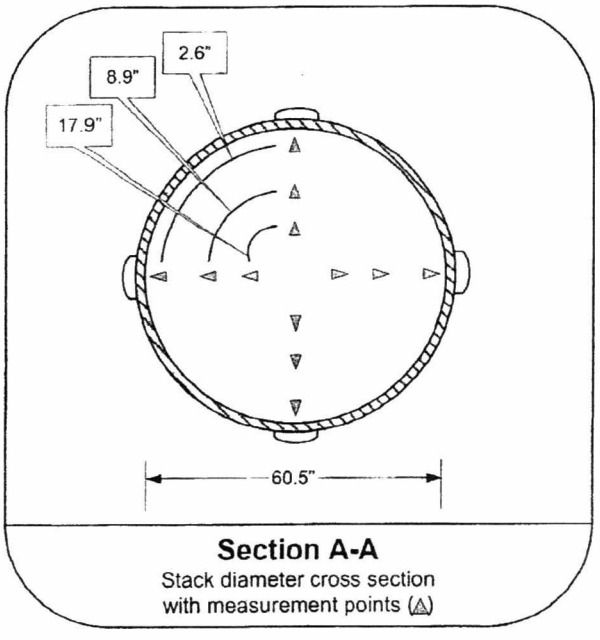
RAWINGS | REVISIONS | REVISIONS

TITLE

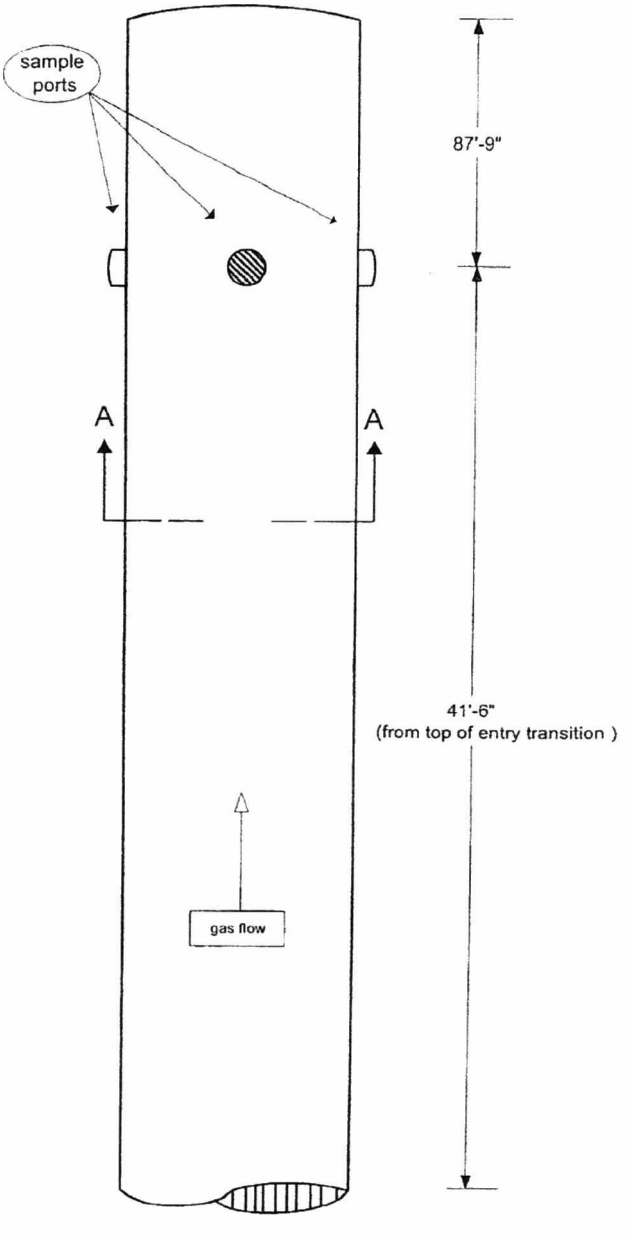




WESP Inlet
sampling location schematic
(not to scale)



Section A-A
Stack diameter cross section
with measurement points (△)



Exhaust Stack
Sampling Location Schematic
(not to scale)

APPENDIX C

CLEAN HARBORS ARAGONITE LLC.

CPT PLAN

CMS-PET PLAN

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CMS PERFORMANCE EVALUATION AND TEST PLAN

Clean Harbors Aragonite, LLC. Incinerator

By

Clean Harbors Aragonite, LLC.

And

Scherger Associates

October 2016

1.0 Introduction

[40 CFR §63.1207 (e) (ii)].

This plan describes the Clean Harbors Aragonite facility Continuous Monitoring System (CMS) quality control program as it relates to air pollution control. The plan is submitted in order to comply with 40 CFR Subpart EEE (MACT) which directs that a CMS Performance evaluation and site specific test plan be submitted one year before the incinerator's Comprehensive Performance Test (CPT) is scheduled and is to be submitted as part of the Comprehensive Performance Test Pan (CPT Plan) . The CMS system discussed in this plan concerns the instruments and associated equipment necessary to comply with Subpart EEE operating parameter limits and emission standards..

The requirements for CMS operation and maintenance are given in 63.8 (c), a description of the CMS quality control program is given in 40 CFR §63.8 (d), and the performance evaluation for CMS discussed in 63.8 (e).

Waste is fed to the Aragonite incinerator by various feed pumps, conveyors, and controls. These deliver waste into the rotary kiln and afterburner along with combustion air. Heat released by the resulting combustion destroys the organic hazardous constituents in the waste. The hot flue gases are cooled and cleaned by flowing through a spray dryer, a baghouse, a saturator, and a two stage packed tower scrubber. An induced draft fan discharges the treated combustion gases.

The term continuous monitor refers to any instrument or mechanical device used to track a parameter (such as pressure, temperature or flow) relevant to a particular unit operation. Subpart EEE uses Continuous Emission Monitor Systems (CEMS), such as THC and O_2 monitors, to measure and track pollutants at the point of emission. This plan includes a separate quality control plan for CEMS. Subpart EEE also uses continuous parameter monitoring systems (CPMS) to assure emission standards are met for pollutants for which CEMS are not available. This plan also includes a quality control plan for these types of instruments.

The CMS includes a Distributed Control System (DCS), which collects data from the instruments and performs various calculations with that data. One of the key calculations and functions performed by the DCS is initiation and monitoring of automatic waste feed cutoffs (AWFCOs). A separate Data Acquisition System stores operating data so that the operating record can be reviewed as needed.

This plan includes a description of the continuous monitoring system, quality control programs for both the CEMS and CPMS instruments, and a CMS performance evaluation plan.

2.0 Description of Aragonite Continuous Monitoring Systems

2.1 Types of Instruments

The types of instruments are discussed below. They are tabulated in Table 1-1 of this plan as well. The instruments fall into two categories – Continuous Emissions Monitors (CEMs) and Continuous Parameter Monitors (CPMs).

2.2 Continuous Emission Monitors (CEM)

Continuous emissions monitors (CEMs) are used to monitor stack emissions continuously. Subpart EEE requires that either Total Hydrocarbon (THC) or carbon monoxide (CO) be monitored. O_2 must also be monitored, to correct the THC or CO measurement to 7 % O_2 on a dry basis. Aragonite monitors both THC and CO and can use either for subpart EEE compliance. The CO CEMs are also maintained to comply with the facility's TSCA Authorization, and SO_2 and NO_x CEMs are maintained to monitor other air pollutants with limits in the Air permit. Carbon dioxide (CO_2) is also monitored. The quality control plan for CEMs is described later in this plan.

2.3 Continuous Parameter Monitors (CPM)

Continuous parameter monitoring systems (CPMs) are used to monitor parameters that assure emission standards are met for pollutants for which CEMs are not available. The selected parameters (e.g. scrubber flow rates, baghouse inlet temperature, carbon feed rates, waste feed rates, etc.) correlate to specific unit operations, whose function is determined to be primary control for the MACT-designated pollutants.

2.3.1 Waste Feed Instruments

Waste feed instruments used for the specific task of monitoring mass flow are one class of CPMS. Their output is also used to ensure compliance with constituent feed limits. The incinerator uses 14 feed monitoring instruments; ten are liquid flow meters, two are weigh scales, and two are loss-in-weight devices.

The liquid flow meters are "Coriolis" meters, which use rotational forces to accurately measure mass flow. The meters' outputs are a direct reading of pounds per minute.

The weigh scales are used to weigh the bulk solids and the containers. Containers are barcoded and weighed on certified scales as they are received or after being generated. The weight is placed into the plant database. The bulk solid scale is located on the flop gates that feed bulk solid to the kiln. This scale weighs increments of the bulk solids just before they are fed to the kiln.

The loss-in-weight devices each use a weigh scale, with electronic output. One of these scales is used to feed large cylinders and the other, smaller laboratory cylinders. Both feed gases to the incinerator.

The waste flow meters' outputs are used directly in tracking mass feed rates to the combustion units. Outputs from those feeds that enter the kiln are summed to monitor that aggregate feed rate. Similarly, the afterburner chamber (ABC) feeds are summed. The outputs are also used in a calculation system to track feed rates of various constituents to the incinerator. Specifically, chlorine and permit-limited metals are tracked. That part of the system utilizes a combination of the flow data, and laboratory analysis inputted separately. This system is discussed more completely in the Feedstream Analysis Plan.

2.3.2 Standard Instruments

A second class of CPMS is the variety of standard instruments that monitor operating parameters on the unit operations in the system gas cleaning train. These include thermocouples (Types K and J); change in pressure (dP) cells for pressure, magnetic flow meters for flow, an annubar for stack flow, and standard pH electrochemical cells. These instruments all deliver data to the ABB 800xA Distributed Control System (DCS) for use in monitoring and controlling the process.

The quality control plan for CPMS is described in Section 4 of this plan.

2.4 The Distributed Control System

The instruments described in this section deliver the instrument output to the plant DCS. This is a computer system that tracks and controls operating parameters. The system updates all the instrument outputs (CMS and others) on a rotating basis, at least once every second. The current data are made available to plant operators at interface screens in the control room. Past data are downloaded to the plant historian (Wonderware). The archived information is available for examination using Wonderware software. Several months of data are kept in the network and ready to view at request. Older data are archived electronically, and can be reloaded to the network when those data are needed.

The DCS tracks many instrument outputs for control. Output from a control instrument is compared to its set point. Deviations from set point are used to manipulate a control valve or motor controller. The controller might act directly on the measured parameter itself or on some associated stream that directly affects the parameter. Control algorithms are programmed within the DCS.

The DCS also uses control outputs to determine when a CMS parameter reaches its limit, and executes an Automatic Waste Feed Cutoff (AWFCO). The DCS will calculate hourly or 12-hour rolling averages for each CMS parameter and shut down waste feeds before any such parameter goes beyond its limit. If an instrument fails by providing either no output or full-scale output, the DCS will also immediately execute an AWFCO.

The DCS functions by use of a broad set of programming customized to the facility and installed in the various hardware components of the system. This programming is itself controlled by a management-of-change procedure that minimizes the potential for random or uncontrolled changes to the program logic.

3.0 CEMS Quality Assurance/Quality Control Program

CEMS sampling devices are situated on the exit stack from the incineration system where exhaust gases enter the atmosphere and continuously measure emissions. The Aragonite incinerator stack discharges treated flue gases at an elevation of 150 feet above grade. Sample ports for the CEMS meet all EPA criteria for upstream and downstream disturbances to ensure that samples extracted from the stack are representative of the combustion gas flow.

Aragonite uses either THC or CO along with O_2 CEMS to comply with Subpart EEE. All instruments are extractive devices with the actual instrumentation located at ground level. The THC CEMS consists of two (2) each of the following components:

- Sample probe inserted into the stack, with a heated filter assembly.
- Electrically heated trunk line incorporating sample tubing and calibration
- Gas delivery tubing, from the stack to the analyzer building.

- Flame ionization THC detector, which draws sample directly from the gas delivery tubing above. This unit is a multi range unit that is operated at 0-100 ppmv range.

- Calibration gas bottles, tubing and controls.

The O_2 CEMS consists of the following equipment:

- Sample probe inserted into the stack, with a heated filter assembly.
- Electrically heated trunk line incorporating sample tubing and calibration gas delivery tubing, from the stack to the analyzer building.
- Sample conditioner including filters and a condenser to drop water out of the sample before it enters the instruments.
- Sample pump, that pulls gas out of the stack, and conveys it to the analyzers.
- Parametric O_2 analyzer with a single range of 0-25% O_2.
- Calibration gas bottles, tubing and controls.

The appendix to Subpart EEE contains Quality Assurance Procedures for CEMS that are required by Subpart EEE. These specify that the THC CEMS comply with Performance Specification 8A and the O_2 CEMS comply with Performance Specification 4B (both are located in 40 CFR §60 Appendix B). The O_2 CEMS is part of a system that also measure CO, CO_2, SO_2 and NO_x to comply with other requirements of the facility's permits.

The analyzers deliver instantaneous data to the DCS, which calculates 60-minute rolling averages, corrected to 7% O_2.and dry basis.

CEMS quality control is performed as required by the Appendix to Subpart EEE. This includes:

> (i) Performance Specification Testing when a new or substantially rebuilt instrument is installed. Performance Specification testing includes an examination of the installation to ensure that the installation meets Performance Specifications, a 7 day drift test, calibration error tests, and response time tests.

(ii) Daily calibration checks that include inspection for leaks and abnormal conditions and zero and calibration drift tests.

(iii) Quarterly cylinder audit tests and an annual relative accuracy test (RATA) for CO, NO_x, SO_2 and O_2.

(iv) Quarterly seven day drift, calibration error tests, and response time tests for THC.

A contractor performs the required annual RATA on all CEMs. The contractor prepares a protocol for the work based upon Performance Specification 4B and completes a formal report when the tests are completed.

The plant's preventative maintenance system schedules the rest of the quality assurance requirements. Each preventative work order includes a specific procedure for each activity. The results of CEMS quality control work orders are recorded on the work order and on standard forms that are filed in the facility's operating record.

4.0 CPMS Quality Control Program

The CPMS instruments incorporated in this plan are listed in Table 1-1. The chart includes a tag number for each instrument, the system parameter measured, the manufacturer used as of the date of this document, model number, and frequency of calibration. From time to time the manufacturer and type of instrument is changed. When this occurs the instrument will be replaced with an equal or better instrument.

The plant's preventative maintenance system schedules calibration at the frequency listed on the table. Each work order includes a specific procedure for each calibration. The results of quality control work orders are recorded on the work order.

Instruments are verified as accurate by the process of calibration, where the physical parameter measured by the instrument is reproduced, verified, and confirmed by the instrument. In some cases, such as high temperature (2000°F), direct *in situ* calibration is not physically possible. In this case the instrument will be audited, to confirm the factory calibration and specification on record is still assignable to the instrument in use. This process will be considered equivalent to calibration in this program.

Aragonite plant operators are certified as Incinerator Operators under a site-specific program. This training and certification program is compliant with MACT requirements. The operators are constantly monitoring all parameters, especially CPMS parameters, for deviations or questionable data points. If any parameter discrepancy is noted and not

readily resolved, the operator will write a maintenance work order and appropriate action will be taken. Many CPMS instruments have an installed spare and the spare will be used to continue operation. If a calibrated CPMS instrument is not available, waste feeds will be shut off until the instrument is repaired. CPMS repairs are documented within the plant's computerized maintenance system, as are annual calibrations and the monthly functionality checks. Spare parts are catalogued and maintained in the plant storeroom. Stock levels are reviewed as part of the quarterly calibration procedure and updated as needed.

5.0 CMS Performance Evaluation Plan

This plan will be executed one to three months before the CPT itself is performed, in keeping with the regulations. It relies upon a combination of activities to determine whether the CMS is operating properly. These include the following:

- Auditing the instrument maintenance and calibration program;
- Calibration of field instruments;
- Auditing the AWFCO test program; and
- Reviewing portions of the programmable logic to verify that AWFCO set points used assure that regulatory limits will be met.

Personnel, who are knowledgeable of Aragonite incinerator operations, the process control systems, and relevant regulatory requirements, will perform these activities.

5.1 Instrument Audit and Calibration

Repair records for the CMS instruments will be reviewed and instruments that have not been recalibrated since repair will be calibrated. Calibration records for the CMS instruments will be reviewed, recalibrated should there be any discrepancy, and calibration records collected for inclusion in the CMS report. Calibration of some instruments requires that the incinerator be off-line. This will be scheduled well in advance to minimize process interruptions. The CPT will not be executed until all CMS instruments are calibrated and the calibrations documented.

5.2 AWFCO System

The functionality of the AWFCO system is checked on a weekly basis. The records from the last four weeks will be reviewed to assess whether there are any recurring problems with the system. Any incidence of problems will be identified and corrected before the CPT.

6.0 Document Update and Maintenance

This document is reviewed annually by a combination of operations and maintenance personnel. The Instrument and Electrical (I&E) Engineering Manager is responsible for control engineering, and therefore for this program. Key efforts of this review are to:

- Verify and update the instrument tag list and Piping and Instrumentation Diagrams.
- Review maintenance records and tabulate dates of annual calibration by instrument.
- Identify any discrepancies in the above checks.
- Review non-scheduled maintenance on the CMS, and identify problem areas where capital and/or engineering focus may have value.

These items are assembled into an annual report that is filed in the incinerator operating record. Other significant changes such as software, instrument replacement or addition, or procedural changes are documented as they occur into the operating record. The plant Management of Change program controls such changes. This plan is updated as part of such changes. Revisions are maintained in the operating record.

The annual report prepared to document the yearly evaluation is maintained as part of the operating record. A report corresponding to the calibrations and audits performed prior to the CPT will be prepared and maintained in the operating record.

Table 1-1: Aragonite CMS Instruments

TAG #	Parameter Measured	Monitor Type	Manufacturer	Model Number	Required Calibration Frequency
CEMS					
AT 2207A	Stack THC –CEM A	Flame Ionization Detector	Thermo Scientific	51i-HT	Daily
AT 2207B	Stack THC –CEM B	Flame Ionization Detector	Thermo Scientific	51i-HT	Daily
AT 2199A	Stack CO - CEM A	Non dispersive Infrared	Servomex	4900	Daily
AT 2199B	Stack CO - CEM B	Non dispersive Infrared	Servomex	4900	Daily
AT2200A	Stack O_2 -- CEM A	Paramagnetic	Servomex	4900	Daily
AT2200B	Stack O_2 -- CEM B	Paramagnetic	Servomex	4900	Daily
CPMS					
Waste Feed Systems					
FT1121	Kiln Blend Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1131	Kiln Fuel Oil Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1151	Kiln Aqueous Flow Rate	Coriolis Mass Flow Meter	Micro Motion	DS1005128SU	Monthly
FT1184	ABC North Blend Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1194	ABC North Fuel Oil Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1221	ABC South Blend Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1231	ABC South Fuel Oil Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1253	ABC North Aqueous Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1263	ABC South Aqueous Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT3018	Drum Direct Burn Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT4042	Sludge Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 63 I	Monthly
FT3366	Corrosive Waste system	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
WT1035	Flop Gates Weigh Cells	Load Links	Mettler Toledo	JAGXTREME	Quarterly
WT1102A	Cylinder Weight	Load Cells	Rice Lake	HP33-1K	Monthly
WT1102B	Small Cylinder Weight	Load Cells	Rice Lake	BM1818-300	Monthly
N/A	E-1 Drum Scale	Load Cell	Avery Weigh Tronix	1310	Annual
N/A	E-5 Drum Scale	Load Cell	Avery Weigh Tronix	1310	Annual
N/A	E-2 Drum Scale	Load Cell	Fairbanks	IND-HR2300-1	Annual
N/A	E-4 Drum Scale	Load Cell	Rice Lake	IQT355-2A	Annual
FT1171	Direct Burn Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 63 I	Monthly

TAG #	Parameter Measured	Monitor Type	Manufacturer	Model Number	Required Calibration Frequency
Standard Instruments					
AT2104A	1st Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P	Quarterly
AT2104B	1st Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P	Quarterly
AT2129A	2nd Stage Rundown pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P	Quarterly
AT2129B	2nd Stage Rundown pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P	Quarterly
AT2130A	2nd Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P	Quarterly
AT2130B	2nd Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P	Quarterly
AT2020A/ B	Baghouse Broken Bag Detectors	Optical Particle Counter	BHA	CPM-750	Annual
WT2037 A/B	Activated Carbon Feed Rate	Load Cells	Thermo Ramsey	Micro-Tech 2000	Quarterly
FT2066A	Carbon Injection Train 1 Air Flow Rate	Orifice Plate / dP Cell	Viatran	IDP10	annual
FT2066B	Carbon Injection Train 1 Air Flow Rate	Orifice Plate / dP Cell	Viatran	IDP10	annual
FT2092A	1st Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P2H	Quarterly
FT2092B	1st Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P2H	Quarterly
FT2095A	2nd Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P2H	Quarterly
FT2095B	2nd Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P2H	Quarterly
FT2107	TMT Flow rate	Diaphragm metering pump	Tacmina	FC-1	Annual
FT2195	Stack Flow Rate	Annubar (Δp Converted to Flow Rate)	Rosemount	3051	Annual
TT2194	Stack Temperature	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
FT2081A/ B	Saturator Flow Rate	Magnetic flow converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P2H	Annual
TT2082A/ B/C	Saturator Temp	Temp transmitter Type J thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
PIT1006A	Combustion Pressure	Pressure Switch	Rosemount	1151DP3	Annual
PIT1006B	Combustion Pressure	Pressure Switch	Rosemount	1151DP3	Annual
PIT1006C	Combustion Pressure	Pressure Switch	Rosemount	1151DP3	Annual
PT2044	Spray dryer top nozzle pressure	Pressure Transmitter	Rosemount	114G1200	Annual
PT2045	Spray dryer bottom nozzle pressure	Pressure Transmitter	Rosemount	114G1200	Annual

TAG #	Parameter Measured	Monitor Type	Manufacturer	Model Number	Required Calibration Frequency
TT2001A/ B/C	Spray Dryer Temp	Temp Transmitter/ Type J thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
PIT2020A	Baghouse Inlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2020B	Baghouse Outlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2093A	Scrubber Inlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2093B	Scrubber Outlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2093C	Scrubber Middle Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PT1018	Kiln Combustion Air Pressure	Pressure Switch	Rosemount	1151DP3	Annual
ST1003	Kiln speed	speed	Electro Sensor	SA420	Annual
TT1005A	Kiln Temperature	Infrared Pyrometer	E^2 Technology Corp.	Pulsar III M7000SR	Annual
TT1005B	Kiln Temperature	Infrared Pyrometer	E^2 Technology Corp.	Pulsar III M7000SR	Annual
TT1005C	Kiln Temperature	Infrared Pyrometer	E^2 Technology Corp.	Pulsar III M7000SR	Annual
TT1009A	ABC Temperature	Temp Transmitter/ Type K Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT1009B	ABC Temperature	Temp Transmitter/Type K Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT1009C	ABC Temperature	Temp Transmitter/Type K Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT2001A	Spray Dryer Temp	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT2001B	Spray Dryer Temp	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT2001C	Spray Dryer Temp	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
PSL1119A	Kiln Blend Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	44V1-K5-N1-C1A or 4NX-KS-MI-CIA	Annual
PDSL1124	Kiln Atomizing Air / Blend Δp Switch	Pressure Switch	Ashcroft	LDDN4GGB25	Annual
PSL1156	Kiln Aqueous Atomizing Air Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1157	Kiln Aqueous Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	44NN-K4-N4-C1A or 4NX-KS-MI-CIA	Annual
PSL1119B	North ABC Blend Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	44V1-K5-N1-C1A or 4NX-KS-MI-CIA	Annual
PDSL1187	North ABC Atomizing Air / blend Δp switch	Pressure Switch	Ashcroft	LDDN4GGB25	Annual
PSL1196	South ABC Blend Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	44V1-K5-N1-C1A or 4NX-KS-MI-CIA	Annual

TAG #	Parameter Measured	Monitor Type	Manufacturer	Model Number	Required Calibration Frequency
PDSL1224	South ABC Atomizing Air / Blend Δp Switch	Pressure Switch	Ashcroft	LDDN4GGB25	Annual
PSL1162	Direct Burn Atomizing Air Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1165B	North ABC Aqueous Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1256	North ABC Aqueous Atomizing Air Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1165C	South ABC Aqueous Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1266	South ABC Aqueous Atomizing Air Switch	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1107	Cylinder Eductor N2 Pressure	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual
PSL1206	Glove Box Eductor N2 Pressure	Pressure Switch	SOR Static O'Ring Control Devices or REO Temp	6NN-K5-N4-F1A-RR or 4NX-KS-MI-CIA	Annual

Quality Assurance Project Plan Appendix D to CPT Plan

Clean Harbors Aragonite, LLC

Hazardous Waste Incinerator

Aragonite, Utah

Proposed Test Date: Week of October 9, 2017

Test Plan prepared for:

Clean Harbors Aragonite, LLC

Test Plan prepared by:

Air Pollution Testing, Inc.
5530 Marshall Street
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and

Waste Pro Engineering
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October 2016
Revision 0.0

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1. CPT PROGRAM QUALITY ASSURANCE/QUALITY CONTROL

This document presents the Quality Assurance and Quality Control goals, objectives, and procedures for the Aragonite 2017 Comprehensive Performance Test (CPT) program. The Aragonite incinerator is regulated under the United States Environmental Protection Agency's (EPA) final hazardous waste combustor (HWC) Maximum Achievable Control Technology (MACT) standard (40CFR Part 63 Subpart EEE). The facility is a permitted RCRA facility operating under a State of Utah RCRA permit. The facility also operates under Clean Air Act (CAA) Permit Number 4500048002. The unit is authorized under the Toxic Substances Control Act (TSCA) to burn polychlorinated biphenyl (PCB) wastes. The TSCA authorization is incorporated into the RCRA permit as described in Attachment 17 to the RCRA permit.

Aragonite will conduct the CPT to demonstrate compliance with MACT emission standards for existing hazardous waste incinerators [40CFR 63.1219). During the CPT, emissions testing will also be conducted to measure parameters specified in the facility RCRA and Air Permits.

The quality assurance/quality control procedures and criteria for this program will comply with the requirements of this document and its updates. The analytical work conducted will incorporate the QA/QC requirements of the approved methods. This document has been prepared using available guidance provided in the following EPA documents:

- "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5, November 1999.
- "Component 2 - How to Review a Quality Assurance Project Plan (including Attachment A - Generic Trial Burn QAPP", Hazardous Waste Combustion Unit Permitting Manual, U.S. EPA Region 6, January 1998.
- "Handbook – Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration" (EPA/625/6-89/023 January 1990).
- Specific Quality Control requirements are in accordance with specified USEPA and ASTM methods and the laboratories Standard Operating Procedures and methods performance data.

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Quality Assurance Project Plan for Clean Harbors' Comprehensive Performance Test and RCRA Performance Test Program

Facility ID Number: UTD 981 552 177

Prepared for: Clean Harbors Aragonite, L.L.C.

Prepared by: Air Pollution Testing, Arvada, CO 80002; and

Waste Pro Engineering, Kennett Square, PA 19348

Scherger Associates, Ann Arbor, MI 48105

Revision No.: 0.0 **Date:** October, 2016

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1.1. Title Page

1.1 Project Title

Clean Harbors Aragonite 2017 Comprehensive Performance Test (CPT)

1.2 Expected CPT Test Date

October 10-13, 2017

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1.3 Project Approvals

Tyler Lee Clean Harbors CPT Manager	Date
Carl Richard Ullrich CPT Coordinator	Date
Dane Murphy APT Project Manager	Date
Paul Ottenstein APT Technical Director	Date
Kevin Woodcock TestAmerica Knoxville Laboratory Coordinator	Date
David Lunt Aragonite Laboratory Manager	Date

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TABLE OFCONTENTS

APPENDICES

A Process Description
B Field Data Sheets
C Sample Train Setup
D SVOC/Dioxin/PCB Analytical Schematic

TABLES

FIGURES

Appendix A – Process Description
Appendix B - Typcial Field Data Sheets
Appendix C - Diagrams for the various sampling trains
Appendix D – Dioxin/SVOC/PCB Extract Preparation Flow Chart

2. PROJECT DESCRIPTION PURPOSE AND OBJECTIVE

This Comprehensive Performance Test (CPT) program (40 CFR Part 63 Subpart EEE (HWC MACT) is designed to demonstrate compliance with the HWC MACT final standards for existing incinerators (40 CFR 63.1219), while operating the incineration train at maximum feed rates, maximum stack flow rate, minimum temperature, and while operating the gas cleaning equipment at maximum/minimum operating limits. In addition, to demonstrating compliance with the MACT standards, the CPT includes testing to demonstrate compliance with the emission limits in the facility Air Permit and RCRA permit.

The stack testing objectives are to demonstrate compliance with the following emission limits:

- Dioxins/furans (DF) emissions < 0.4 ng TEQ/dscm (baghouse inlet Temp ≤400 °F) (MACT, RCRA and Air Permit
- Carbon monoxide (CO) emissions < 100 ppmv, hourly rolling average (MACT, RCRA and Air Permit
- Carbon monoxide (CO) emissions < 500 ppmv, one minute average (RCRA Permit)
- Total Hydrocarbon (THC) emissions < 10 ppmv, hourly rolling average (MACT, Air Permit)
- Particulate matter (PM) emissions ≤ 28 mg/dscm (≤ 0.013 grains/dscf) (MACT, RCRA and Air Permit
- Mercury emissions (Hg) ≤ 3200 grams/24hrs (Air Permit) and ≤ 130 ug/dscm (MACT, RCRA and Air Permit referenced to MACT)
- Semi-volatile metals (SVM) (cadmium and lead) emissions ≤ 230 ug/dscm (MACT, RCRA and Air Permit)
- Low volatile metals (LVM) (arsenic, beryllium, chromium) emissions ≤ 92 ug/dscm (MACT, RCRA and Air Permit)
- Hydrogen chloride (HCl) + chlorine (Cl_2) emissions ≤32 ppmdv (MACT, RCRA, Air Permit Air)
- Chlorine (Cl_2) ≤ 8.5 ppmdv (Air Permit)
- Oxide of Nitrogen (NO_x) ≤ 44.18 lbs/hr average over 24hrs (Air Permit)
- Oxides of Sulfur (SO_x) ≤ 91 ppmdv (Air Permit)
- Nickel (Ni) <5090 ug/dscm (Air Permit)
- Beryllium (Be) ≤ 9.18 grams/24hrs (Air Permit)
- DRE 99.99% ((MACT, RCRA, Air Permit)
- Total PCB DRE 99.9999% (RCRA/TSCA Permit)

All concentrations measured will be reported on a dry basis and corrected to 7% oxygen in keeping with the standard. CO and hydrocarbon (THC) will be continuously monitored. The incineration system will be operated at extremes of the operating parameters while these tests are underway. This will demonstrate compliance even while the system is at those extremes,

2.1 Overview of the CPT Approach

2.1.1 CPT Test Runs

The comprehensive performance test will be performed as one set of three test runs demonstrating the normal operation of the incinerator. Aragonite previously demonstrated operating limits under two mode of operation, the normal mode with the baghouse inlet temperature $\leq$400 ^{o}F and an alternate mode with the baghouse inlet temperature > 400 ^{o}F. Aragonite does not plan to use the alternate mode in the future and therefore is not re-demonstrating performance for the alternate mode. The test will be performed using EPA and ASTM approved methods in accordance with the MACT regulations.

The three test runs will be performed with the incinerator operating in normal mode with all MACT emission parameters being tested (dioxin/furan, PM, HCl/Cl_2, LVM, SVM, Hg, CO, THC) except for DRE (see Section 2.1.4 for DRE waiver discussion). During these test runs, operating conditions, as described in Section 4 of the CPT Plan, will represent the extremes of operation for all feed systems and constituents that generate emissions. The conditions will also represent minimum or maximum operating criteria for the emission control equipment. The results, therefore, will define an operating envelope to ensure the incinerator meets the MACT, RCRA and Air Permit emissions standards during normal operating mode.

Both total hydrocarbon (THC) and carbon monoxide (CO) will be monitored during all test runs. Aragonite normally uses THC as the emission standard and as the CEM-based AWFCO. CO CEMs are also operated by the facility and can be selected for MACT compliance [40 CFR 63.1219 (a)(5)(i) and (a)(5)(ii)].

2.1.2 Waste Feed Rates

The total waste feeds (pounds per hour) and total pumpable waste feed (pounds per hour) to the unit will be maximized during the all test runs. Total waste feed of specific constituents, namely the MACT metals (LVM, SVM, mercury) will be spiked as needed to establish maximum limits. It is expected that sufficient high chlorine waste will be available to achieve high chlorine feed rates, but if for any reason high chlorine waste is not available at the time of the test, additional chlorine, as needed, will be spiked to the system. If DRE is not waived or it is decided to perform DRE testing, it will be demonstrated by the inclusion of two Principal Organic Hazardous Constituents (POHC) in the feeds, and burning waste with PCB to verify the organic destruction capability of the system at the extreme operating conditions. The POHCs will be monochlorobenzene (MCB), hexachloroethane (HCE), and PCB. These POHCs have been used in all previous CPT and RCRA trial burn tests, as required by the RCRA permit.

2.1.3 Operating Limits

The operating parameters are discussed in Section 4 of the CPT Plan and which are the automatic waste feed cutoff (AWFCO) parameters established under the previous CPT and by the Notice of Compliance (NOC), will be documented during the test in sufficient detail to create specific operating

limits that ensure compliance with the MACT standards. The current operating parameters limits for the normal operating mode are tabulated in the CPT Plan in Section 4.

2.1.4 RCRA DRE Waiver

Aragonite has requested that DRE testing using the POHCs MCB and HCE be waived for this performance test and that PCB be used as the primary and only DRE performance test. This waiver request is based on the fact that the previous five performance tests have all demonstrated that DRE performance is at least 80 to 100 times better than the required 99.99% DRE based on MCB and HCE testing. Further, PCB DRE performance requires that a DRE of 99.9999% be demonstrated for PCB and thus PCB DRE data will provide data for assessing the system DRE performance. Finally, on-going DRE performance testing is not required under the MACT rules. and is a provision in the RCRA permit that can be waived by the State of Utah. This QAPP is written to include MCB and HCE spiking and analysis of air emissions to assess DRE using those POHCs. However, if the State of Utah approves the waiver request, sampling and analysis for MCB and HCE will not be required and those samples (air and waste feed) will not be collected and analyzed during the test. All members of the CPT team and sub contactors will be notified before the start of the test, if the waiver has been approved.

The reader is referred to the CPT Plan for further details on program scope, test objectives and target parameters for emission measurements and process monitoring. The remainder of this Attachment outlines the detailed measures that will be followed to ensure collection of valid data. A summary of the laboratories performing sample analyses during the program is provided in Table 1. A more detailed summary of the sampling and analytical program is provided later in Section 6.

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3. PROJECT ORGANIZATION

This CPT will be coordinated by Waste Pro Engineering (WPE) under the direction of Aragonite personnel. WPE will be responsible for the test implementation and will oversee the incinerator operations and the stack sampling activities during the test program. Air Pollution Testing (APT) will perform the stack sampling for the test program. APT will be responsible for all emissions samples collected during the test program and for producing the final report. Aragonite personnel under the direction of WPE will collect all process waste feed samples. Aragonite will operate spiking systems for the POHC and metals during the CPT under the direction of WPE. The emissions will be sent to TestAmerica Laboratories, Inc. (TestAmerica) in Sacramento and Knoxville for analysis. Process samples will analyzed by the Aragonite laboratory with possible assistance from the Clean Harbors Kimball laboratory or from TestAmerica Denver for analyses of HCE and MCB in waste feed samples, if needed.

Aragonite and their contractors will have specific duties in the implementation of the CPT project. The project team duties are summarized below. This QAPP has been reviewed by all key personnel on the CPT project team.

Aragonite, through the CPT Manager, Larry Cruse will:

- Report all feed rates and incineration system process parameters;
- Procure and prepare waste feeds;
- Operate the incineration system; and
- Collect waste samples.

WPE Project Coordinator Rick Ullrich will:

- Serve as liaison with regulatory agencies and the CPT team;
- Provide oversight for the project and onsite coordination during the test;
- Be responsible for reviewing all test data;
- Ensure that all deviations from the CPT Plan and QAPP are adequately addressed in the appropriate sections of the CPT report; and
- Prepare waste feed information and rates and measured OPLs for the final report.

APT, through the Stack Testing Director, Paul Ottenstein, and Project Manager, Justin Nylen and with the APT field team, will:

- Perform stack gas sampling;
- Implement the QA program for the emissions testing and sample analysis;
- Provide custody of all samples generated by the test efforts;
- Transport or ship the samples to the laboratories for analysis;

- Review QC and stack sampling data to confirm the data meets the requirements of the CPT Plan and QAPP. If there is any invalid or unusable data, these data will be identified in the CPT report, as presented in the laboratory case narratives and field sampling reports; and
- Prepare the stack and process sampling report and supporting documentation.

The subcontracted laboratories through Kevin Woodcock, Project Manager, for Test America Knoxville and David Lunt, Laboratory Manager, for Aragonite laboratory will:

- Review this QAPP and sign signature pages, agreeing to adhere to all methods as specified in the QAPP;
- Perform sample analyses;
- Perform method and QAPP specified QA/QC;
- Review QC and analytical data to determine if additional samples or repeat analyses are needed. If there is any invalid or unusable data, these data will be identified in the laboratory reports and case narratives;
- Provide a detailed case narrative; and
- Generate an analytical data report in the specified format with all supporting raw data.

3.1 CPT Manager

Tyler Lee will serve as the Clean Harbors Aragonite CPT Manager. Mr. Lee will be responsible for directing Clean Harbors personnel in the operations of the incineration system during the testing. He will also ensure that all necessary unit operating data are collected during the test.

3.2 CPT Project Coordinator

Carl "Rick" Ullrich, P.E. of WPE will provide coordination and oversight during the test program. Mr. Ullrich will ensure that all test team members communicate throughout the test program and that the objectives of the CPT plans are met (*i.e.,* test operating conditions, spiking rates, field sampling objectives). As the Project Coordinator, he will review the CPT report and CPT data, and ensure that all deviations are adequately addressed in the appropriate sections of the CPT report. It is expected that coordinator will be on site during execution of the CPT.

3.3 Stack Testing Director

The APT Technical Director, Mr. Paul Ottenstein, will be responsible for the overall direction of the program and will report to the CHA CPT Manager, Mr. Larry Cruse and the CPT Project Coordinator. Mr. Ottenstein will be responsible for project design and implementation, communicating with the client, scheduling all air sampling related activities, reviewing all project data and preparing all reports. He will be assisted in the oversight of Quality Assurance activities by the APT Project Manager and each Analytical Laboratory Services Coordinator (LSC). Each contract laboratory will have one individual designated as the person responsible for project activities.

3.4 APT Project Manager

Mr. Dane Murphy will serve as the APT Project Manager and will be responsible for review and approval of the Quality Assurance Project Plan presented in this section, as well as any subsequent revisions. He will monitor implementation of field and laboratory activities, scheduling performance and/or system audits as warranted. The Project Manager will report to the CPT Project Manager and CPT Coordinator on any conditions noted which may adversely affect data quality.

Mr. Murphy will provide independent oversight for data verification and data quality assessment activities. He will prepare a section for the Final Report summarizing QA/QC activities and provide an overall evaluation of data quality.

3.5 Field Team

The field team will be made up of Clean Harbors and APT personnel. Aragonite operators and staff will be responsible for collecting all process samples. The stack sampling field team will collect all of the stack gas samples and will ship or deliver the air emissions samples to the laboratory.

3.7 Subcontracted Laboratories

TestAmerica of Sacramento California and of Knoxville, Tennessee will be subcontractor laboratories for all air sample analyses. The points of contact for the laboratories are:

- Robert Weidenfeld Project Manager for TestAmerica Sacramento; and
- Kevin Woodcock Project Manager for TestAmerica Knoxville

The Aragonite facility laboratory will perform the waste analysis for all parameters except for the two POHCs, hexachloroethane and monochlorobenzene. Waste liquid samples or other process samples requiring these analyses will be subcontracted to either the Clean Harbors Kimball facility laboratory or TestAmerica Denver. The points of contact for these laboratories are:

- David Lunt, Laboratory Manager for Aragonite facility laboratory
- To be identified if needed or used for Aragonite Kimball
- To be identified if needed or used for TestAmercia Denver

Each of these laboratories is well experienced in conducting analyses per the methods described in this QAPP. Prior to test execution, each laboratory representative is required to review the QAPP to understand their project responsibilities. Each laboratory representative has signed (or will sign) the appropriate QAPP signature page. The laboratory representative will be responsible for ensuring that the laboratory follows all analytical methods specified in the QAPP, for ensuring that a detailed case narrative is prepared that addresses all analytical deviations, and for ensuring that the laboratory report is provided in an appropriate format. Each laboratory representative will review QC and analytical data and determine if additional samples or repeat analyses are needed. If there is any invalid or unusable data, these data will be identified in the laboratory reports and case narratives.

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4. QA/QC PROGRAM OBJECTIVES

4.1 Precision, Accuracy and Completeness

The collection of data to fully characterize the incinerator waste feed materials and stack gas emissions requires that sampling and analysis procedures be conducted with properly operated and calibrated equipment by trained personnel. QA objectives specific to each analytical methodology performed by the subcontractor laboratories are presented later in Section 9. The overall program has been designed with consideration of sampling parameters and analytical limits to ensure that the achieved MDLs for emissions will be more than adequate for regulatory limit decisions.

Precision is defined as a measurement of mutual agreement among individual measurements made under prescribed similar conditions. Precision is expressed in terms of relative percent difference (RPD) between duplicate determinations (less than 4) and in terms of relative standard deviation (RSD) when 4 or more determinations are made. Overall precision for analysis of the waste feed streams will be assessed through the analysis of one set of duplicate samples for each designated parameter.

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Analytical accuracy will be measured through the recoveries of surrogate spikes, matrix spikes, analysis of standard reference materials or audit sample analysis. Surrogates are compounds added to samples submitted for organic analyses prior to extraction and analysis; their recoveries are measured to assess sample-specific analytical efficiency and accuracy. Matrix spike samples for the waste feed will be prepared by spiking known amounts of target analytes into a portion of the sample. Matrix spike samples for the stack organic analyses will be prepared by spiking known amounts of target analytes into the sampling media and then carrying the spiked sample through the entire preparation and analysis sequence. Recoveries are monitored to assess laboratory and method accuracy. Laboratory control samples (LCS) will also be used to distinguish between method performance and matrix effects on accuracy. LCS and MS spiking solutions will be independent from calibration standards.

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected under normal conditions. The overall program objective is to obtain valid data for three (3) runs for each test condition. For all data considered critical to the investigation, a completeness objective of 100% has been established. As a result, critical priority data from each of three (3) runs should achieve the precision and accuracy goals established herein. This completeness criterion applies to all permit parameters in emissions samples as well as feed stream samples. Individual samples for which the critical data points do not achieve accuracy and/or precision data quality objectives may require reanalysis. Results for samples where matrix interferences preclude meeting objectives for the recoveries of surrogates or spikes will be evaluated for potential bias to calculated emission results. In summary, the completeness goals are stated at 100%, since three valid runs are necessary to assess operation at any one condition.

The possibility always exists that a sample(s) may be lost or broken and that the data from each individual analytical parameter may not be 100% complete for all test runs. Field blanks, reagent blanks, and archive samples have been incorporated into the sampling and analysis design in an effort to ensure complete test data and the means to assess overall data quality. The impact(s) of any occurrence of sample loss or failure to meet data quality objectives (DQOs) will be assessed with regard to the specific test objective and/or overall objective of obtaining valid results, and will be discussed in the final report. The completeness objective of this test program is to generate sufficient data for the regulatory agency to judge the performance of the incineration system.

4.2 Representativeness and Comparability

It is recognized that the usefulness of the data is also contingent upon meeting the criteria for representativeness and comparability. Wherever possible, reference methods and standard sampling procedures will be used. The QA objective is that all measurements be representative of the matrix and operation being evaluated. The detailed requirements for sampling given in the various EPA Reference Methods will be followed to ensure representative sampling of flue gases. The frequent grab sampling of incinerator feed during each test run will provide representative samples of these matrices.

The corresponding QA objective is that all data resulting from sampling and analysis be comparable with other representative measurements made by the CPT test team, on this or a similar process operating under similar conditions. The use of published sampling and analytical methods and standard reporting units will aid in ensuring the comparability of the data.

5. SAMPLING AND MONITORING PROCEDURES

This section describes the procedures that will be followed during the field sampling program. Throughout the overall program, all sampling will be performed using sampling protocols described herein and approved by EPA. Regulatory agency approval will be obtained for any deviations from or changes to the approved CPT Plan and QAPP, which may be warranted prior to program implementation as a result of changes in personnel or facility circumstances. If situations occur during the testing which necessitate deviations from the plan, the agency will be notified and onsite approval requested. Any deviations from the specified protocols will be fully documented in the final CPT Report.

5.1 Field Program Description

The program is configured to collect samples during three runs under one (1) process operating condition. Tables 2 through 4 provide detailed listings of the sampling and analytical parameters and methods planned for this program.

5.2 Pre-sampling Activities

Pre-sampling activities include equipment calibration, sample media preparation, cleaning of sample train glassware, preparation of computer-generated sample labels, and other miscellaneous tasks. Each of these activities are described or referenced in the following subsections. Other pre-sampling activities include such details as team meetings, equipment packing and shipment, equipment setup, and finalization of all details leading up to the coordinated initiation of the sampling program.

5.2.1 Equipment Calibration

A most important aspect of pre-sampling preparations is the inspection and calibration of all equipment planned to be used for the field effort. Equipment is inspected for proper operation and durability prior to calibration. Calibration of equipment is conducted in accordance with the procedures outlined in the EPA document entitled "Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III—Stationary Source Specific Methods" (EPA-600/4-77-027b). Equipment calibration is performed in accordance with EPA guidelines and/or manufacturer's recommendations. Documentation of all calibration records will be kept in the project file during the field program and will be available for inspection by test observers. Examples of field equipment used and typical calibration requirements follows:

- Probe nozzles - make three measurements of the nozzle ID (to the nearest 0.001 in.) using different diameters with a micrometer. Difference between the high and low values should not exceed 0.004 in. Post-test check - inspect for damage.

- Pitot tubes - measured for appropriate spacing and dimensions or calibrate in a wind tunnel. Rejection criteria given on the calibration sheet. Post-test check - inspect for damage.

- Thermocouples - verify against an electronic calibrator (which is annually certified) at three points (approximately ambient, approximately 250°F, anticipated stack temperature). Acceptance limits - impinger ±2°F; DGM ±5.4°F; stack ±1.5 percent of stack temperature.
- Dry gas meters - calibrate against a reference meter. Acceptance criteria - pretest Yi = Y ± 2%; post test Y = ± 5% Yi.
- Field barometer - compare against a mercury-in-glass barometer or use Airport Station BP and correct for elevation. Acceptance criteria - ± 0.1 in. Hg; post-test check - same.

5.2.2 Glassware Preparation

Sample train glassware and sample containers require specialized pre-cleaning to avoid contamination of the sample from the collection container or devices. Cleaning/storage procedures for sample train glassware are summarized below. Note that all bottle caps are fitted with Teflon liners which are cleaned in the same manner as the bottles themselves. Sample containers used for waste feed streams are purchased pre-cleaned and sealed to specified EPA protocols.

- EPA Method 0023A / 0010 glassware and containers (PCDDs/PCDFs, PCBs and other semivolatile organics) - wash with soap and water, followed by rinses with acetone, toluene, hexane, and DCM, and then air dried with nitrogen. Open ends will be sealed prior to shipment to the field with clean aluminum foil.
- EPA Method 29 glassware and containers (metals) – wash with soap and water, rinse with hot tap water, rinse three times with reagent water. The glassware is next soaked in a 10% nitric acid solution for a minimum of 4-hours, rinsed three times with reagent water, rinsed a final time with acetone and air dried. All glassware openings where contamination can occur will be covered until the sampling train is assembled prior to sampling.
- EPA Method 26A glassware and components (particulate matter and HCl/Cl_2) - wash with soap and water, rinse three times with deionized (DI) water and air dry. Open ends will be sealed prior to shipment to the field with paraffin.
- EPA Method 0030 glassware and containers (volatile organics) - wash with detergent (Alconox) and hot water, rinse three times with HPLC grade water and oven dry at 110°C for 2 hours. Open ends will be sealed prior to shipment to the field with clean aluminum foil.

5.2.3 Sample Media Preparation

All reagents will be checked in accordance with APT's existing QC Program to minimize the probability of using contaminated solvents. This includes the use of the proper grade reagents/solvents as specified in the test method, selection of reagents from the same lot and the collection and analysis of the appropriate blanks. Sampling media will be procured and prepared in accordance with the appropriate test methods as described below:

- Tenax and Tenax/charcoal sorbent traps will be conditioned in accordance with protocols outlined in Methods 0030 and/or 5041A.
- XAD resin is purchased new and packed in specially designed sorbent traps. All glass cleaning and sorbent packing procedures will follow the protocols specified in EPA Methods 0023A and/or 0010.
- Quartz filters used in the Methods 5 / 26A sampling train are purchased from Tisch International Inc. with designated technical specifications and efficiency ratings.
- Quartz filters used in the Method 29 sampling train are purchased from Tisch International Inc. who pre-screen filters for metals content.

5.2.4 Other Pre-sampling Activities

Sample team meetings will be held to designate responsibilities to each team member. Assignments will be based on individual experience and relative importance of the assigned task. Other pre-sampling activities in the office will include generation of sample checklists, printing of computer-generated sample labels, and proper packing of all equipment. Equipment will then be transported by freight or truck to the sampling location.

Site setup is the final pre-sampling activity. This task will involve moving the equipment to the vicinity of the sample collection area. A separate office trailer or other suitable onsite facility will be used to serve as a sample train setup and recovery area and sample custody area.

Normally, preliminary tests are conducted at the stack location to verify the absence of cyclonic flow conditions and to determine flue gas moisture, temperature and velocity. These measurements facilitate determination of nozzle size selection and sample train operation rates for the isokinetic sampling trains. Extensive past testing at the facility has demonstrated the absence of cyclonic flow.

5.3 Sampling Locations

5.3.1 Waste Feed

Waste feed materials and process residual streams will be sampled in accordance with acceptable protocols. Waste feed sampling will occur upstream of any POHC or metal spiking location. Taps in the feed lines will be used to access feed streams. Samples will be collected using methodologies described later in Section 5.4.

5.3.2 Stack Sampling Location

The primary and preferred sampling location is at the scrubber outlet because there is more room, more ports, and this sampling location is more accessible than at the sampling ports on the stack. This sampling location has been used for the last several performance tests that have been performed after the obsolete wet electrostatic precipitator unit was shut down.

The scrubber outlet sampling location consists of a 60.0" inside diameter (ID), vertical, round duct with two (2) 5.5" ID sampling ports arranged 90° apart in accordance with EPA Method 1. The ports are located 121.5" (2.0 diameters) upstream of a flow disturbance and 412" (6.9 diameters) downstream of a flow disturbance. A total of twelve (12) sample traverse points are typically used (six points traversed per port). During the last comprehensive performance test in 2012, the first and last point for each port was not sampled due to the stack being saturated with water. Sampling at the these four points closest to the wall prevented water droplets in the nozzle and was approved by the onsite State of Utah representative. A twelve-point cyclonic flow check of the sampling location was conducted prior to sampling. The results of the cyclonic flow check demonstrated acceptable, non-cyclonic flow conditions in the scrubber outlet gas stream.

It is anticipated that all samples will be collected at the scrubber outlet to determine emission levels of dioxins/furans (PCDD/F), semi-volatile organic compounds (SVOC – specifically the selected POHC hexachloroethane (HCE)), polychlorinated biphenyls (PCBs), particulate matter (PM), hydrogen chloride (HCl), chlorine (Cl_2), metals (Hg, Pb, Cd, As, Be, Cr, Ni), and volatile organics (VOC – specifically the selected POHC monochlorobenzene (MCB)).

Additional sampling ports are available on the incinerator stack, which is constructed of fiberglass and has a height of 150 feet with an inner diameter of 60 inches and an outer diameter of 62 inches. There are eight ports installed in the stack, four each at two different levels. The four lower-level ports are at a height of 58 feet above ground level. There is a sampling platform at the 58 ft level. The four upper-level ports are at a height of approximately 66 feet above ground level and do not have a sampling platform. It is not expected that this upper level will be used, but if for any reason the 66 ft level ports are needed, appropriate scaffolding will be constructed to provide safe access to these ports. Each port is four inches in diameter and extends a maximum of six inches from the stack wall. The stack gases are typically saturated in moisture at a temperature of 140° to 160°F.

5.4 Waste Feed Sampling Procedures

All waste feed sampling will be performed by facility personnel. Each sample will be assigned a unique sample code for identification. Sufficient quantity will be collected to allow for sample splits, backup or archived samples and duplicates, as applicable.

5.4.1 Waste Feed

Containerized wastes will be characterized by analysis prior to the materials being repacked into CPT feed drums as described below. Bulk solids will be sampled at the apron feeder access port above the bulk solids flop gates. Pumpable material fed through the sludge port will be sampled from a tap in the sludge feed line at the front wall. ABC aqueous liquid waste will be sampled from a tap in the aqueous feed line at the afterburner. Blend liquid to the kiln will be sampled from a tap in the blend liquid line at the front wall. Blend liquid to the ABC will be sampled from a tap in the blend liquid line at the ABC, if the blend feed is from a different source than the kiln blend feed. Aqueous liquid and blend liquid to each chamber will be fed to the system from the tank farm. Direct burner trailers will be sampled from a tap in the direct burn line to the kiln or ABC. Fuel oil will be sampled at the tap on the fuel oil feed line near the kiln front wall.

Grab samples of the liquid streams are collected during each run from sample taps in accordance with Method S004 ("Sampling and Analysis Methods for Hazardous Waste Incineration", February 1982). The sample tap is opened and the line is flushed with the material being collected. The flush is then discarded into a container and managed appropriately, then the specified sub-sample is collected. This ensures that the actual material collected is representative of the stream. At the prescribed frequency of once every 30 minutes, liquid is collected into a large beaker or sample jar. This composite sample collected for each test run is analyzed for nonvolatile parameters. If required, a separate 20-mL or 40-mL VOA vial is filled with material for determination of volatile organics. VOA sample bottles are composited at the laboratory.

Samples of the apron feed solids will be obtained by compositing sub-samples collected at 30-minute intervals. A 250-mL beaker (or sample jar) will be filled, and the material will be transferred into a larger sample container. The resulting composite will be analyzed for non-volatile parameters. If volatile analyses are required, a separate 4-oz. sample jar will be filled and these samples will be composited at the laboratory.

The containers to be fed during the CPT will be prepared prior to the test. Containers will be prepared by re-packing contaminated soil, debris, scrap PVC and/or salt into drums. Each waste stream or material being used will be characterized prior to re-packing. Each roll-off of contaminated soil will be sampled and analyzed on a roll-off basis. The debris will be characterized using the Matrix Protocol defined in the facility WAP. As the CPT containers are prepared, the amount of each material added will be determined by weighing each container as re-packing occurs. The analysis of each material combined with the weight of the material in each drum will be used to calculate the content of each drum. The POHC content in containerized waste will not be sampled and analyzed and will not be used to calculate DRE. A concentration of zero will be assumed.

5.4.2 Spiked Materials

Given that the solid POHC (HCE), liquid POHC (MCB) and solid (Pb) and liquid metals (Cr) are pure materials of known analysis, no sampling will be conducted. Rather, the purity of these materials will be based on certificates of analysis provided by the vendor. Individual bags of HCE will be weighed prior to placement into or onto a drum.

POHC (MCB) and the chromium metal spiking solution will only be analyzed prior to the test, if certificate of analysis is unavailable or if the material is diluted as part of feed preparation.

Typically, the purchased mercury material requires dilution into water to make a larger volume of spiking material. A grab sample of each tote or container used will be sampled for mercury. If the mercury solution is purchased and fed at the purchased concentration without dilution, then the certificate of analysis will be used as the basis for the feed concentration.

It is expected that sufficient chlorine will be present in the waste feeds and that no augmentation or spiking of chlorine will be needed to achieve the target chlorine feed rate. However, if for any reason spiking or augmentation of chlorine is needed, the following procedure will be used to characterize the feed material.

If PVC scrap is added to the bulk solids stream to increase its chlorine content, a grab sample will be taken from each PVC container and composited. The chlorine analysis for the composite will be used in calculating bulk solids chlorine content.

If for any reason organic chlorine (chlorinated solvent e.g. TCE, PCE, etc) or HCl is purchased and fed to the incinerator in order to increase the amount of Chlorine fed, the purity of this material will be based upon the certificate of analysis supplied with the shipment.

5.5 Stack Sampling Methodologies

Gases discharged from the exhaust stack will be sampled for the following parameters:

- Flue gas velocity, flow rate, temperature, and moisture content;
- MACT metals – As, Be and Cr (LVM); Cd and Pb (SVM); and Hg;
- Other Metals - Ni,
- Particulate matter;
- HCl and Cl_2;
- Volatile POHC (MCB);
- PCDDs/PCDFs;
- PCBs, HCE;
- Carbon Monoxide (CO), oxygen (O_2), total hydrocarbons (THC), sulfur dioxide (SO_2) oxides of nitrogen (NO_x) and carbon dioxide (CO_2) using the facility's CEMS.

The following sections provide summaries of the sampling methodologies to be followed. Examples of typical field data sheets to be used during the program are provided in Appendix B. Summaries of relevant information pertaining to setup and recovery of each isokinetic sampling train are provided in Appendix C.

5.5.1 Gas Stream Velocity, Moisture and Fixed Gases

Gas stream flow rate, moisture and fixed gas concentration will be determined concurrent with each of the isokinetic sampling trains. Gas stream velocity will be determined using a pitot tube and water manometer in accordance with EPA Method 2. Gas stream temperature will also be determined at each of the Method 2 traverse points using a Type "K" thermocouple and pyrometer. Gas stream moisture will be determined as specified in EPA Method 4 concurrent with the isokinetic sampling methods. In this procedure the impinger contents are measured or weighed before and after each test run and used in conjunction with the metered gas volume to determine the gas stream moisture content. The facility's stack CEMS will be used for measuring O_2 and CO_2 for gas stream molecular weight determination and constituent oxygen correction at both gaseous sampling locations.

5.5.2 Volatile Organic Sampling Train (VOST) for Volatile POHC

EPA Method 0030 will be used to determine stack gas concentrations of the volatile POHC. Data collected from VOST samples will be used to calculate the destruction removal efficiency (DRE) for the volatile POHC, monochlorobenzene. The VOST method utilizes Tenax and Tenax/Charcoal cartridges to adsorb target volatile organic compounds; each cartridge is preceded by a condensing module. Specific sampling details for the Method 0030 train are as follows:

- Sampling rate – 0.5 Lpm
- VOST pair run time – 40 minutes
- VOST tube pairs collected per run - 4 (a, b, c and d)
- VOST tube pairs designated for analysis - 3 (a, b and d)
- Minimum probe temperature - 135 °C
- No. of field blank pairs collected - 3
- No. of trip blank pairs collected - 1

The recovery activities for the VOST method will include:

- Sealing the sorbent cartridges with Swagelok fittings and placing them in their original glass culture tubes with glass wool to absorb shock.
- Transferring the collected condensate into a 40 mL VOA vial, noting the volume collected by marking the VOA vial with a black indelible marker and diluting to volume with DI water to eliminate all headspace and the possibility of re-volatilization of the compounds.
- Further reducing reactivity by storing all samples at 4°C.

5.5.3 Metals

EPA Method 29 will be utilized for the collection of target metals including:

- MACT LVM metals – arsenic, beryllium and chromium;
- MACT SVM metals – cadmium and lead and;
- Nickel and Mercury.

Specific sampling details for the Method 29 sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 2-hr
- No. of sampling points per stack traverse - 6

- Total No. of sampling points - 12
- No. of field blanks collected – 1

5.5.4 Particulate Matter (PM), HCl, Cl_2

Sampling for PM, HCl and Cl_2 will be performed in accordance with EPA Methods 5 and 26A. Specific sampling details for the Methods 5 and 26A sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 2-hr
- No. of sampling points per stack traverse - 6
- Total No. of sampling points - 12
- No. of field blanks collected – 1

5.5.5 PCDDs/PCDFs and Other Target Semivolatile Organic Parameters (HCE and PCB)

A combined Method 0023A/0010 sampling train will be used to sample for all target parameters. PCDDs/PCDFs will be collected following the procedures outlined in EPA Method 0023A. PCBs and HCE will be collected following the procedures outlined in Method 0010. Specific sampling details for the Method 0023A/0010 sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 3-hr
- Minimum sample volume required (as per Subpart EEE) - 2.5 dscm
- No. of sampling points per stack traverse - 6
- Total No. of sampling points - 12
- No. of field blanks collected – 1

5.5.6 Continuous Emissions Monitoring (CEM)

Aragonite will provide continuous emission monitoring for parameters including CO, O_2, CO_2, SO_2, THC and NO_x in accordance with existing permit requirements. These data will be collected in accordance with the existing facility CEM QA Plan. The instruments will have been calibrated and verified in an annual RATA and quarterly ACAs, as required by the regulations. The plant follows an annual program for RATA and a quarterly ACA of the CEMs. These data will demonstrate that the CEMS are properly calibrated. These QA procedures are in addition to the daily calibration that performed for various CEMS in accordance with the MACT regulations and the RCRA/Air permits.

6. SAMPLE HANDLING, TRACEABILITY AND HOLDING TIMES

Sample integrity will be maintained throughout all phases of the sampling and analysis program. Samples will be held within sight of the samplers or sample custodian, or will be kept in sealed or secured containers at all times. Sealed coolers and DOT shipping boxes will be used to ship samples to the designated laboratory via Priority 1 overnight FedEx service or they will be personally delivered by APT personnel.

Preprinted sample identification labels are used by APT to ensure that all required information is fully documented. When sample batches are shipped to the specified laboratory, a sample packing list (see Figure 1) accompanies the shipment. This form is based on established laboratory format and will be used to document sample transfer in the field and from sampling personnel to the laboratory.

The APT Project Manager will coordinate the packing and shipment of all samples. Worksheets specifically designed for this program will be generated prior to the field effort. These sheets will assist the Project Manager in assuring that all samples have been collected, accounted for and shipped under sample traceability documentation to the appropriate laboratory. Requirements pertaining to sample preservation and recommended holding times are noted in Table 4.

All materials such as field and laboratory notebooks and logbooks, field and laboratory data records, correspondence, reports, sample tags, traceability records and instrument printouts will be clearly labeled with the project number and become a permanent part of the project file. Project samples will be disposed of in an appropriate manner 60 days after acceptance and approval of a final report. All project-related documentation at both APT and the subcontractor laboratories will be kept on file for 2 years following submittal of the final report.

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7. ANALYTICAL METHODS AND CALIBRATION PROCEDURES

This section delineates the analytical protocols that will be used to analyze samples during this CPT. Samples of waste feed materials and stack gas will be collected and analyzed for the parameters previously discussed using the appropriate laboratory protocols detailed in this section and as outlined in Tables 2 through 4.

7.1 Analysis of Waste Feed

All waste feed samples will be analyzed by or under the direction of the onsite Aragonite laboratory. Waste feed materials include containerized solids, apron feed solids, pumpable sludge, direct burn liquids, aqueous waste and liquid blend. The MCB and HCE analyses will be analyzed by either the Clean Harbors Kimball laboratory or Test America Denver laboratory.

7.1.1 Chemical and Physical Properties of Waste Feed Streams

Analyses to determine the chemical and physical properties of the waste feed materials will be performed using appropriate ASTM or EPA SW-846 analytical methods as outlined in the table below. Quality assurance requirements for the determination of chemical and physical properties of these materials are summarized in Table 5.

Total chlorine (preparation)	EPA M 5050
Total chlorine (analysis)	EPA M 9253
Ash content	ASTM D 482
Viscosity (liquids only)	ASTM D 2983
Heat content	ASTM D 240

7.1.2 Metals in Waste Feed

Waste feed streams will be analyzed for the following target metals: arsenic, beryllium, cadmium, chromium, lead, mercury and nickel. Analyses for metals other than mercury will be performed using inductively coupled argon plasma emission spectroscopy (ICAP) as described in EPA Method 6010C (SW-846, 3rd edition). Mercury analysis will be performed using EPA Methods 7470A or 7471B (SW-846, 3rd edition). Quality assurance requirements for the analyses of metals in waste feed materials are summarized in Table 6. As previously discussed, purchased inorganic metal spiking feeds in drums or bulk will not be sampled and analyzed but rather a certificate of purity will be provided by the supplier/manufacturer of these commercial grade materials. If mercury spiking solution is made by either dilution of a pure liquid or by dissolving a solid, then the totes that are made will be sampled and analyzed for mercury content.

7.1.3 POHCs in Waste Feed Materials

Target POHCs for the program include hexachloroethane, monochlorobenzene and total PCBs. Only the pumpable feed materials will be analyzed for the POHCs, following the analytical methods outlined in Table 2. These include EPA Methods 8260B for MCB, 8270C for HCE and 8082 for PCBs. Quality assurance requirements for these analyses are summarized in Table 7. Container and bulk solids feeds will not be analyzed for POHC, as they are typically low in concentration. A value of zero (0) will be used for the POHC concentration for all solids feeds.

7.2 Analysis of Stack Gas Samples

7.2.1 Stack Gas-VOST Analysis

Stack gas samples will be analyzed for MCB using EPA Method 5041A (VOST tubes) and EPA Method 8260B (condensate).

Analysis — The samples collected from each VOST run will consist of a Tenax cartridge, a Tenax/charcoal backup cartridge, and a flue gas condensate. Cartridges will be desorbed and analyzed for volatile organics using the thermal desorption GC/MS procedures specified in Method 5041A of SW 846. Condensate samples will be analyzed using Method 8260B. All VOST tubes from each run will be analyzed separately to confirm that significant analyte breakthrough has not occurred. If the back tube contains < 30% of the amount of the POHC found on the front Tenax trap, or if the back trap contains less than 75 nanograms of the POHC, breakthrough will not be considered to have occurred. All audit and blank samples will be analyzed via codesorption.

All QA/QC requirements of EPA Method 5041A for instrument calibration and performance will be met prior to sample analyses, including:

- System performance checks using the five system performance check compounds (SPCCS) will be conducted initially and after every 12 hours of analysis. The minimum response factors for the volatile SPCCS will be 0.300.
- Daily calibration of the system, including evaluation of the internal standard responses and retention times in the check calibration standard. Performance criteria specified in the method will be used to determine whether the system has malfunctioned. If samples are analyzed under conditions of malfunction, an evaluation of the impact of that malfunction on data quality will be performed, with the results of the investigation presented in the final report.

Thermal desorption will be conducted using a Tekmar Model 4210 automated desorption unit which is designed to accommodate sorbent cartridges in series. The desorption gas is plumbed to direct flow through each pair of traps, then through a purge vessel to trap desorbed water and, finally, onto the head of a smaller sorbent column (Tenax/silica gel/OV-1) which is located in a Tekmar LSC-2 purge and trap device. The volatile components adsorbed onto the secondary trap are then thermally desorbed onto the GC by heating the trap to 180°C as detailed in Method 5041A. Prior to analysis, the volatile surrogate compounds and internal standards listed in the method will be flash vaporized onto each Tenax cartridge set.

The analytical performance check for the designated POHC will be completed prior to the program in accordance with SW-846 Method 0030, Section 7.1 by the laboratory conducting the analyses. The performance check for this analysis will be recognized as having passed the check if the recovery is within 50% - 150% of the expected value.

Calibration for Method 5041A - The GC/MS will be tuned to BFB at the beginning of each 12-hour analysis sequence, applying the acceptance criteria for key ion abundance listed in the method.

Upon compliance with all system criteria, the GC/MS will be initially calibrated at a minimum of three to five calibration levels by analyzing sets of adsorbent tubes spiked with the volatile POHCs, internal standard and surrogates.

Calibration standards for the POHC will cover the range of concern for DRE demonstration. Spiked tubes will be prepared by flash evaporating methanol solutions of the calibration standards (including 250 ng of the internal standards) through an injector at 180°C with a carrier flow of 10 mL/min onto blank Tenax or Tenax/charcoal cartridges. Carrier gas will be connected such that it flows in the same direction through the tube as during sample collection (which is opposite to the flow direction for GC/MS desorption). Total flow through the cartridges during spiking of standard (and sample) cartridges will be minimized to reduce the breakthrough of volatile compounds.

Response factors versus the internal standard will be calculated for all components at each level of calibration. Verification of a single point of the calibration curve will be performed for each 12 hours of sample analysis. QA/QC requirements for VOST analyses are provided in Table 8.

7.2.2 Metals in Stack Gas Samples

Analysis - Each sampling train will be prepared and analyzed in accordance with EPA Reference Method 29.

From each sampling train, five samples are generated for analysis. The first sample, labeled Fraction 1A for metals front half (FH) and 1B for mercury consists of the digested sample from the front half of the train, consisting of the particulate filter and the front-half nitric acid probe rinse. Fraction 2A for metals back half (BH) and 2B for mercury consists of digestates from the HNO_3/H_2O_2 impingers 1 and 2. Fraction 3A for mercury consists of digestates from intermediate moisture knock out impinger 3 and HNO_3 rinse. Fraction 3B consists of digestates from $H_2SO_4/KMnO_4$ impingers 4 and 5. Fraction 3C is the final 8N HCl rinse. A chart depicting the sample preparation and analysis scheme for the metals train is included in Appendix C.

Analyses for metals except mercury will be performed using Inductively Coupled Argon Plasma (ICP) as described in EPA Method 6010 (SW-846, 3rd Edition). Mercury analysis will be performed using Cold Vapor Atomic Adsorption (CVAA) and analyzed in accordance with EPA Method 7470A (SW-846, 3rd Edition). All quality control procedures, including the interference check standard, will be followed as described in the respective method.

The filter and front half sample of the M29 sample train can also serve as a backup to the PM being measured by the M5/26A train.

Calibration—Calibration of the ICAP will be performed daily in accordance with the procedures described in Method 6010 and the manufacturer's instructions. The calibration is verified daily by analysis of an instrument check standard prepared from an EPA quality control concentrate or other independent standard.

QA/QC requirements for the analysis of metals in stack gas samples are summarized in Table 9.

Calibration of the Cold Vapor Atomic Absorption System will be performed daily, generating a 6-point curve (a blank and six calibration standards). Calibration is checked initially with a second source initial calibration verification (ICV) standard, and on an ongoing basis with continuing calibration verification (CCV) samples. Background contamination is similarly assessed with initial calibration blank and continuing calibration blank samples.

QA/QC requirements for the analysis of mercury in stack gas samples are summarized in Table 9.

7.2.3 Total Chlorides (HCl/Cl_2) in Stack Gas Samples

Impinger samples from the Methods 5 / 26A sampling train will be analyzed by ion chromatography in accordance with EPA Method 9057 without any further preparation. QA/QC procedures for these analyses are presented in Table 10.

The contents of the first three H_2SO_4 impingers plus the knock out fourth impinger along with a series of water rinses will be recovered for subsequent ion chromatography analysis for chloride to determine the HCl, content of the stack gas. The contents and water rinses of the two NaOH impingers will be spiked with sodium thiosulfate (to ensure complete conversion of the hypochlorous acid to the halide ion) and recovered for IC analysis for chloride ions to determine the Cl_2 content of the stack gas.

7.2.4 Particulate Matter (Gravimetric Analysis)

Gravimetric analyses will be performed on samples collected from the Methods 5 / 26A Particulate/HCl/Cl_2 train. Weights will be obtained on the front-half acetone rinse and particulate filter using a Denver Instruments APX-100 analytical balance. Balance accuracy is checked by using Class "S" standard weights before and after tare weighings and sample determinations. Sample fractions are dried to constant weight, defined as two successive weighings at a 6-hr interval showing a weight change of less than 0.5 mg.

7.2.5 Stack Gas - Analysis for PCDDs/PCDFs, PCB, and HCE

Stack flue gas samples collected using the Method 0023A/0010 sampling train will be analyzed for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs), total mono-deca polychlorinated biphenyls (PCBs), and HCE (a POHC), which is a semivolatile organic compound (SVOC)..

Each sampling train will be prepared and split appropriately for the designated analyses. A combined front half and back half analysis will be performed for HCE and PCBs in order to provide the lowest detection limits. The PCDDs/PCDFs will be analyzed as separate front and back halves in accordance

with Method 0023A. A schematic of the analytical scheme for the combined sampling train is provided in Appendix D.

Briefly, the XAD and filter will be spiked with internal standards for PCDDs/PCDFs, PCBs and surrogates for the semivolatile organics and then sequentially extracted with methylene chloride and toluene. The methylene chloride and acetone rinses will be combined and added to the methylene chloride Soxhlet extract. This combined sample will be concentrated and split. The portions allocated for PCB and HCE analyses will be combined with the acid/base neutral extracts of the impinger contents. The portion allocated for PCDD/PCDF analysis will be combined with an appropriate fraction of the toluene extract.

Method 0023A analyses (which include high resolution GC/MS as per EPA Method 8290) incorporate five isotopically labeled PCDD and PCDF field surrogates and nine labeled PCDD/PCDF internal standards. The field surrogates are spiked into the XAD resin prior to field sampling; their recoveries are monitored to assess overall method accuracy and precision. The internal standards are added to the combined XAD/filter/rinse concentrate sample at a level of 2,000 pg/sample prior to Soxhlet extraction. These internal standards are used for direct quantification of all surrogate and native PCDD/PCDF species. The addition of these standards prior to the extraction and cleanup procedures permits internal correction for any losses of target analytes that might occur during the preparation steps.

Method 8290 details instrument tune, GC column performance and instrument calibration requirements for the analysis of stack gas samples by high resolution gas chromatography/high resolution mass spectrometry. Instrument calibration will be performed for all 15 2,3,7,8- substituted PCDD and PCDF isomers; data will be reported for each of these target analytes and for the total dioxins and total furans at each level of chlorination from Cl_4 through Cl_8.

Analysis for target PCBs will be performed by HRGC/HRMS following EPA Method 1668A (modified). At the same point when the PCDD/PCDF internal standards are added, nine isotopically labeled PCBs will be added to the combined XAD/filter/ rinse concentrate sample prior to extraction. These will be used to quantify total mono-deca PCB analytes.

Analysis for HCE will be performed by low resolution mass spectrometry using single ion monitoring (SIMS) following the analytical protocol of SW-846, Method 8270C. Instrument tune and calibration procedures of the method will apply.

QA/QC requirements for these analyses are summarized in Tables 11 through 13.

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8. INTERNAL QA PROGRAM

Quality control checks will be performed to ensure the collection of representative samples and the generation of valid analytical results for these samples. These checks will be performed by project participants throughout the program under the direction of the Project Manager and the QA Officer.

8.1 Data Collection and Sampling QC Procedures

QC checks for the process data collection and sampling aspects of this program will include, but not be limited to, the following:

1. Use of standardized data sheets, checklists and field notebooks to ensure completeness, traceability, and comparability of the process information and samples collected.
2. Field checking of standardized forms by the Field Team Leader and a second person to ensure accuracy and completeness.
3. Strict adherence to the sample traceability procedures.
4. Submission of field blanks.
5. Leak checks of sample trains before and after sample collection and during the test, when appropriate.

8.1.1 Sampling Equipment QC Checks and Frequency

Calibration of the field sampling equipment will be performed prior to and at the conclusion of the field sampling effort. Copies of the calibration sheets will be available onsite during the field sampling program for inspection, will be kept in the project file and will be submitted in the final report. Calibrations will be performed as described in the EPA publication "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods;" Section 4.2.1 presents acceptance limits.

Leak checks of the sample trains will be conducted in accordance with the protocol called out for each method. Leak checks will be conducted prior to and at the end of sample collection and during the test run, when appropriate.

8.1.2 Sample Collection QC Checks

Field blanks of reagents and collection media (deionized water, filters, impinger solutions, etc.) will be placed in appropriately cleaned and sized sample containers in the field and handled in the same way as actual field samples, to provide a QC check on sample handling.

For this program, sample collection QC checks and frequency for samples to be analyzed in the laboratory are listed below:

- One field blank VOST train (i.e., one set of blank traps exposed to conditions analogous to actual samples) and one trip blank for the overall program.
- One blank Method 29 sampling train
- One blank Method 26A sampling train
- One blank Method 0023A / Method 0010 sampling train

8.2 Analytical QC Procedures for Samples to be Analyzed in the Laboratory

The Quality Control program for laboratory analysis makes use of a number of different types of QC samples to document the validity of the generated data. The following types of QC samples will be used during the program.

8.2.1 Quality Control Samples and Blanks

Method Blanks

Method blanks contain all the reagents used in the preparation and analysis of samples and are processed through the entire analytical scheme to assess spurious contamination arising from reagents, glassware, and other materials used in the analysis.

Calibration Check Samples

One of the working calibration standards which is periodically used to check that the original calibration is still valid.

Laboratory Control Samples (LCS) or Blank Spikes

These samples are generated from spikes prepared independently from the calibration concentrates. The LCS is used to establish that an instrument or procedure is in control. An LCS is normally carried through the entire sample preparation and analysis procedure also.

Surrogate Spikes

Samples requiring analysis by GC/MS are routinely surrogate-spiked with a series of deuterated analogues of the components of interest. It is anticipated that these compounds would assess the behavior of actual components in individual program samples during the entire preparative and analysis scheme.

The percent recovery for each surrogate will be calculated in accordance with method-specific procedures. Any values which fall outside the target QC limits described in the applicable analytical

method will be flagged. Some of these recovery values may be outside the QC limit owing to matrix interferences. The following guidelines will be used:

1. All recovery data are evaluated to determine if the QC limits are appropriate and if a problem may exist even though the limits are being achieved (e.g., one compound that is consistently barely within the lower limit).

2. Any recovery data which are outside the established limits are investigated. This evaluation will include an independent check of the calculation.

3. *Corrective action will be performed if any of the following are observed:*

    - All recovery values in any one analysis are outside the established limits, where one analysis is considered to be one sample analyzed by one method,

    - Over 10 percent of the values for a given sample delivery group are outside limits, or

    - One compound is outside the limits in over 10 percent of the samples.

An analysis batch is defined as a group of ten or fewer samples carried through the entire preparation and analysis procedure in one batch.

Reagents used in the laboratory are normally of analytical reagent grade or higher purity; each lot of acid or solvent used is checked for acceptability prior to laboratory use. All reagents are labeled with the date received and date opened. The quality of the laboratory deionized water is routinely checked. All glassware used in the sampling and analysis procedures will be pre-cleaned according to the method requirements. Standard laboratory practices for laboratory cleanliness, personnel training and other general procedures are used. The results of these quality control procedures will be included in the final report.

8.2.2 Quality Control of Sorbents

Sorbents used for the organic sampling trains are provided by the laboratory after QC verification has been performed following recommended procedures in each applicable method. Additional details on sample media preparation were provided previously in Section 5.2.3.

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9. DATA REDUCTION, VERIFICATION AND DATA REPORTING

Specific QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in all such projects.

9.1 Field Data Reduction

Appendix B of this QAPP presents typical examples of the standardized forms that will be used to record field sampling data. The Field Team Leader and at least one other field crewmember will review the data collected from each train in its entirety in the field. Errors or discrepancies will be noted and dealt with accordingly. The Field Team Leader has the authority to institute correction actions in the field. The QA officer will also be notified for resolution if the situation warrants. At a minimum, the QA officer is appraised of all deviations from standard protocol. Field data reduction (checking of valid isokinetic sampling rate and other sampling parameters) is done with a laptop computer using standardized Excel spreadsheets. Appendix C provides setup and recovery schematics and a description of solutions and reagents to be used in each isokinetic sampling train required for the overall program. All sample recovery sheets will be checked for completeness.

9.2 Laboratory Analysis Data Reduction

Analytical results will be reduced to appropriate units by the laboratory using the equations given in the applicable analytical method. Unless otherwise specified, results from the analysis of waste feed and process samples for specific target constituents will be reported in units of mg/kg or % wt. Other parameters will be reported in standard units such as g/cc, Btu/lb, etc.

The laboratory typically reports results from the analysis of stack flue gas samples as total mass detected for the sample submitted. For those sample fractions where liquid impinger condensate is analyzed, the laboratory will measure the total liquid volume submitted and multiply by the measured concentrations of target analytes in these samples. The laboratories will generally report data as follows:

- Volatile POHC (MCB) – total **ng** collected
- Particulate matter - total **mg** collected in each fraction (front-half rinse and filter)
- All metals except mercury – total **µg** of each metal in the front-half and back-half sample train fractions reported separately
- Mercury –total **µg** in each sample train fraction reported separately
- HCl /Cl_2 - total **µg** as HCl and Cl_2
- PCDDs/PCDFs - total **pg** collected for the front-half and the back half reported separately
- SVOC POHC (HCE) - total **µg** collected

- PCBs - total **ng** collected

Each Laboratory Services Coordinator will be responsible for reviewing all results and calculations and verifying the completeness of the data set. The laboratory reports submitted by each laboratory will include the following deliverables:

- Transmittal letter listing all samples and analyses and a case narrative identifying any difficulties associated with the analyses and any anomalous QA/QC results
- Copies of Chain of Custody Forms
- Sample Report forms with sample field and laboratory identifier, dates of sample preparation and analysis, analytical results and detection limits
- Method Blank results
- Matrix spike and matrix spike duplicate results (as applicable)
- Replicate sample analyses (as applicable)
- Laboratory Control Sample results

Reports for organics in waste feed and stack samples will include the following additional information:

- Surrogate recoveries
- Summary of initial calibrations
- Continuing calibration summaries
- Instrument tunes

All laboratory results will include reporting limits (RL). RLs for the target analytes are summarized in Tables 14A and 14B for air samples, and Tables 14C and 14D for waste feed samples.

9.3 Data Verification

Data verification is the process of reviewing data and accepting, qualifying or rejecting it on the basis of method-specific criteria. The independent project QAO will use validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data will be maintained, even that judged to be an "outlying" or spurious value.

Field sampling data will be validated by the Field Team Leader based on a judgment of the representativeness of the sample, maintenance and cleanliness of sampling equipment and the adherence to an approved, written sample collection procedure.

Analytical data will be validated by the subcontractor laboratory QC or supervisory personnel using criteria outlined in their laboratory-specific QA Plan and/or written SOPs. Results from field and laboratory method blanks, replicate samples and internal QC samples will be used to further validate

analytical results. Analytical results on field blanks and replicate field samples are valuable for validation of sample collection also. QC personnel will review all subcontractor laboratory raw analytical data to verify calculated results presented.

The following criteria will be used to evaluate the field sampling data:

- Use of approved test procedures
- Proper operation of the process being tested
- Use of properly operating and calibrated equipment
- Leak checks conducted before and after tests
- Use of reagents that have conformed to QC specified criteria
- Use of NBS traceable CEM calibration gases (as applicable)
- Proper chain-of-custody maintained

All sample trains—check to ensure proper sample gas volume collected The criteria listed below will be used to evaluate the analytical data:

- Use of approved analytical procedures
- Use of properly operating and calibrated instrumentation
- Precision and accuracy achieved should be comparable to that achieved in previous analytical programs and consistent with objectives stated in this document.

9.4 Final Data Reporting

Stack gas concentrations for each applicable parameter will be calculated from laboratory results and field sampling data. The total weight of the analyte detected will be divided by the volume of gas sampled to provide emission concentrations. For demonstrating MACT and RCRA compliance, all emission concentrations, as appropriate, are further corrected to 7% oxygen for comparison to the published standards.

A complete Final Report outlining the goals, methods and results for the program will be prepared and any deviations from this test plan will be documented. The Final Report will include a section on evaluation and discussion of QA/QC results. Results will be compared to expected limits for accuracy, precision and/or completeness as targeted in this protocol. The final test report will also include the results of any internal audits conducted on the program as well as:

- All field data sheets showing sampling method, dates, run times, personnel, equipment; sample preservation, identification and compositing records.
- Field equipment calibration data.
- Analytical lab reports and relevant supporting documentation.

10. ROUTINE MAINTENANCE PROCEDURES AND SCHEDULES

This section provides pertinent information for field sampling equipment as well as a listing of all critical facility equipment necessary to maintain permitted operating conditions and to demonstrate continuing permit compliance. Information is provided for preventive maintenance and schedules and spare parts for key equipment and instrumentation.

10.1 Field Sampling Equipment

The field team follows an orderly program of positive actions to prevent the failure of equipment or instruments during use. This preventive maintenance and careful calibration helps to ensure accurate measurements and minimal field delays.

All equipment that is scheduled for field use is calibrated as outlined previously in Section 5.2.1. Prior to each field use for a specific project, the equipment is cleaned and checked to ensure it is in good working order. An adequate supply of spare parts and sample train glassware is brought to each site to minimize downtime and field sampling delays. Any equipment that does experience problems is appropriately tagged in the field to ensure that it is repaired upon return to the office.

10.2 Facility Equipment and Instrumentation

During scheduled shutdowns, all waste feed lances are pulled and inspected. If necessary, the lance is repaired, otherwise it is replaced. All seals and expansion joints from the feed end to the stack are inspected and repaired as needed. Instrumentation is maintained and calibrated as required by the facility's RCRA permit and in accordance with the MACT Subpart EEE requirements.

- RCRA Attachment 13 – Instrument Calibration,
- RCRA Attachment 15 – QAPP for CO_2 and O_2 continuous emission monitors,
- RCRA Attachment 16 – Data Archiving System. and
- MACT Subpart EEE - CO and THC continuous emission monitors

A CMS-PET Plan (Appendix B of the CPT Plan) details all of the continuous monitoring system (CMS) instrumentation that is part of the plant operating system and that will be used to monitor waste feed rates and plant operating parameters. This CMS-PET Plan is part of the requirements for the CPT. All equipment and instrumentation will be calibrated prior to the CPT on the normal maintenance/calibration schedule required by the regulations and permits. These calibration results are documents as described in the CMS-PET Plan.

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11. QA/QC ASSESSMENT PROCEDURES

The QA activities implemented in this program will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 8 of this attachment discusses the QA activity that will generate the accuracy and precision data for each sample type. A generalized form of the equations that will be used to calculate accuracy, precision and completeness follows.

11.1 Accuracy

Percent accuracy will be determined using the following equation:

$$\% \text{ Recovery } = \frac{(X - S)}{T} x\ 100 \text{ where:}$$

X = experimentally determined concentration of the spiked sample

T = true concentration of the spike

S = sample concentration before spiking

11.2 Precision

Precision will be determined using the following equation:

$$\text{Re}lative\ Percent\ Difference\ (RPD) = \left[\frac{(D_1 - D_2)}{\left\{ \frac{D_1 + D_2}{2} \right\}} \right] x\ 100$$

where:

D_1 and D_2 = results of duplicate measurements or standard deviation relative to the average value expressed as relative standard deviation:

Relative standard deviation will be expressed as follows:

$$\text{Relative Standard Deviation (\% RSD)} = \left\{ \frac{\sigma_{(n-1)}}{\bar{x}\ (x_1 \cdots x_n)} \right\} x\ 100$$

where:

$\sigma_{(n-1)}$ = standard deviation of the sample data

n = number of replicates

$x_{(x1\ xn)}$ = arithmetic mean of the sample data

11.3 Completeness

Data completeness is a measure of the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. For this program, completeness will be defined as the percentage of valid data for the total valid tests. Completeness is assessed using the following equation:

$$Completeness\ (\%) = \left[\frac{D_r}{D_c}\right] \quad x \quad 100$$

where:

D_r = number of samples for which valid results are reported

D_c = number of planned measurements

The completeness objective will help to evaluate the accuracy and precision of the analytical measurements.

12. EXTERNAL QA PROGRAM

The External Quality Assurance Program includes both performance and system audits as independent checks on the quality of data obtained from sampling, analysis, and data gathering activities. Every effort is made to have the audit assess the measurement process in normal operation. Either type of audit may show the need for corrective action.

12.1 Performance Audits

The sampling, analysis, and data handling segments of a project are checked in performance audits. A different operator/analyst prepares and conducts these audit operations to ensure the independence of the quantitative results.

Audit samples will be performed as available through the Stationary Source Audit Sample Program (SSASP). Currently Stationary Source Audit Sample Program has approved audit samples for HCl and metals, which are available from private contractors. Aragonite will arrange with APT to obtain these audit samples and they will be processed along with the samples collected during the CPT. It is believed that USEPA does not currently have or provide any additional audit samples, but if they become available and are provided to the facility, they will be performed along with the SSAS Program samples. Any additional audit samples presented by the regulatory agencies will be analyzed along with program samples, by the appropriate lab and at the same time as all other samples. It will, however, be the responsibility of the regulatory agency to obtain these samples, and present them to the facility project manager in a form that is amenable and appropriate to the analytical methods being utilized.

The audit sample results will be used to assess the analytical work. Results will be reviewed by the subcontractor laboratory and QC personnel. If the audit results fall outside of acceptable ranges, the analytical data will be further reviewed for error. If a simple, correctable error is found (e.g., an arithmetic error), correction will be made and results resubmitted. If no error is found, an investigation into other causes of the failure (e.g., lack of sample integrity) will be conducted and results evaluated in terms of the impact on sample data integrity.

12.2 Corrective Action

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by the project manager. The corrective actions are likely to be immediate in nature and most often will be implemented by the analyst or project manager; the corrective action will usually involve recalculation, reanalysis, or repeating a sample run. Ongoing corrective action policy is described here.

12.2.1 Immediate Corrective Action

Specific QC procedures and checklists are designed to help analysts detect the need for corrective action. Often the person's experience will be more valuable in alerting the operator to suspicious data or malfunctioning equipment.

If a corrective action can be taken at this point, as part of normal operating procedures, the collection of poor quality data can be avoided. Instrument and equipment malfunctions are amenable to this type of action and QC procedures include troubleshooting guides and corrective action suggestions. The actions taken should be noted in field or laboratory notebooks but no other formal documentation is required, unless further corrective action is necessary. These on-the-spot corrective actions are an everyday part of the QA/QC system.

Corrective action during the field sampling portion of a program is most often a result of equipment failure or an operator oversight and may require repeating a run. When equipment is discovered to be defective (i.e., pre- and post-sampling leak check) it is repaired or replaced and a correction factor is established as per the EPA method. If a correction factor is unacceptable the run is repeated. Operator oversight is best avoided by having field crew members audit each other's work before and after a test. Every effort is made by the field team leader to ensure that all QC procedures are followed. Economically, it is preferred to repeat a run during a particular field trip rather than return at a later date.

Corrective action for analytical work would include re-calibration of instruments, reanalysis of known QC samples and, if necessary, of actual field samples.

If the problem is not solved in this way, more formalized long-term corrective action may be necessary.

12.2.2 Long-Term Corrective Action

The need for this action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem which cannot be solved by immediate corrective action falls into the long-term category. The condition is reported to a person responsible for correcting it who is part of the closed-loop action and follow-up plan.

The essential steps in the closed-loop corrective action system are:

- Identify and define the problem.
- Assign responsibility for investigating the problem.
- Investigate and determine the cause of the problem.
- Determine a corrective action to eliminate the problem.
- Assign and accept responsibility for implementing the corrective action.
- Establish effectiveness of the corrective action and implement it.
- Verify that the corrective action has eliminated the problem.

Documentation of the problem is important to the system. A Corrective Action Request Form is filled out by the person finding the quality problem. This form identifies the problem, possible causes and the person responsible for action on the problem. The responsible person may be an analyst, field

team leader, department QC coordinator or the QA Director. If no person is identified as responsible for action, the QA Director investigates the situation and determines who is responsible in each case.

The Corrective Action Request Form includes a description of the corrective action planned and the date it was taken, and space for follow-up. The QA Director checks to be sure that initial action has been taken and appears effective and, at an appropriate later date, checks again to see if the problem has been fully solved. The QA Director receives a copy of all Corrective Action Forms and then enters them in the Corrective Action Log. This permanent record aids the QA Director in follow-up and makes any quality problems visible to management; the log may also prove valuable in listing a similar problem and its solution.

12.3 Quality Assurance Reports to Management

12.3.1 Internal Reports

The Laboratory Services Coordinator will prepare a written report on QC activities associated with this project for the Quality Assurance Director. This report will detail the results of quality control procedures, problems encountered and any corrective action, which may have been required.

All Corrective Action Forms are submitted to the QA Officer for initial approval of the corrective action planned and a copy is provided to the Program Manager. All system audit reports are provided to the Program Manager and the Quality Assurance Officer.

Raw data collected in the field will be verified by the original field personnel for completeness and accuracy at the site and time of test. Raw data are reviewed by a test engineer prior to reduction to assure completeness of methods used. Transcription of raw data into computerized spreadsheets for reduction is completed and rechecked by a second test team member.

Calculations performed in the data reduction spreadsheets are reviewed and checked with hand calculations. Hand calculations are compared with computerized reductions and summarily included in the final reports.

A final review of the test reports includes raw field data sheets, laboratory data, transcriptions, data reductions, and final reporting is conducted by the APT quality control officer.

12.3.2 Reports to Client

The final report will include a section summarizing QA/QC activities during the program. The Project Manager, Laboratory Services Coordinators and the QA Officer will participate in preparing this section. This section will provide summary QA/QC results for method blanks, surrogate spikes and laboratory control spike recoveries. This section will evaluate overall data quality in terms of accuracy, precision and completeness. Any discrepancies or difficulties noted in program work, protocol deviations or documentation gaps will be identified and discussed.

Table 1 Laboratories Performing Analyses

Parameter	Stream [a]	Laboratory [b]
Viscosity, Total Chlorine, Heat Content and Ash Content	Waste	Aragonite
Hexachloroethane	Waste	Kimball or TA Denver
Monochlorobenzene	Waste	Kimball or TA -Denver
PCBs	Waste	Aragonite or TA-Denver or Kimball
Metals	Waste	Aragonite or Kimball
Particulate Matter	Stack Gas Exit	APT or TA Knoxville
Hydrogen Chloride / Chlorine	Stack Gas Exit	APT or TA – Knoxville
Metals	Stack Gas Exit	TA – Knoxville
Mercury	Stack Gas Exit	TA – Knoxville
Volatile Organics	Stack Gas Exit	TA – Knoxville
PCDDs/PCDFs	Stack Gas Exit	TA – Knoxville
PCBs and HCE	Stack Gas Exit	TA – Knoxville

[a] Waste Feed Streams include containerized solids, apron feed solids, sludge materials, direct burn liquid waste (energetic), aqueous liquids and liquid blend. Viscosity is only measured on waste liquids.

[b] Aragonite = Clean Harbors Onsite Laboratory;
APT = Air Pollution Testing's Laboratory – Arvada, Colorado
TA - Knoxville = TestAmerica, Knoxville, TN
TA-Denver = Test America, Denver, CO
Kimball = Clean Harbors Kimball Incinerator Facility Kimball, NB

Table 2 Sampling and Analytical Program Summary for Waste Feed

Waste Feed	Sampling Method ©	Sampling Frequency	Analytical Parameters	Analytical Method	Total Samples for Analysis: Total Field	Lab QC	Total
Waste Solids **(a)**	Thief (S005) or Scoop (S007)	**(d)**	Total Chlorides	EPA M 5050 / 9253	4	1	5
			Heat Content	ASTM D 240	4	1	5
			Metals **(g)**	EPA M 6010C/7470A/7471B	4	2	6
			Ash	ASTM D 482	4	1	5
Pumpable Wastes **(b)**	Tap (S004)	**(e)**	Viscosity	ASTM D 2983	18	6	24
			Total Chlorides	EPA M 5050 / 9253	18	6	24
			Heat Content	ASTM D 240	18	6	24
			Metals **(g)**	EPA M 6010C/7470A/7471B	18	12	30
			Ash	ASTM D 482	18	6	24
			HCE	EPA M 8270C	18	12	30
			MCB	EPA M 8260C	18	12	30
			PCBs	EPA M 8082A	18	12	30
Fuel Oil	Tap (S004)	**(f)**	Viscosity	ASTM D 2983	1	1	2
			Total Chlorides	EPA M 5050 / 9253	1	1	2
			Heat Content	ASTM D 240	1	1	2
			Ash	ASTM D 482	1	1	2

(a) Waste solids (2 streams) include containerized solids and apron feed solids.

(b) Pumpable wastes (6 streams) include sludge, aqueous waste and liquid blend fed to the kiln and ABC and direct burn liquids fed to the kiln.

(c) Sampling method designations from EPA-600/8-84-002, February 1984.

(d) Containers will be prepared and characterized prior to the CPT. See Section 5.4.1.

Number of samples assumes all containerized waste (re-packed at plant) is from one source. If more than one source then number of samples will be higher - one sample per source used for containers. Apron feed solids will be three samples one for each test run,

(e) One grab sample every 30 minutes; one composite sample per run.

(f) One grab sample will be collected from the feed tank.

(g) Metals are As, Be, Cd, Cr, Pb, Hg, Ni

Table 3 Sampling and Analytical Program Summary for Emissions Monitoring

				Total Samples Analyzed			
	Analytical	**Analytical**	**Total**	**Field**		**Lab**	
Sampling Method	Parameters	Method	Field	Blanks	Audit	QC	Total
EPA M 5 / 26A	PM	EPA M 5	3	1	0	1	5
	HCl and Cl_2	EPA M 9057	3	1	1	2	7
EPA M 0023A	PCDDs/PCDFs	EPA M 0023A / M 8290	3	1	1	2	7
EPA M 0010	PCBs **(a)**	EPA M 1668A	6	1	0	2	9
EPA M 0010	SVOCs **(b)**	EPA M 8270C (Single Ion Monitoring)	3	1	0	1	5
EPA M 29	Metals **(c)**	EPA M 6010B	3	1	1	2	7
EPA M 0030 (VOST)							
VOST Tubes	VOCs **(d)**	EPA M 5041A / 8260B	9	4	3	1	17
VOST Tube Prep		EPA M 5041A	15				15
VOST Condensate	VOCs **(d)**	EPA M 8260B	3	1	0	1	5
Facility CEM	O_2, CO_2, CO, NO_X, SO_2, THC	Facility CEM QA Plan	3	0	0	0	3

(a) Target PCBs will include total mono-deca congeners. One sample per test run - front half/back half, condensate fractions combined.

(b) Target SVOCs: POHC – Hexachloroethane; One sample per test run - front half/back half, condensate fractions combined.

(c) Target Metals include: arsenic, beryllium, cadmium, chromium, lead, nickel and mercury.

(d) Target VOCs: POHC - Monochlorobenzene.

VOST tube analysis assumes that 3 of the 4 pairs from each run are analyzed individually.
4th pair is kept as an archive sample.
All field and trip blanks and any audit samples will be co-desorbed.

(e) Currently Stationary Source Audit Sample Program only has HCl and metals approved from the private contractors. Audit samples will be performed if they become available from the EPA SSAS Program.

Table 4 Sample Preservation and Holding Time Requirements

Stack Gas Samples [a]

Parameter	Matrix	Preservation	Holding Time
Volatile Organics (Method 0030)	Aqueous	Cool, 4°C	14 days
	Tenax and Tenax/charcoal	Cool, <10°C	14 days
PCDDs/PCDFs, PCBs and HCE (Method 0023A/0010)	Solvent rinses and XAD Resin	Cool, 4°C	30 days (to extraction)
			45 days (extraction to analysis)
PCBs Condensate 0023A/0010	Aqueous	Cool, 4°C	14 days (to extraction) 40 days (extraction to analysis
Chloride / Chlorine (Method 26A)	Aqueous	None required	30 days
Metals (Method 29) (except Hg)	Aqueous	None required	6 months
	Solid / Filter	None required	6 months
Mercury	Aqueous	None required	28 days
	Solid / Filter	None required	28 days
(a) Holding times will be calculated from the day of sample collection.			

Waste Feed Samples[a]

Parameter	Preservation	Holding Time
Metals	none required	6 months
Metals – Mercury	cool	28 days
Total Chlorides	none required	30 days
HCE, PCBs	cool	14 days to extraction; 40 days extraction to analysis
MCB	cool	14 days
BTU	none required	6 months
Viscosity	none required	6 months
Ash	none required	6 months
(a) Holding times will be calculated from the day of sample collection.		

Table 5 Summary of QA/QC Procedures for Chlorine, BTU, Ash, and Viscosity in Waste Feed

Summary of QA/QC Procedures for Chlorine in Waste Feed

Quality Parameter	Method Determination	Frequency	Target Criteria
Accuracy - calibration	Titration of Reference standard - 10mg/L NaCl	Daily	90%-110% of expected value
Accuracy	Matrix spike(1)	Once per batch	80% to 120% of expected value
Precision	Duplicate preparation and analysis of at least one run's samples	Once per waste stream	20% RPD(2)
Blank	Method blank carried through all sample preparation and analysis steps	Once per batch	Below detection limit

(1) Matrix spike is not applicable for high concentration samples above 10% Cl. So MS not performed
(2) RPD = relative percent difference

Summary of QA/QC Procedures for Heat Content (BTU) in Waste Feed

Quality Parameter	Method Determination	Frequency	Target Criteria
Accuracy	Reference material	Once per batch	75% to 125% of expected value
Precision	Duplicate samples	Once per waste stream	35% RPD
RPD – Relative Percent Difference			

Use Benzoic Acid once per batch. Range 11201 – 11545 btu/lb.
LCS standard once per batch. Range 19487 – 20277 btu/lb.

Summary of QA/QC Procedures for Ash in Waste Feed

Quality Parameter	Method Determination	Frequency	Target Criteria
Accuracy	Reference material	Once per batch	80% to 120% of expected value
Precision	Duplicate samples	Once per waste stream	35% RPD
RPD – Relative Percent Difference			

Table 5 Continued

Summary of QA/QC Procedures for Viscosity in Waste Feed

Quality Parameter	Method Determination	Frequency	Target Criteria
Accuracy	Reference material	Once per batch	80% to 120% of expected value
Precision	Duplicate samples	Once per waste stream	30% RPD
RPD – Relative Percent Difference			

Reference standard used is 50cps @ 25C

Table 6 Summary of QA/QC Procedures for Metals in Waste Feed Samples

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Initial analysis of standards at different concentration levels	At least once before sample analysis	Instrument-dependent. Linear corr. coefficient of std. Data >=0.995 for CVAA and 0.998 for ICAP
	Continuing mid-range calibration standard	Before and after sample analysis	80% to 120% of expected value for CVAA. 90% to 110% of expected value for ICAP
Interference check	Interference check sample	Before and after ICAP analysis	80% to 120% of expected value
Accuracy – calibration	Analysis of calibration check standard	After every initial calibration	90% to 110% of expected value
Accuracy	MS/MSD - Aliquot of one sample from a run spiked with analytes at 100 mg/kg for AS, Be, Cd, Cr, Pb, Ni; 0.2 mg/kg for Hg	One MS/MSD per sample matrix	70% to 130% recovery
Precision	MS/MSD preparation and analysis of one sample from each matrix	One MS/MSD per sample matrix	Range < 35% if sample result above lowest standard
Blank	Method blank carried through all sample preparation and analysis steps	Once per sample batch	Below detection limit
CVAA = cold vapor atomic absorption **ICAP = inductively coupled argon plasma**			

Table 7 Summary of QA/QC Procedures for POHCs in Waste Feed Samples

Analytical Parameter	QC parameter	Method of Determination	Frequency	Objective
Monochlorobenzene (Method 8260C)	Accuracy	Surrogate Recovery for Toluene-d8	Every sample	50-130%
	Accuracy	Matrix spike (MCB)	One per stream	
	Precision	Surrogate Recovery for Toluene-d8	Calculate RSD for each stream	< 35% RSD
	Precision	Duplicate preparation and analysis of one sample from each matrix	One per stream	< 35% RPD
Hexachloroethane (Method 8270C)	Accuracy	Surrogate Recovery for Nitrobenzene-d5	Every sample	50-130%
	Accuracy	Matrix spike (HCE)	One per stream	50-130%
	Precision	Surrogate Recovery for Nitrobenzene-d5	Calculate RSD for each stream	< 35% RSD
	Precision	Duplicate preparation and analysis of one sample from each matrix	One per stream	< 35% RPD
PCBs (Method 8082A)	Accuracy	Surrogate Recovery for Decachlorobiphenyl Tetrachloro-m-xylene	Every sample	50-130%
	Accuracy	Matrix spike (Aroclor 1016 and Aroclor 1260) [a]	One per stream	50-130%
	Precision	Surrogate Recovery for Decachlorobiphenyl Tetrachloro-m-xylene	Calculate RSD for each stream	< 35% RSD
	Precision	Duplicate preparation and analysis of one sample from each matrix	One per stream	< 35% RPD

[a] Matrix spikes not applicable for samples with > 0.1% of the target analyte (i.e., liquid blend material). Replicate analysis will be done on any such sample with the control limit determined by the Aragonite laboratory.

Table 8 QA Objectives for VOST Analyses

Quality Parameter	Method Determination	Frequency	Target Criteria
Blanks – sample integrity and field contamination	Field blanks, 1 pair of traps	One pair per sampling day	Less than lowest standard
Blanks – verify no contamination from storage / shipment	Trip blanks, 1 pair of traps	One pair per shipment	Less than lowest standard
Blanks – verify no lab contamination and system control	Lab blanks, 1 pair of traps	Daily, before analysis of samples and in-between high-level samples	Less than lowest standard
Consistency in chromatography	Monitor internal standard; retention time and area	Every sample, standard and blank	Retention time within ±30 sec of last calibration check; area within -50% to +100% area of IS in CCV.
Accuracy	Surrogate recovery for Toluene-d8	Every sample	50% - 150% recovery
Verification of VOST system accuracy	Analysis of samples from EPA audit cylinder, if provided	Once per test	Within 50% - 150% of certified concentration
Breakthrough determination	Separate analysis of front and back traps	All sample runs Unnecessary for blanks	Quantity on TX/C must be < 30% of amount on TX trap - does not apply when < 75 ng on TX/C trap
RSD = Relative Standard Deviation			

Table 9 QA Requirements for Metals in Stack Gas

Quality Parameter	Method Determination	Frequency	Target Criteria
Metals Other Than Mercury			
Calibration (M6010)	Initial analysis of standards at multiple levels	At least once when instrument is setup	Method-dependent. Linear correlation coefficient of standard data > 0.995
	Initial mid-range calibration verification (ICV)	At least once before and after sample analysis	90-110%
	Continuing calibration blank (CCB)	Every ten samples.	<Reporting Limit
	Continuing calibration check verification (CCV)	Every ten samples.	90% to 110%
Accuracy	Matrix spike	Once per test	75% to 125% recovery
Precision	MS / MSD (post-digestion spikes)	Once per test	RPD $\leq$ 20%
Blanks	Field Blanks & Method Blanks	One each per test	Evaluated on case by case basis
Mercury			
Calibration	6-point : Blank and 5 standards, lowest is reporting limit (RL)	Daily	$R^2 \geq 0.995$
	Continuing Calibration Verification (CCV) – may also be LCS	Every 10 samples and at end of day	85-115%
Accuracy (calibration)	Second Source Initial Calibration Verification (ICV)	Daily	90-110%
Accuracy	Matrix spikes (MS)	Once per test, all fractions except F1/2	80% - 120%
	Laboratory control samples (LCS)	Once per test, all fractions	85% - 115%
Precision	Matrix spike duplicate (MSD)	Once per test, all fractions except F1/2	RPD $\leq$ 20%
	Laboratory control sample duplicate (LCSD)	Once per test, F1/2 only	RPD $\leq$ 20%
Contamination	Method blanks (MB)	Once per test	Below RL
	Field blanks	Once per location	Case-by-case
	Reagent blanks	Once per batch	Case-by-case

RPD = Relative Percent Difference
ICAP = Inductively Coupled Argon Plasma

Table 10 QA Requirements for Chlorides in Stack Gas

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration (qualitative)	Relative retention time	Every calibration curve	±3 standard deviations of average
	Average retention time	Every calibration curve	Within retention time window of stds.
Calibration (quantitative)	Initial calibration with a minimum of four standards	At least once before sample analysis	Linear correlation coefficient > 0.995
	Continuing calibration	Every 10 samples and at end of day	90% - 110% of theoretical conc.
Accuracy (calibration)	Certified reference solution	After every initial calibration and before sample analysis	90% - 110% of true value
Accuracy	Matrix spikes	Once per test	75% - 125%
Precision	MS / MSD	Once per test	< 20%
Blank	One method blank carried through sample preparation and analysis	Once per test	ND at the RL or higher than RL if sample concentration is > 10X of the concentration measured in the blank

RPD = Relative Percent Difference

Table 11 QA Objectives for PCDD/PCDF Analysis of Stack Gas Samples

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Five-level calibration curve; continuing calibration standard	At least once; continuing calibration check at beginning of each 12-hr shift	Initial: <=20% RSD for unlabelled standards <=30% RSD for internal standards S/N ratio >=2.5; Isotope ratios within control limits Continuing: <=20% of ICAL for 17 unlabelled stds <=30% of ICAL for internal standards S/N ratio >=2.5; Isotope ratios within control limits
Accuracy-calibration	Analysis of calibration check	After every initial calibration	60% - 150% varies by homolog
Accuracy-surrogates	Spiked into samples prior to sampling	Every sample	70% - 130% recovery
Accuracy-internal standards	Spiked into samples prior to extraction and analysis	Every sample	40%-135% recovery for tetra – hexa 25%-150% for hepta & octa homologs
Blanks	Method blank	One per batch of samples	ND at the RL or higher than RL if sample concentration is > 10X of the concentration measured in the blank
	Field Blank	Once per test	Evaluated on a case-by-case basis
Mass Spectrometer Performance	Section 8.2.2 of Method 8290	At beginning of each 12-hr period	Static resolving power of 10,000 (10% valley definition)
Qualitative Identification	Retention Time and GC Column Performance	Every sample	Compliance with Section 8.2.1 of Method 8290

S/N = Signal to Noise Ratio

RSD = Relative Standard Deviation

Table 12 QA Objectives for SVOC (HCE) Analysis of Stack Gas Samples

Quality Parameter	Method Determination	Frequency	Target Criteria
Accuracy (surrogates)	Nitrobenzene-d5 spiked into samples prior to sampling and/or analysis	Every sample	50% - 150% recovery
Accuracy (spike)	Representative SVOCs spiked onto blank XAD trap	Once per CPT	50% - 150% recovery
Precision (surrogates)	Same as for accuracy - surrogates pool results for each SVOC component	Every SVOC sample	<40% RPD of surrogate recovery. If more than 3 determinations – RSD <35%
Method Blank	Each target analyte	Once per batch	ND at the RL or higher than RL if sample concentration is > 10X of the concentration measured in the blank
Field Blank	Each target analyte	Once per test	Evaluated on a case-by-case basis
RSD = relative standard deviation **RPD = relative percent difference**			

Table 13 QA Objectives for PCB Analysis of Stack Gas Samples

Quality Parameter	Method Determination	Frequency	Target Criteria
Accuracy-surrogates	Isotopically-labelled compounds spiked into samples prior to sampling and/or analysis	Every sample	30% - 140% recovery
Precision-surrogates	Same as for accuracy-surrogates; pool results for each PCB component	Every sample	< 50% RSD
Method Blank	Each PCB analyte	One per batch of samples	ND at the RL or higher than RL if sample concentration is > 10X of the concentration measured in the blank
Field Blank	Each PCB analyte	Once per test	Evaluated on a case-by-case basis
RSD = relative standard deviation			

Table 14 Air Emission Analytical Reporting Limits - VOST (MCB) and Dioxins/Furans

	Estimated Reporting Limits			
Parameter	**µg**	**µg/dscm**	**µg/dscf**	**lb/hr**
VOST (Tube Analysis)	0.010	4.71E-03	1.33E-04	6.17E-07
VOST (Condensate Analysis)	0.043	2.02E-02	5.73E-04	2.65E-06
2,3,7,8-TCDD	0.00004	1.88E-05	5.33E-07	2.47E-09
1,2,3,7,8-PeCDD	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,4,7,8-HxCDD	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,6,7,8-HxCDD	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,7,8,9-HxCDD	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,4,6,7,8-HpCDD	0.0002	9.42E-05	2.67E-06	1.23E-08
OCDD	0.0004	1.88E-04	5.33E-06	2.47E-08
2,3,7,8-TCDF	0.00004	1.88E-05	5.33E-07	2.47E-09
1,2,3,7,8-PeCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
2,3,4,7,8-PeCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,4,7,8-HxCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,6,7,8-HxCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
2,3,4,6,7,8-HxCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,7,8,9-HxCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,4,6,7,8-HpCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
1,2,3,4,7,8,9-HpCDF	0.0002	9.42E-05	2.67E-06	1.23E-08
OCDF	0.0004	1.88E-04	5.33E-06	2.47E-08

µg – micrograms, µg/dscm – micrograms per dry standard (68°F, 1 Atmosphere) cubic meter, µg/dscf – micrograms per dry standard (68°F, 1 Atmosphere) cubic foot, lb/hr – pounds per hour
Concentrations and mass emissions assumes a sample volume of 75 dry standard cubic feet and a volumetric stack flow of 35,000 dry standard cubic feet per minute.

Table 15 Air Emissions Analytical Reporting Limits - PCB. HCE, Metals

	Reporting Limits			
Parameter	**µg**	**µg/dscm**	**µg/dscf**	**lb/hr**
PCB #77	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #81	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #105	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #114	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #118	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #123	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #126	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #156	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #157	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #167	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #169	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #170	0.0008	3.76E-04	1.06E-05	4.94E-08
PCB #180	0.0016	7.52E-04	2.12E-05	9.88E-08
PCB #189	0.0004	1.88E-04	5.33E-06	2.47E-08
PCB #209 (Decachlorobiphenyl)	0.004	1.88E-03	5.33E-05	2.47E-07
Mono - Deca PCB (totals) by chlorination level	0.005	3.76E-03	2.67E-04	4.94E-07
Hexachloroethane	0.4	1.88E-01	5.33E-03	2.47E-05
Arsenic	2	9.4E-01	2.6E-02	1.2E-04
Beryllium	1	4.7E-01	1.3E-02	6.2E-05
Cadmium	1	4.7E-01	1.3E-02	6.2E-05
Chromium	2	9.4E-01	2.6E-02	1.2E-04
Lead	2	9.4E-01	2.6E-02	1.2E-04
Nickel	8	3.8E-00	1.1E-01	4.9E-04
Mercury	1.0	4.71E-01	1.33E-02	6.17E-05

µg – micrograms, µg/dscm – micrograms per dry standard (68°F, 1 Atmosphere) cubic meter, µg/dscf – micrograms per dry standard (68°F, 1 Atmosphere) cubic foot, lb/hr – pounds per hour
Concentrations and mass emissions assumes a sample volume of 75 dry standard cubic feet and a volumetric stack flow of 35,000 dry standard cubic feet per minute.

Table 16 Waste Feed Liquids Estimated Analytical Reporting Limits

PARAMETER	METHOD	METHOD DETECTION LIMIT	LABORATORY REPORTING LIMIT
Heating Value (BTU)	ASTM-D240	600 btu/lb	600 btu/lb
Ash	ASTM-D482	0.1%	0.1%
Viscosity	ASTM-D2983	1cps	1cps
Chlorine	SW-846-5050/9253	2000mg/Kg	2000mg/Kg
Metals			
Arsenic	SW-846-6010B	10 mg/Kg	10 mg/Kg
Beryllium	SW-846-6010B	1.4 mg/Kg	1.4 mg/Kg
Cadmium	SW-846-6010B	2.0 mg/Kg	2.0 mg/Kg
Chromium	SW-846-6010B	10 mg/Kg	10 mg/Kg
Lead	SW-846-6010B	10 mg/Kg	10 mg/Kg
Mercury	SW-846-7470A	0.06 mg/Kg	0.06 mg/Kg
Nickel	SW-846-6010B	10 mg/Kg	10 mg/Kg
Chlorobenzene	SW-846-8260B	0.5 mg/Kg	0.5 mg/Kg
Hexachloroethane	SW-846-8270C	0.5 mg/Kg	0.5 mg/Kg
PCB	SW-846-8082	2.0 mg/Kg	2.0 mg/Kg

Lab reporting limit is based on the LOQ (Limit of Quantitation) which is the lowest verified point that a value can be reported within a known level of confidence, adjusted for sample dilution. It is based on the lowest calibration standard checked daily before and after analysis.

Table 17 Waste Feed Solids Estimated Analytical Reporting Limits

PARAMETER	METHOD	METHOD DETECTION LIMIT	LABORATORY REPORTING LIMIT
Heating Value (BTU)	ASTM-D240	600 btu/lb	600 btu/lb
Ash	ASTM-D482	0.1%	0.1%
Chlorine	SW-846-5050/9056	2000 mg/Kg	2000 mg/Kg
Metals			
Arsenic	SW-846-6010B	10 mg/Kg	10 mg/Kg
Beryllium	SW-846-6010B	1.4 mg/Kg	1.4 mg/Kg
Cadmium	SW-846-6010B	2.0 mg/Kg	2.0 mg/Kg
Chromium	SW-846-6010B	10 mg/Kg	10 mg/Kg
Lead	SW-846-6010B	10 mg/Kg	10 mg/Kg
Mercury	SW-846-7470A SW-846-7471A	0.06 mg/Kg	0.06 mg/Kg
Nickel	SW-846-6010B	10 mg/Kg	10 mg/Kg

Lab reporting limit is based on the LOQ (Limit of Quantitation) which is the lowest verified point that a value can be reported within a known level of confidence, adjusted for sample dilution. It is based on the lowest calibration standard checked daily before and after analysis.

Figure 1 Sample Packing List

Site of Program :	**Clean Harbors**	**Sample Date :**	**Project Location: Aragonite, UT**	**Lab P.O. #**
Type of Program :	**RCRA/TSCA CPT**	**Date Shipped :**	**Laboratory:**	
Project No. :		**Cooler No. :**		
APT Office :	**Arvada, CO**	**DOT Box No. :**		
APT Contact :	**Alex Mongold**	**Signature :**	**FedEx Airbill No. :**	

Item	Sample ID	Matrix	Description	Analytical Parameters	Instructions

Field Notes / Comments:

(1) Please return this form with analytical results.

C:\TEMPLATE\QAPP\[samplist.xls]A

Relinquished by (Print) **Justin Nylen**	Date:	Received by (Print)	Date:	**Analytical Laboratory:**	
Signature:	Time:	Signature:	Time:		
Relinquished by (Print)	Date:	Received by (Print)	Date:	Received by:	Date:
Signature:	Time:	Signature:	Time:	Signature:	Time:

APPENDIX A

CLEAN HARBORS ARAGONITE QAPP

PROCESS DESCRIPTION

1. Introduction

This section briefly describes the incineration train and waste materials fed to the incinerator.

2. Incineration System Description

The incineration system consists of a slagging rotary kiln followed by a vertical afterburner chamber (ABC) and a gas conditioning and air pollution control train composed of a spray dryer, baghouse, saturator, and a two-stage packed bed scrubber. A wet electrostatic precipitator, installed after the scrubber during original construction, is no longer operated.

The incineration system was designed by Ford, Bacon and Davis Utah, Inc., of Salt Lake City, Utah. The rotary kiln design is by Deutsche Babcock Anlagen, West Germany. No model number designation is available since the unit was custom designed.

2.1 Combustion System

The combustion system consists of a slagging rotary kiln and afterburner chamber. The incineration system has a rated heat release of 140 x 10^6 Btu/hr. The kiln has a diameter of 13.4 feet and is 39.2 feet long. The carbon steel kiln is lined with high temperature resistant brick. The cross-sectional area of the kiln with an eight-inch thick brick lining perpendicular to the direction of gas flow is 114.4 ft^2.

Bulk solid wastes are fed to the rotary kiln at the kiln front wall through the solids feed chute (apron feeder). Drums are fed to the rotary kiln through the solids feed chute using an elevator and feed inlet gate.

Liquid organic wastes from the bulk liquids tank farm and/or auxiliary fuel are fed to the rotary kiln through a single combination burner located in the kiln front wall. Fuel oil and/or liquid organics can be fired at a maximum design rate of 80 MM Btu/hr through the kiln combination burner. The kiln burner is air atomized. Normal operation of the kiln front wall burner requires only a nominal auxiliary fuel rate to maintain a stable flame.

The sludge lance is installed in the kiln front wall, and is a pipe that extrudes waste into the rotary kiln. The direct burn port and an aqueous port are also located in the kiln front wall.

The afterburner is a steel structure lined with refractory. The cross-sectional area of the afterburner chamber is 324.4 ft^2, and the internal dimensions of the afterburner chamber are:

- Width – 17' 3 3/8",
- Depth – 18' 9 ¼", and
- Height (from burner centerline to top) – 36' 5".

Liquid organic wastes from the bulk liquids tank farm and/or auxiliary fuel are fed to the afterburner chamber through two combination burners. The combination burners in the afterburner chamber and in the front wall of the kiln are fully equipped with control systems, flow indicating and recording instruments, and safety systems. Aqueous waste spray nozzles are also located in the afterburner chamber. The aqueous waste nozzles are air atomized. Materials from compressed gas cylinders are also fed to the afterburner.

Following are the calculations to determine maximum combustion gas flow rate through the ABC to maintain a residence time of two (2) seconds.

Chamber Volume

Volume = 18.7708 ft x 17.2813 ft x 36.4167 ft

= 11,813 ft^3

Stack Flow Rate at Residence Time of Two Seconds

Flow Rate = (11,813 ft^3 ÷ 2.0 seconds) x (60 sec/minute)

= 354,390 cfm @ 2,012°F, 12.5 psi, and 25% moisture

= 354,390 cfm x (68°F + 460)°R/(2,012°F + 460)°R x (12.5 ÷14.7) x (1 – 25/100)

= 48,275 dscfm

2.2 Combustion Air

The incinerator operates under negative pressure. Combustion air is distributed to the burner located in the front wall of the rotary kiln and to the two burners in the afterburner chamber. Air is pulled into the fan from the atmosphere and from pick-up points from the bulk solids building. Some combustion air is introduced at the kiln back wall through air in-leakage around the seals. An induced draft fan is used to draw combustion gases through the unit and to maintain a negative pressure on the incineration system. The induced draft fan is located after the WESP and discharges to the stack. The induced draft fan has a variable speed 400 HP motor and a Hastelloy wheel. The amount of air that flows through the incinerator depends upon the speed of the ID fan and system pressure drop.

2.3 Gas Conditioning and Air Pollution Control

The hot combustion gases exiting the afterburner chamber are treated by the gas conditioning and air pollution control train to remove entrained particulate matter and acid gases.

2.3.1 Spray Dryer

The spray dryer serves to cool the hot gases by evaporation to a level acceptable to admit them to the baghouse for filtration. Additionally, the brine solution resulting from the various absorbing, scrubbing, and neutralizing steps is spray dried thus eliminating the need for process liquid blowdown. Some of the dried solids from the brine are collected to the screw bottom and discharged for off-site disposal. Most of the dried solids continue on with the combustion gases to the baghouse. Material of construction is carbon steel and the vessel is refractory lined.

2.3.2 Baghouse

Cooled gases from the spray dryer contain particulate from the combustion and spray drying processes. The baghouse removes most of the particulate by filtration before discharging the gases to the saturator. The fiberglass bags have an area of 42,240 ft^2, and are located in multiple compartments with compressed air bag pulse cleaning systems. The collected solids are mechanically conveyed for off-site disposal at a hazardous waste landfill. Material of construction is carbon steel.

2.3.3 Saturator

The moderately warm gases from the baghouse are cooled to saturation temperature in the saturator. This step is performed to protect downstream equipment and prepare the gases for scrubbing.

2.3.4 Wet Scrubber

Saturated gases exiting from the saturator are admitted to a two-stage packed bed wet absorbing/scrubbing process. This process reduces the levels of sulfur dioxide and hydrogen chloride in the gases. The scrubbers are physically arranged for counter flow of gases and liquids. The scrubbing liquor for each scrubbing stage is separately circulated, cooled, and neutralized. The second stage neutralization circuit has a blow down to the first stage. The first stage neutralization circuit has a blow down to the spray dryer.

2.3.6 Stack

Gases are drawn through the air pollution control train by an induced draft (ID) fan. The ID fan propels the gases to the stack for atmospheric discharge. The stack is constructed of FRP, is secured by guy wires, and discharges 149 feet above grade.

3. Feed Mechanisms

The Aragonite incineration facility has different feed mechanisms, allowing for maximum flexibility in the handling and incineration of wastes. These wastes and their feed mechanisms are:

- Containerized waste – fed to the rotary kiln by use of a ram feed mechanism. Some containerized waste liquid is also pumped from the container directly to the rotary kiln.

- Bulk solids – fed to the rotary kiln by use of an apron feeder.
- Sludge materials – fed to the rotary kiln from storage tanks or directly from direct burn vessels or over the road tankers .
- Direct burn liquid waste (energetic) – fed to the rotary kiln from direct burn vessels and over the road tankers. The material from this system is fed via a direct burn port in the front wall of the rotary kiln.
- Aqueous liquid waste – fed to the rotary kiln (currently not in use) and ABC from storage tanks. The kiln aqueous port will be used to feed aqueous metals solutions (Cr and Hg) being spiked during the test.
- Liquid blend waste – fed to the rotary kiln and ABC from storage tanks, and
- Materials from compressed gas cylinders – fed to the ABC from a cylinder emptying station (currently out of service).

Used oil is used as auxiliary fuel to the incinerator. Used oil can be fed to both the rotary kiln and ABC from the fuel storage tank. Auxiliary fuel is typically used during startup and shutdown of the incinerator and may be used during waste operations as needed.

4.0 Waste Stream Characterization

RCRA characteristic and listed wastes, TSCA wastes, i.e. PCBs-containing wastes, and RCRA/TSCA comingled wastes are treated in the Aragonite incinerator. The facility is designed to handle all waste phases including liquids, solids, and sludges. RCRA characteristic wastes and listed wastes are treated with the exception of those excluded by the permit, i.e. water reactive wastes (except in approved labpacks); pyrophoric wastes; DOT forbidden explosives; shock sensitive wastes; radioactive wastes; and the dioxin-containing wastes (RCRA waste codes F020, F021, F022, F023, F026, F027, and F028).

Additional information for the targeted compositions of waste materials to be fed to the incinerator during the 2017 CPT can be found in Table 5-1 of CPT plan.

5.0 Process Stream Descriptions

The incineration process generates several process streams. The rotary kiln is operated in the slagging mode during normal operations. The slag exits the incinerator and is cooled in a wet deslagger. The cooled material is then discharged into roll-off boxes for off-site disposal.

The combustion gases exiting the ABC enter a spray dryer. Scrubber blow down, which has been neutralized with soda ash, is added to the combustion gases in the spray dryer to cool the gases.

Some of the dried solids fall to the bottom of the spray dryer and are transferred into roll-off boxes for off-site disposal. Most of the dried solids continue on with the combustion gases to the baghouse.

Leaving the spray dryer, the combustion gases enter the baghouse. Remaining solids in the gas stream are removed in the baghouse. Baghouse solids, from the periodic cleaning of the bags, are placed into roll-off boxes for off-site disposal. The combustion gases pass through a saturator that cools them to 175°F and then through a scrubber where some of the combustion products are absorbed by the circulating brine. The scrubbed gases then exit the stack. The circulating brine from the scrubbers is blown down to the spray dryer.

APPENDIX B

CLEAN HARBORS ARAGONITE QAPP

EXAMPLE OF FIELD DATA SHEETS
AIR SAMPLING TRAINS

CHAIN OF CUSTODY RECORD

Temperature on Receipt _____

AIR POLLUTION TESTING
5530 MARSHALL ST.
ARVADA, CO 80002
T (303) 420-5949
F (303) 420-5920

PROJECT CODE			PROJECT MANAGER			CHAIN OF CUSTODY #
CLIENT NAME			TELEPHONE # / FAX #			**Page _____ of _____**
ADDRESS			DATE			CONTRACT/PURCHASE/QUOTE #
CITY	STATE	ZIP CODE	SITE CONTACT	LAB CONTACT	LAB NUMBER	CARRIER / WAYBILL #

SAMPLE I D	RUN	FILTER/BEAKER ID	DATE COLLECTED	MATRIX	ANALYSIS	SPECIAL CONDITIONS

POSSIBLE HAZARD IDENTIFICATION (CIRCLE)	SAMPLE DISPOSAL (CIRCLE)	TURN AROUND TIME (CIRCLE)
NON HAZARD FLAMMABLE SKIN IRRITANT POISON B UNKNOWN	RETURN TO CLIENT DISPOSAL BY LAB ARCHIVE FOR _____ MONTHS	24HRS 48HRS 7 DAYS 14 DAYS 21DAYS OTHER_____

1 Relinquished By	Date	Time	1 Received By	Date	Time
2 Relinquished By	Date	Time	2 Received By	Date	Time
3 **Relinquished By**	Date	Time	3 Received By	Date	Time
Comments					

Air Pollution Testing Inc. : EPA Method 2 - Verification of Absence of Cyclonic Flow Datasheet

Job # ______	Operator ______	Stack Diameter (inches) . ______
Facility ______	Site ______	Upstream Disturbance (inches) . ______
Date ______	Points . 1 7	Downstream Disturbance (inches) ______
Probe ID . ______	2 8	Schematic of Sampling Location
Pitot Constant ______	3 9	
	4 10	
	5 11	
	6 12	
Post Test Pitot Leak Check Good? :		

Point #	*Delta P at 0 degrees*	*Angle at 0 0 Delta P*	*Point #*	*Delta P at 0 degrees*	*Angle at 0 0 Delta P*	*Point #*	*Delta P at 0 degrees*	*Angle at 0 0 Delta P*
Average Absolute Angle =			Average Absolute Angle =			Average Absolute Angle =		

* If the absolute average angle is greater than 20 degrees, the flow is considered non-laminar and an alternative method must be used

Air Pollution Testing, Inc. : Analyzer Calibration Datasheet

Facility :	Date :
Location :	APT Job # :
Unit :	Page # :

Analyzer Information

Analyzer Type						
Analyzer ID #						
Analyzer Scale						
Calibration Range						

Calibration Gas Cylinder Information (Cylinder ID#/Expiration date and Concentration)

Analyzer Type						
Zero						
CC#						
Expiration date						
Low						
CC#						
Expiration date						
Mid						
CC#						
Expiration date						
High						
CC#						
Expiration date						

Calibration Error

Analyzer Type						
Zero						
Low						
Mid						
High						

Initial Bias Check

Analyzer Type						
Zero						
Low						
Mid						
High						
system response time						

Air Pollution Testing, Inc. : Analyzer Calibration Datasheet

Facility : Date :

Location : APT Job # :

Unit : Page # :

Run # : **Start Time :** **Stop Time :**

Calibration Results

Analyzer Type						
Zero						
Low						
Mid						
High						

Run # : **Start Time :** **Stop Time :**

Calibration Results

Analyzer Type						
Zero						
Low						
Mid						
High						

Run # : **Start Time :** **Stop Time :**

Calibration Results

Analyzer Type						
Zero						
Low						
Mid						
High						

Converter Efficiency Test

40 CFR Part. 60, Appendix A, Method 7E, Section 16.2

16.2 - Alternative NO_2 to NO Conversion Efficiency Procedures.

16.2.2 – Add gas from the mid-level NO in N_2 calibration gas cylinder to a clean, evacuated, leak-tight Tedlar bag. Dilute this gas approximately 1:1 with 20.9% O_2, purified air. Immediately attach the bag outlet to the calibration valve assembly and begin operation of the sampling system. Operate the sampling system, recording the NO_X response, for at least 30 minutes. If the NO_2 to NO conversion is 100%, the instrument response will be stable at the highest peak value observed. If the response at the end of 30 minutes decreases more than 2.0% of the highest peak value, the system is not acceptable and corrections must be made before repeating the check.

Date of Test: _____

Analyzer Type: _____

Analyzer S/N: _____

Span Value: _____

Mid-Level Gas Concentration: _____

Start of Test:		After 30 Minutes:	
Time:	_____	Time:	_____
NO_x High Peak Response:	_____	NO_x Final Response:	_____
NO Response:	_____	NO Response:	_____
		NO_X % Decrease:	_____

40 CFR Part. 60, Appendix A, Method 7E, Section 12.9, Equation 7E-9

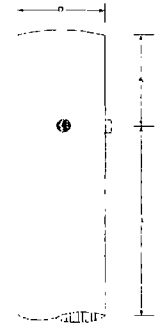
$$\%\ \text{Decrease} = 100 \times \frac{NO_X\ \text{Peak} - NO_X\ \text{Final}}{NO_X\ \text{Peak}}$$

Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #:	Date:	CO_2 (%):	O_2 (%)
Location:	Operator:	Ambient Temperature (°F):	Barometric Press (mbar):
Run #	Meter Box ID	Probe Length (ft):	Moisture (grams):
Meter Box Y_d:	Meter ΔH@:	Static Pressure (" H_2O):	Start Time:
Pre-Test Pump Leak Check:	Post-Test Pump Leak Check	Method.	Stop Time:

Sampling Time (minutes)	Vacuum (" Hg)	ΔH Orifice Setting (" H_2O)	T_m Meter Temp. Inlet (°F)	T_m Meter Temp. Outlet (°F)	Condenser Temp. (°F)	Probe Temp. (°F)	Meter Volume (ft^3) Initial Volume:	Notes
total	maximum	average	average		maximum	average	difference	

Schematic of Stack :



Stack ID (inches):

Upstream Disturbance (inches):

Downstream Disturbance (inches):

200 gram Field Check of Scale (value):

Moisture Determination

Imp. #	Tare	Final	Gain
1			
2			
3			
4			
Total			

Technician's Signature

Project Leader's Signature

Air Pollution Testing, Inc. : Constant Rate Sampling Datasheet

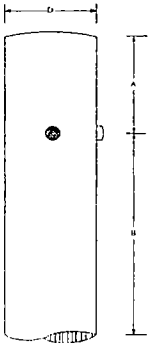
APT Job #.	Date:	CO2 (%):	O2 (%):
Location.	Operator:	Ambient Temperature (oF):	Barometric Pressure (mbar):
Run #	Meter Box ID:	Probe Length (ft):	Moisture (grams):
Meter Box Yd:	Meter DH@:	Static Pressure (" H2O):	Start Time:
Pre-Test Pump Leak Check:	Post-Test Pump Leak Check:	Method:	Stop Time:

Stack ID (inches): _____

Upstream Disturbance (inches): _____

Downstream Disturbance (inches): _____

Schematic of Sampling Location :



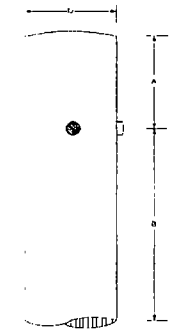
Sampling Time (minutes)	Vacuum (" Hg)	Sample Flow Rate (lpm)	Orifice Setting (in H2O)	Meter Temp Inlet (oF)	Meter Temp Outlet (oF)	Condenser Temp. (oF)	Meter Volume (liters) Initial Volume	Notes
total	maximum	average	average	average		maximum	difference	

Reviewers Signature

Page Of

Air Pollution Testing Inc. : Isokinetic Sampling Train

APT Job #	Date	CO_2 (%)	O_2 (%)
Sample Location	Operator	Assumed Moisture (%)	Barometric Pressure (mbar)
Run #	Pitot ID	Ambient Temperature (°F)	Probe Material
Meter Box Yd	Pitot Tube Coefficient	Probe Length (ft)	Filter Temperature (°F)
Sample Box ID	Meter Box ID	Probe Temperature (°F)	Moisture (grams)
Meter ΔH@	K Factor	Nozzle Diameter (in)	Start Time
Pre-Test Pitot Leak Check	Post-Test Pitot Leak Check	Static Pressure (" H_2O)	Stop Time
Pre-Test Pump Leak Check @ "Hg	Post-Test Pump Leak Check @ "Hg	Filter ID	Method



Traverse Point	Sampling Time (minutes)	Vacuum (" Hg)	√ Velocity Head (" H_2O)	ΔH Orifice Setting (" H_2O)	T_s Stack Temp (°F)	Meter Volume (ft^3) Initial Volume	Probe Temp (°F)	Filter Temp (°F)	T_m Meter Temp Inlet (°F)	Meter Temp Outlet (°F)	Condenser Temp (°F)	XAD Temp (°F)	Ki (ft^3/min)	Pv (ft^3)
number	total	maximum	average root	average	average	difference	minimum	minimum	average		maximum	maximum	Reviewers Signiture	

Stack ID (inches) (D)

Upstream Disturbance (inches) (A)

Downstream Disturbance (inches) (B)

# of points

Moisture Determination

Imp #	Tare	Final	Gain
1			
2			
3			
4			
Total			

Notes :

Air Pollution Testing Inc. : EPA Method 2 - Pitot Traverse Datasheet

Job # :	Operator :	Stack Diameter (inches) :
Facility :	Site :	Upstream Disturbance (inches) :
Date :	Points : 1 5 9	Downstream Disturbance (inches) :
Probe ID :	2 6 10	Schematic of Sampling Location :
Pitot Constant :	3 7 11	
Pitot Tube Visual Check:	4 8 12	

Run # :	Run # :	Run # :
O2% : CO2% :	O2% : CO2% :	O2% : CO2% :
H20% : measured / estimate	H2O% : measured / estimate	H2O% : measured / estimate
Ps ("H2O) : Pb (mbar) :	Ps ("H2O) : Pb (mbar) :	Ps ("H2O) : Pb (mbar) :
Start Time : Stop Time :	Start Time : Stop Time :	Start Time : Stop Time :
Post Test Pitot Leak Check Good? :	Post Test Pitot Leak Check Good? :	Post Test Pitot Leak Check Good? :

Point #	*Delta P*	*Ts*	*Notes*	*Point #*	*Delta P*	*Ts*	*Notes*	*Point #*	*Delta P*	*Ts*	*Notes*
Averages				Averages				Averages			

Reviewers Signature

Air Pollution Testing, Inc. : Laboratory Impinger Weight Gain Datasheet

APT Job # : | Barometric Pressure : | Date :

Facility: | Orsat ID: | Operator :

Stack ID: | Leak Check:

Run # : | Method : | Sample Box ID :

Impinger # and Contents	Inital Mass (grams)	Final Mass (grams)	Gain / Loss (grams)	Notes
1				
2				
3				
4				
5				
6				
7				
8				
Total				

Run # : | Method : | Sample Box ID :

Impinger # and Contents	Inital Mass (grams)	Final Mass (grams)	Gain / Loss (grams)	Notes
1				
2				
3				
4				
5				
6				
7				
8				
Total				

Run # : | Method : | Sample Box ID .

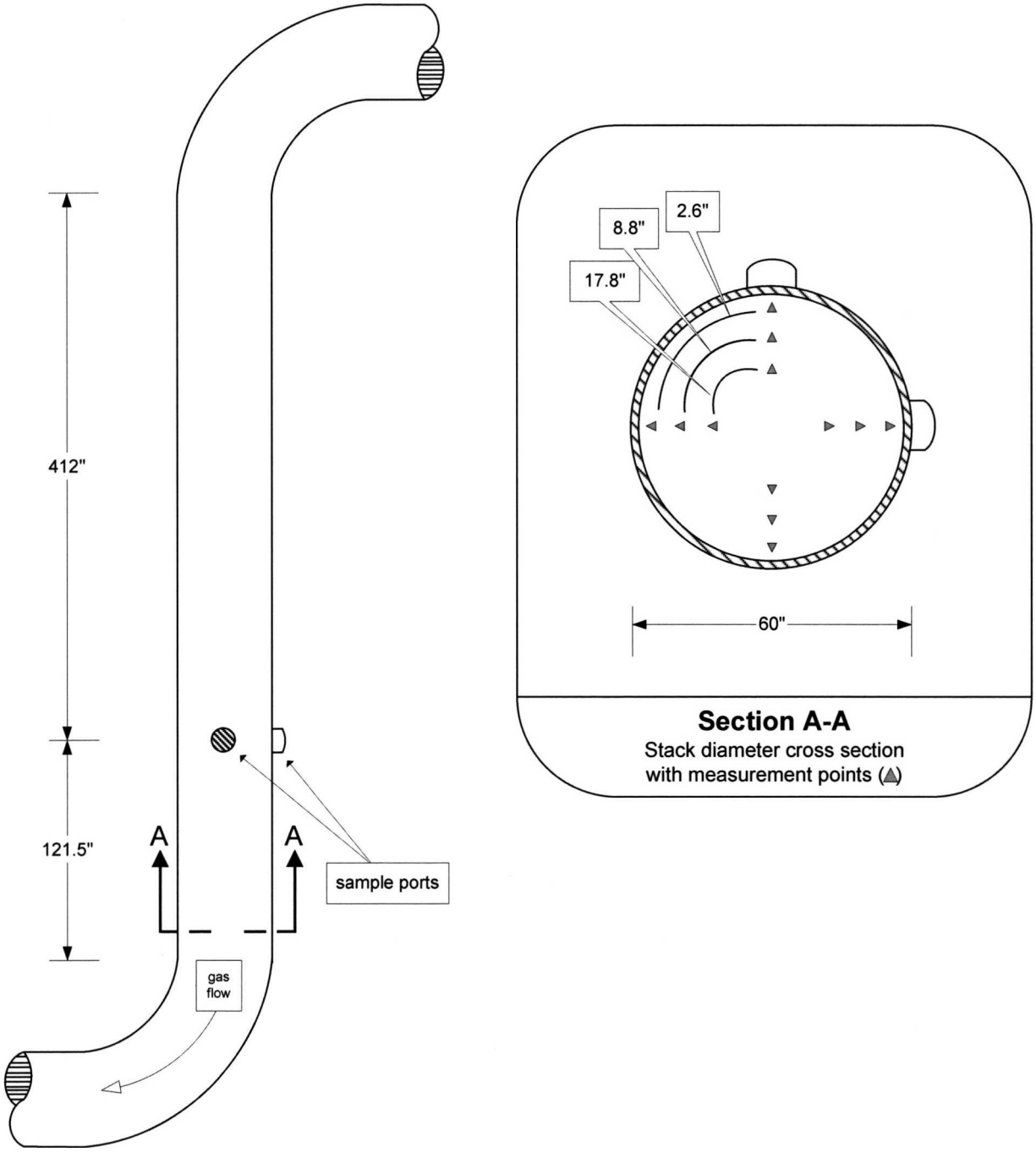
Impinger # and Contents	Inital Mass (grams)	Final Mass (grams)	Gain / Loss (grams)	Notes
1				
2				
3				
4				
5				
6				
7				
8				
Total				

APPENDIX C

CLEAN HARBORS ARAGONITE QAPP

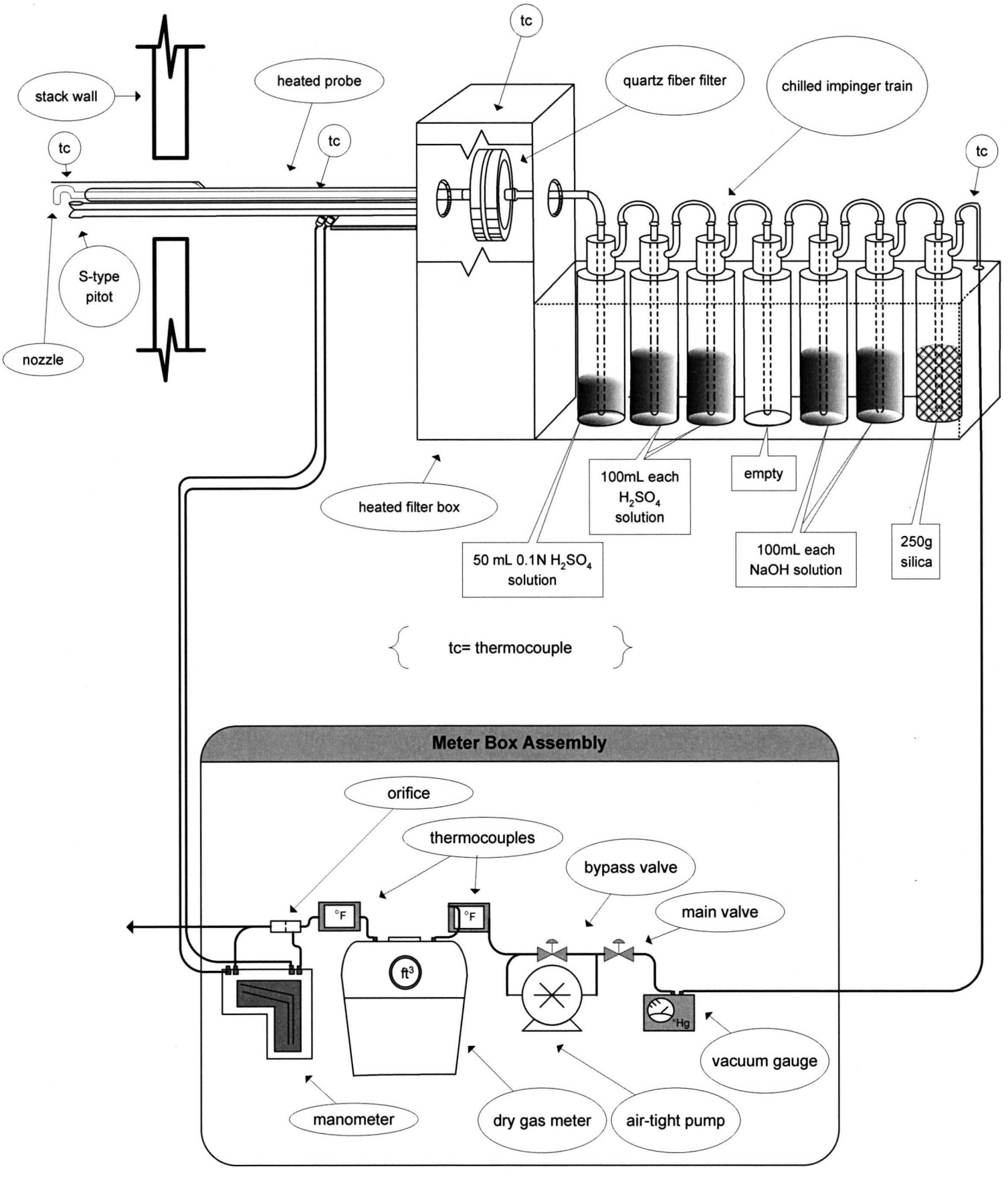
SAMPLE TRAIN SETUP
AND
SAMPLE RECOVERY

Test location

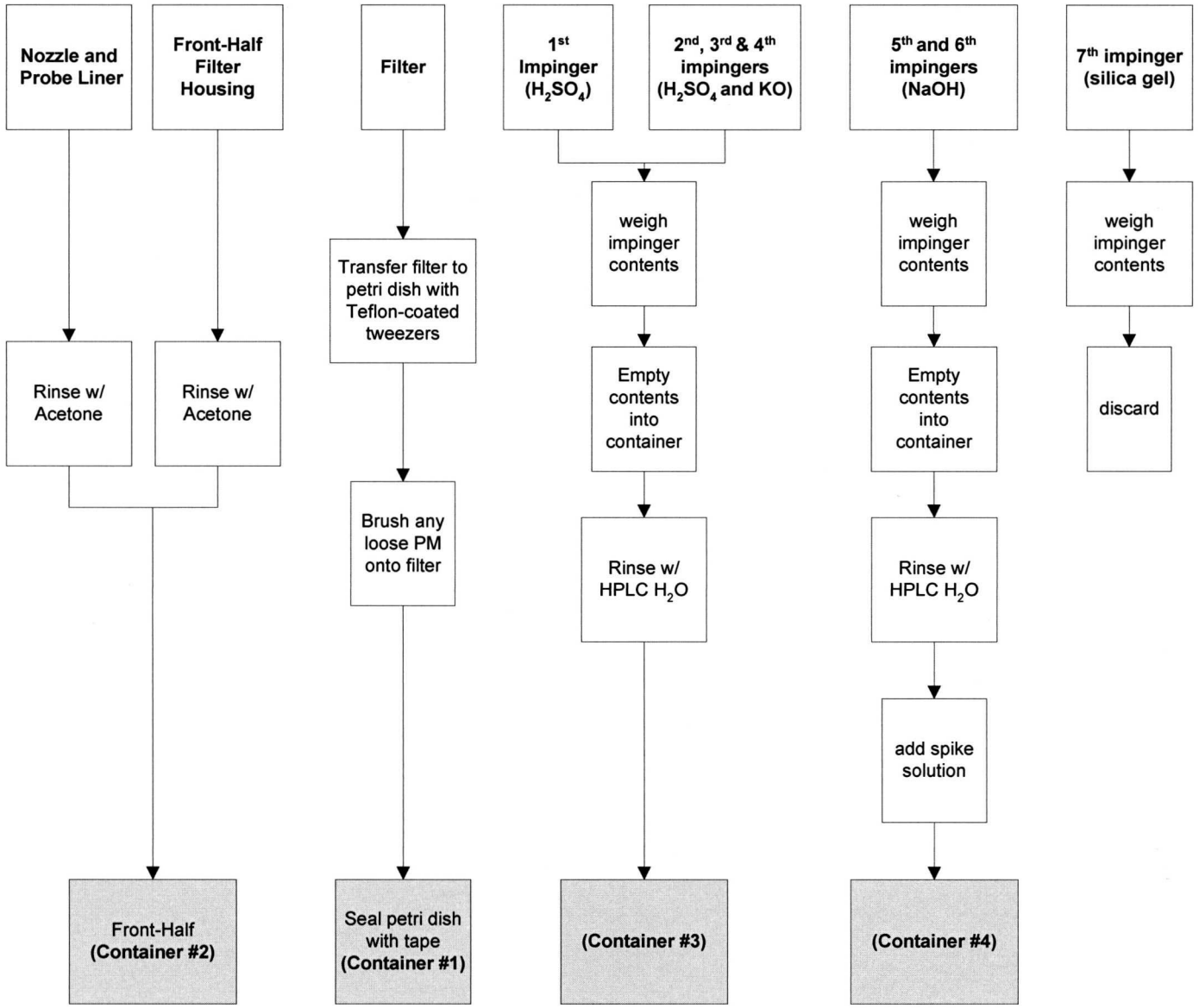


Sampling Location Schematic
(not to scale)

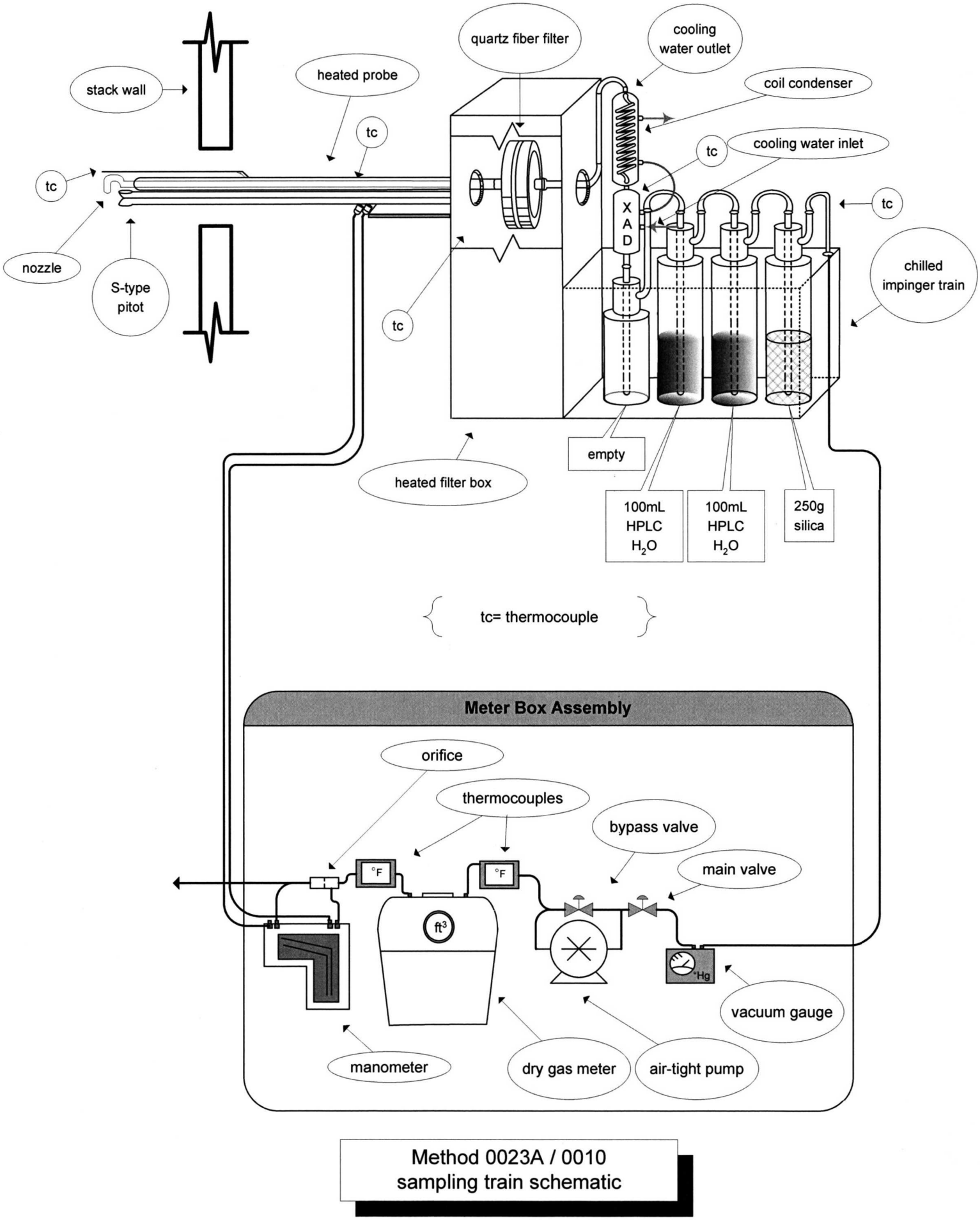
Sampling Trains



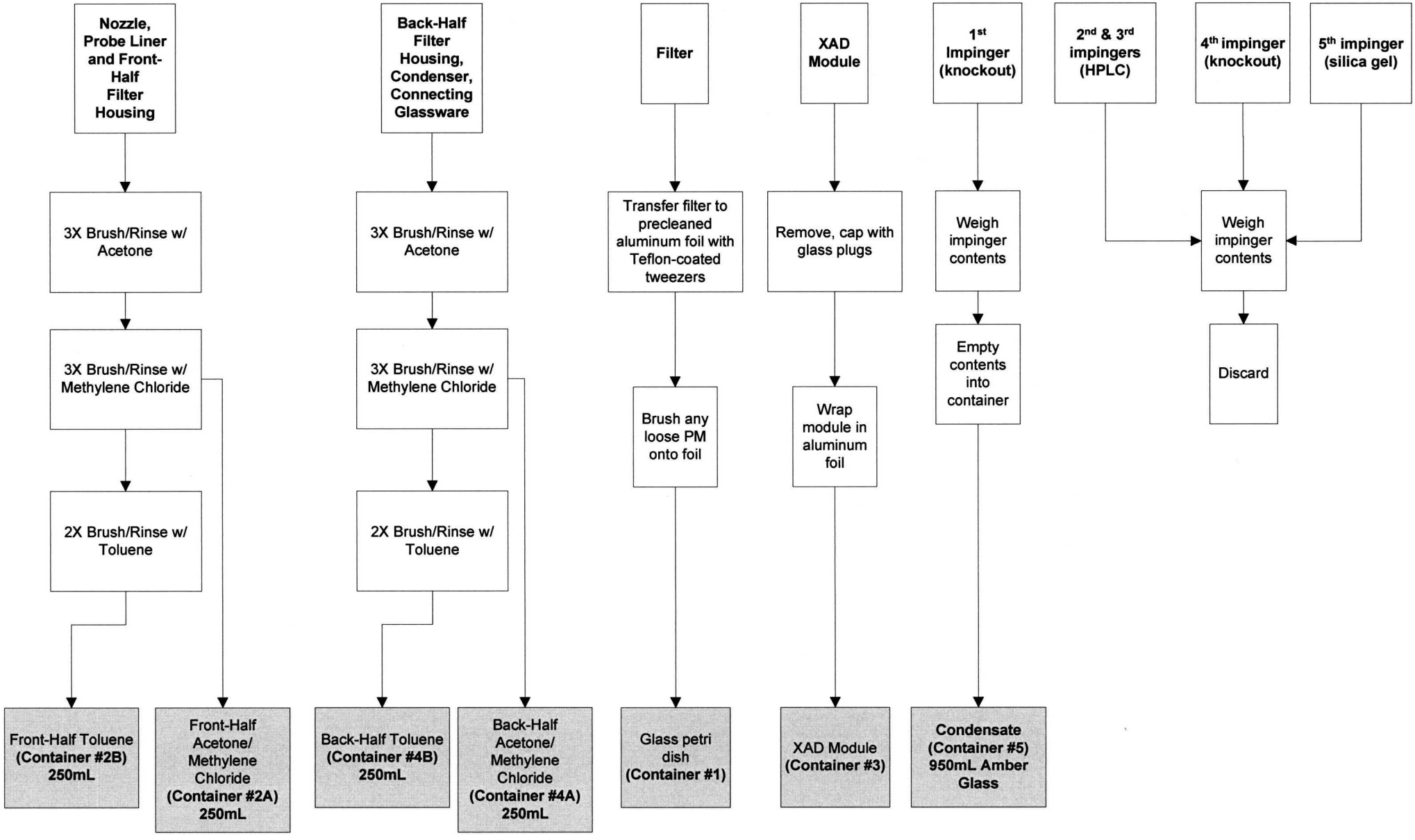
EPA Method 26A
sampling train schematic



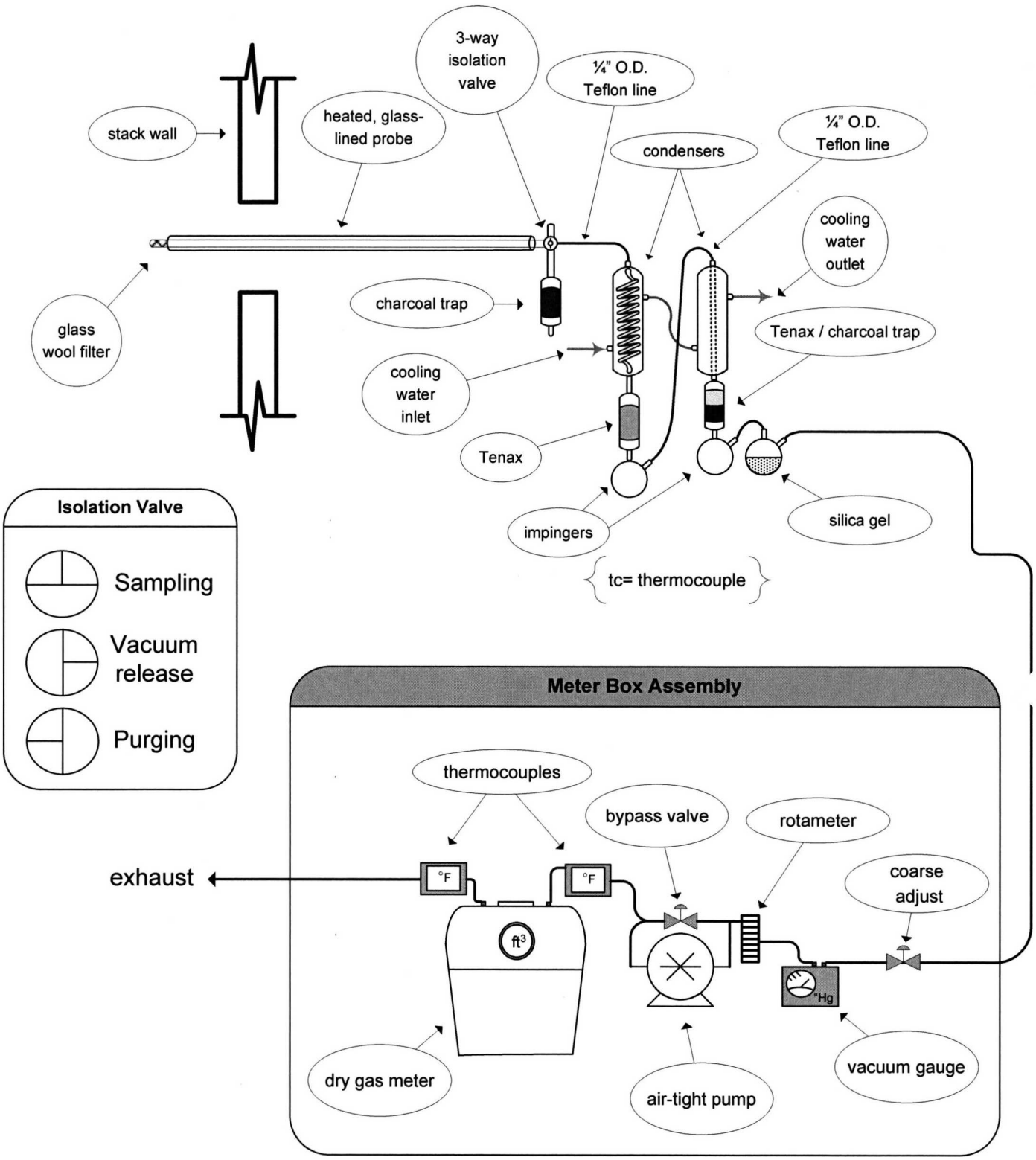
Method 26A Recovery



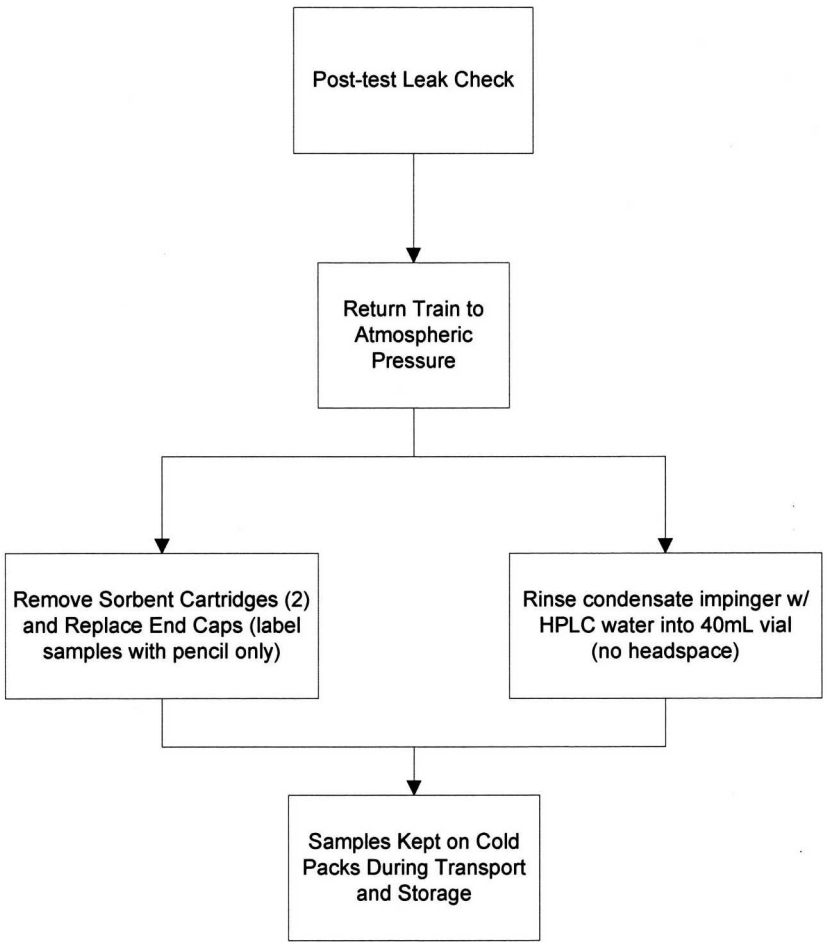
Method 0023A / 0010
sampling train schematic



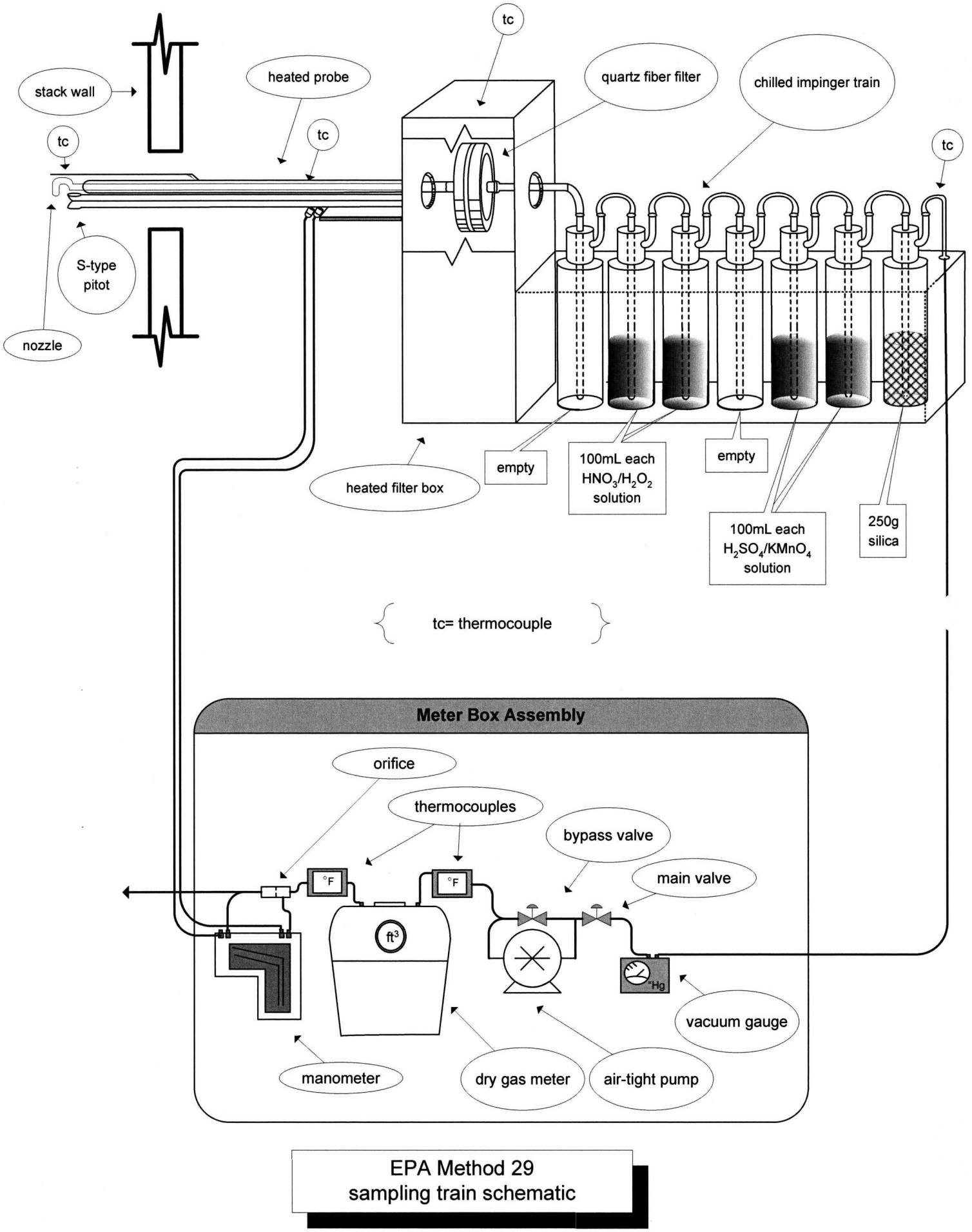
Method 0023A/0010 Recovery (Stack)



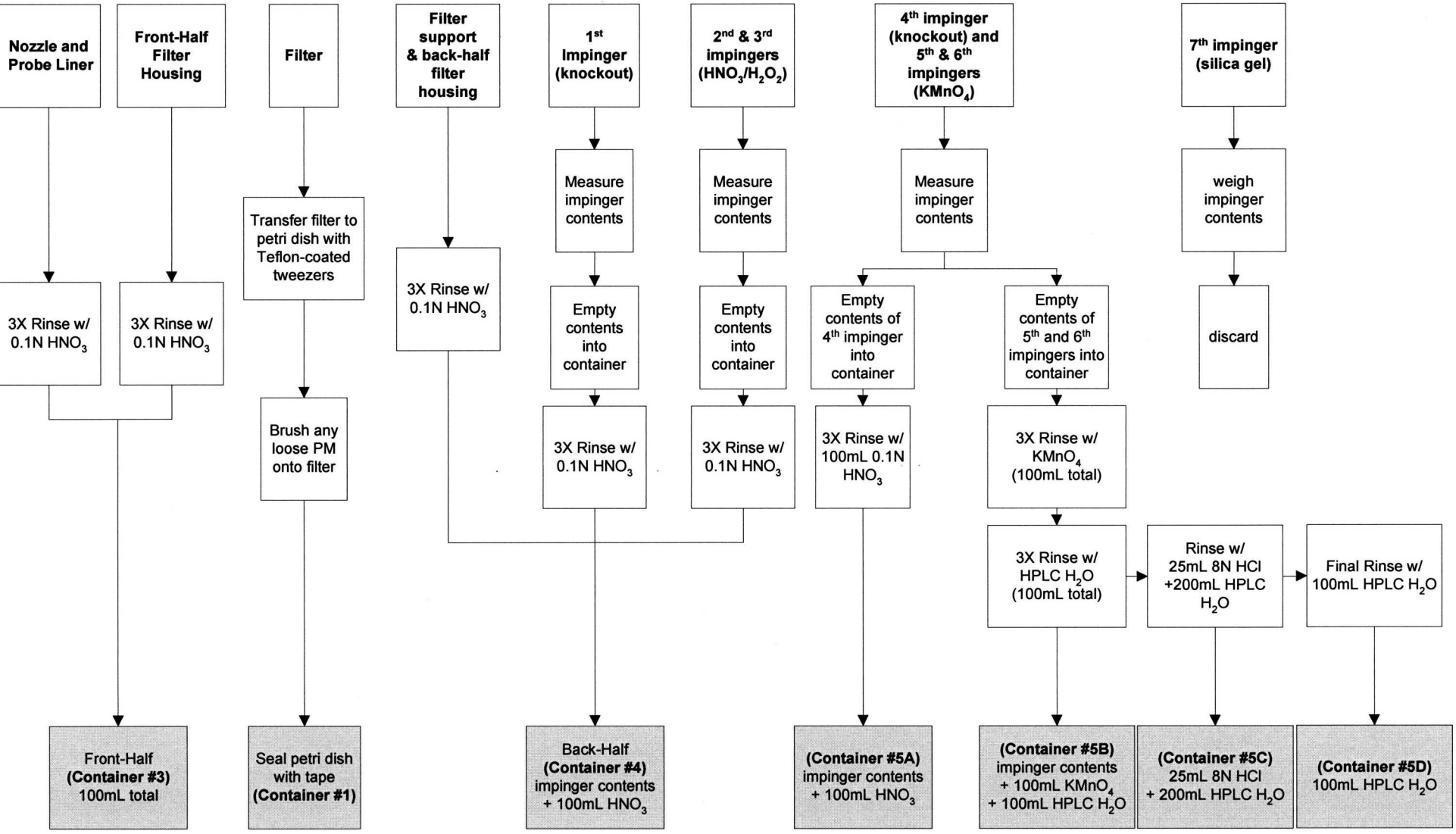
SW-846 Method 0030
(VOST)
sampling train schematic



Method 0030 (VOST) Sample Recovery Scheme



EPA Method 29
sampling train schematic



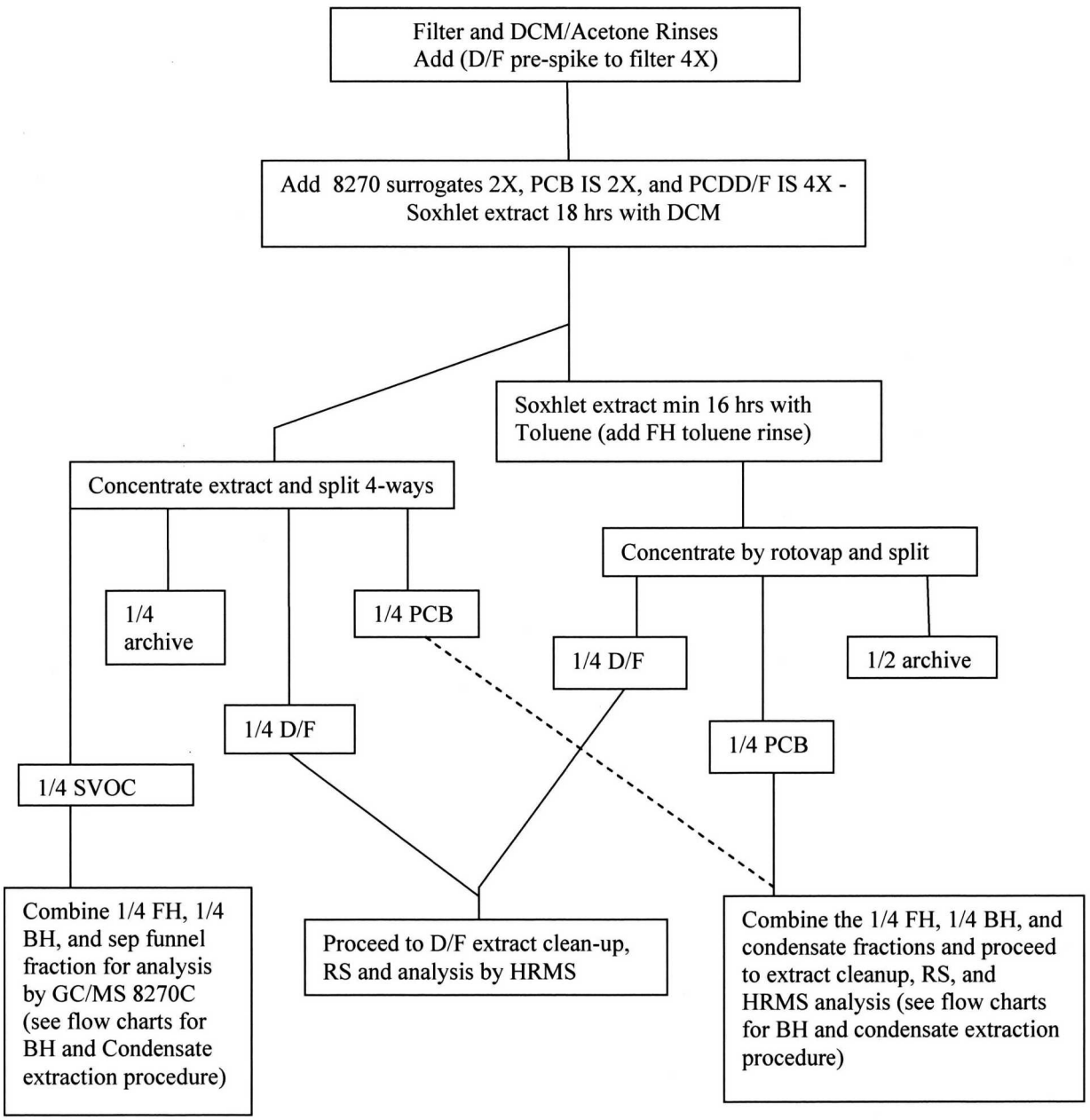
EPA Method 29 Recovery (no particulate determination, extra water rinse)

APPENDIX D

CLEAN HARBORS ARAGONITE QAPP

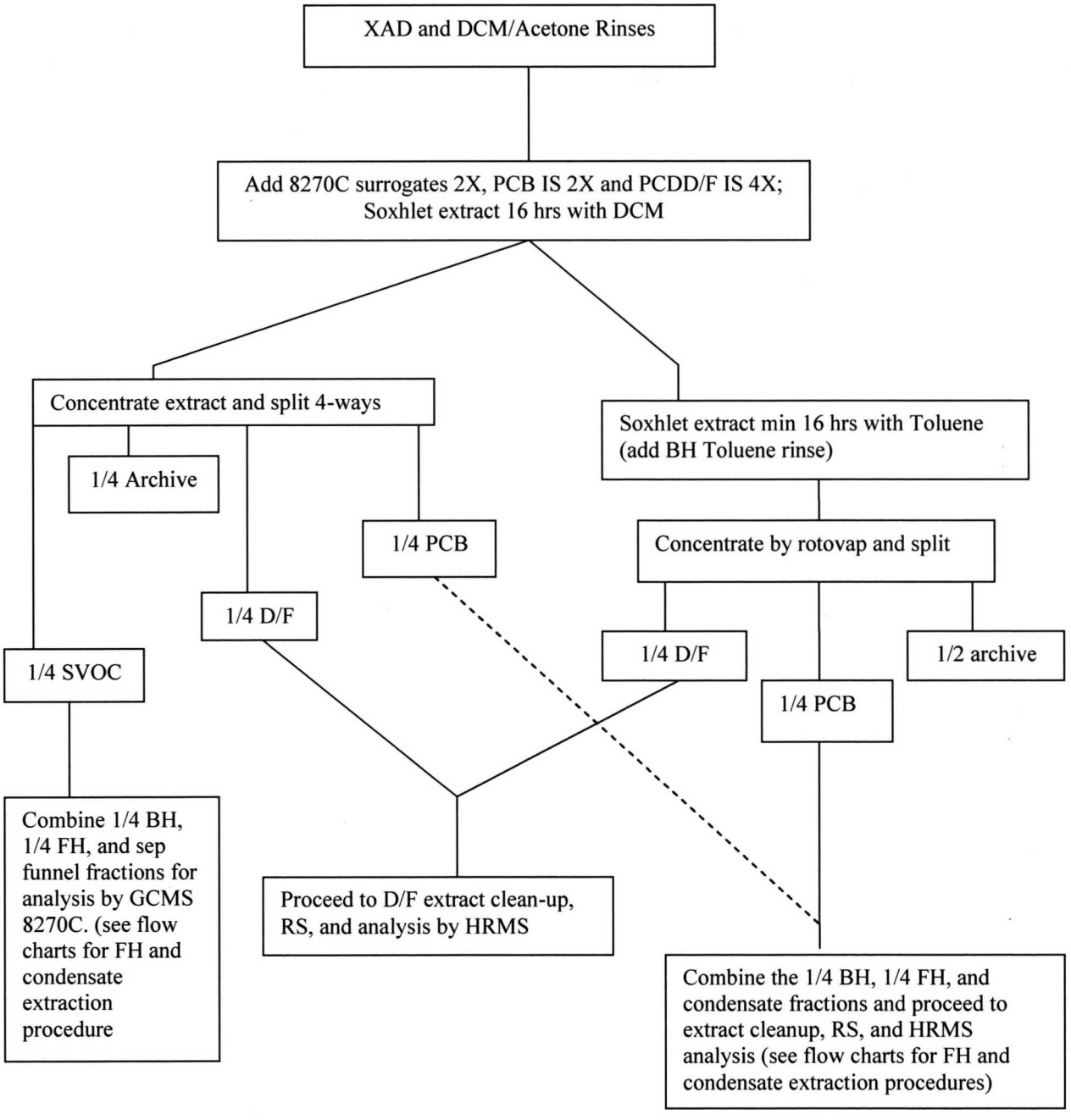
SVOC/PCB/DIOXIN ANALYTICAL FLOW CHART

Extraction Diagram for Combined PCB 1668A, SVOC 8270C, D/F M0023A/8290 for Front Half Sample from Combined Sampling Train M0010/0023A



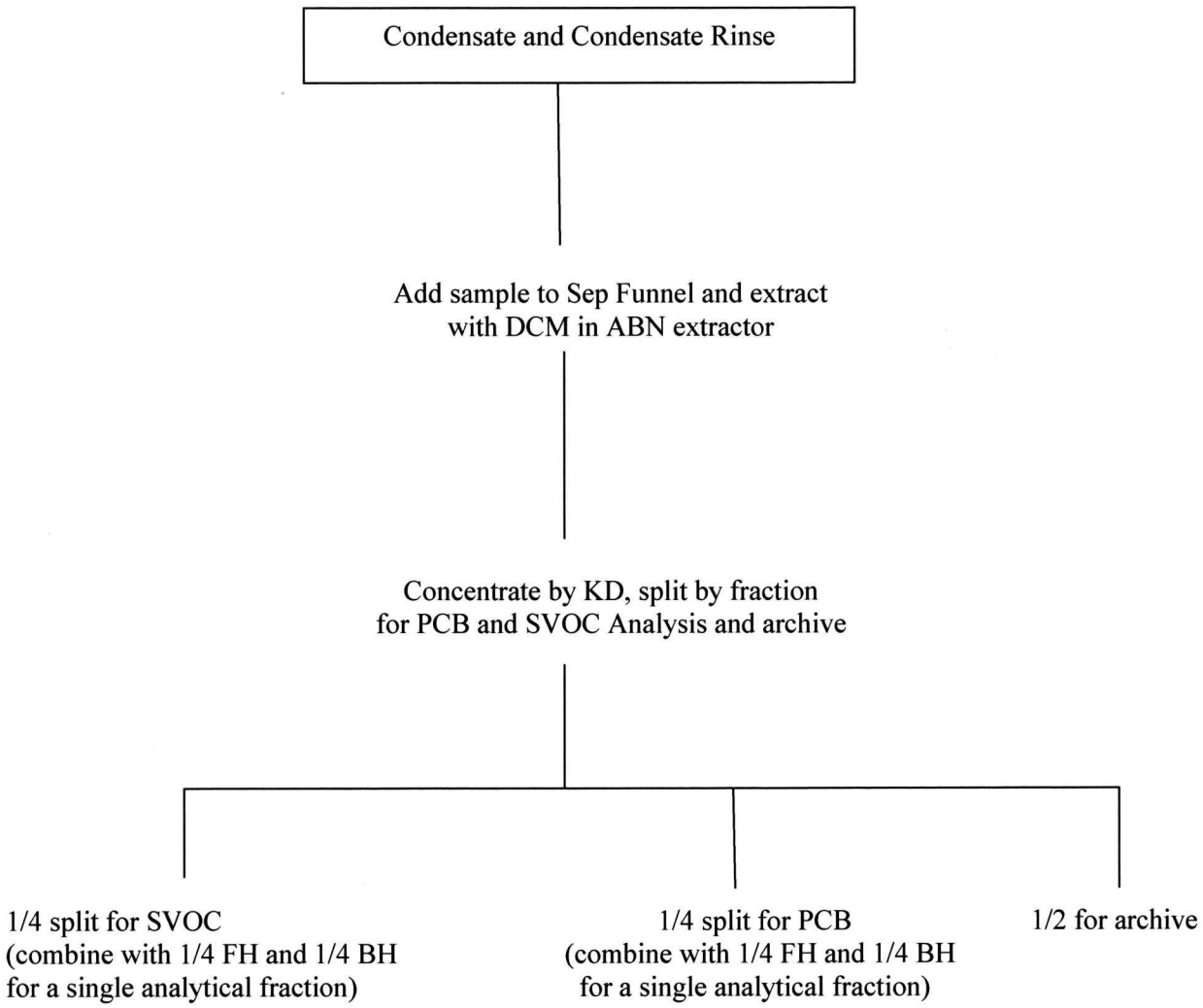
Note - The toluene rinse of the FH must be recovered separately from the acetone and DCM rinses for the combined PCB, SVOC, D/F sampling train.
Note - The D/F pre-spike was added to the BH XAD fraction prior to shipment to the field.
Note- The D/F analysis will be performed with separate FH and BH analysis yielding two (2) analytical fractions per train. The PCB and SVOC analyses will be performed with all fractions combined (FH, BH, condensate) yielding one analytical fraction per train.

Extraction Diagram for Combined PCB 1668A, SVOC 8270C, D/F M0023A/8290 for Back Half Sample from Combined Sampling Train M0010/0023A



Note: The toluene rinse of the BH must be recovered separately from the acetone and DCM rinse for the combined PCB, SVOC, and D/F sampling train.
Note: The D/F pre-spike surrogate was added to the BH XAD fraction prior to shipment to the field.
Note: The D/F analysis will be performed with separate BH and FH analysis yielding two (2) analytical fractions per train. The PCB and SVOC analyses will be performed with all fractions combined (FH, BH, condensate) yielding one analytical fraction per train.

Extraction Diagram for the SVOC 8270C and PCB 1668A Analyses from the Condensate Fraction



Note: The condensate fraction is not combined for PCDD/F analysis. The PCB and SVOC analyses will be performed with all fractions combined (FH, BH, condensate) yielding one analytical fraction per train
Note: The condensate fraction is not spiked with SVOC extraction surrogates or PCB IS (IDAs) because it is combined with the soxhlet fraction that have been spiked.

Appendix E

CLEAN HARBORS ARAGONITE LLC.

CPT PLAN

STARTUP SHUTDOWN MALFUNCTION PLAN

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Hazardous Waste Combustor

Startup, Shutdown, and Malfunction Plan

For The

Clean Harbors Aragonite Incinerator

Clean Harbors Aragonite, LLC
11600 North Aptus Road
Aragonite, Utah 84029

EPA ID Number: UTD981552177

(This document is maintained by Aragonite Environmental Compliance Staff.)

October 2016
Revision 4

TABLE OF CONTENTS

1. INTRODUCTION

The Clean Harbors Aragonite, LLC (Aragonite) Hazardous Waste Treatment facility is a commercial hazardous waste incinerator located near the rail siding of Aragonite in Tooele County, Utah, approximately 60 miles west of Salt Lake City. The facility receives off-site shipments of hazardous waste for treatment in the facility's incinerator. Because it burns hazardous waste the facility's incinerator is subject to the Hazardous Waste Combustor (HWC) Maximum Achievable Control Technology (MACT) regulations under the Clean Air Act (CAA) contained in 40 CFR Part 63 Subpart EEE. The General Provisions contained in 40CFR Part 63 Subpart A also apply to HWC units.

The following is general information pertaining to the Clean Harbors Aragonite LLC facility:

Facility Name:	Clean Harbors Aragonite LLC
Mailing Address:	P. O. Box 22890
	Salt Lake City, Utah 84122-0890
Physical Address:	11600 North Aptus Road
	Aragonite, Utah 84029
EPA ID Number:	UTD981552177
Facility Contact:	Mr. Tyler Lee
Telephone Number:	(435) 884-8122

The regulations contained in 40 CFR 63.1206(c)(2) and 40 CFR 63.6(e)(3) require facilities to "develop and implement a written startup, shutdown, and malfunction plan" for their affected source(s). As such, this startup, shutdown, and malfunction plan (SS&M Plan) was designed to describe the "procedures for operating and maintaining the source during periods of startup, shutdown, and malfunction, and a program of corrective action for malfunctioning process and air pollution control and monitoring equipment used to comply with the relevant standard." This SS&M Plan also addresses the requirements to operate and maintain continuous monitoring system (CMS) devices in a manner consistent with good air pollution control practices pursuant to 40 CFR 63.8(c)(1). The facility will operate and maintain the facility's incinerator in accordance with the procedures specified in this SS&M Plan.

To that end, the purpose of this SS&M Plan is to:

- Ensure that the facility operates and maintains each affected source, including associated air pollution control and monitoring equipment, in such a manner as to minimize emissions [40 CFR 63.6(e)(3)(i)(A)];
- Ensure that the facility is prepared to correct malfunctions as soon as practicable after their occurrence in order to minimize excess emissions of hazardous air pollutants [40 CFR 63.6(e)(3)(i)(B)]; and
- Reduce the reporting burden associated with periods of startup, shutdown, and malfunction, including actions taken to restore malfunctioning process and air pollution control equipment to its normal or usual manner of operation [40 CFR 63.6(e)(3)(i)(C)].

40 CFR 63.2 defines the following terms, as they are applicable to this SS&M Plan:

- Startup is defined as "the setting in operation of an affected source or portion of an affected source for any purpose."
- Shutdown is defined as "the cessation of operation of an affected source or portion of an affected source for any purpose."
- Malfunction is defined as "any sudden, infrequent, and not reasonably preventable failure of air pollution control and monitoring equipment, process equipment, or a process to operate in a normal or usual manner which causes, or has the potential to cause, the emission limitations in an applicable standard to be exceeded. Failures that are caused in part by poor maintenance or careless operation are not malfunctions."
- Monitoring is defined as "the collection and use of measurement data or other information to control the operation of a process or pollution control device or to verify a work practice standard relative to assuring compliance with applicable requirements."

40 CFR 63.1201(a) defines the following terms as they are applicable to this SS&M Plan:

- Air pollution control system is defined as "the equipment used to reduce the release of particulate matter and other pollutants to the atmosphere."
- Combustion chamber is defined as "the area in which controlled flame combustion of hazardous waste occurs."

- Hazardous waste combustor is defined as "a hazardous waste incinerator, hazardous waste burning cement kiln, or hazardous waste burning lightweight aggregate kiln,"
- Hazardous waste incinerator is defined as "a device defined as an incinerator in 260.10 of this chapter and that burns hazardous waste at any time. For purposes of this subpart, the hazardous waste incinerator includes all associated firing systems and air pollution control devices, as well as the combustion chamber equipment."

This SS&M Plan is comprised of the following main sections. Section 2.0 provides a facility description and identifies the specific equipment and monitoring devices addressed by this SS&M Plan. Sections 3.0and 4.0 describe the startup, shutdown, and malfunction procedures, respectively, for the incinerator including the program of corrective action. Section 5.0 contains the recordkeeping requirements related to this SS&M Plan.

2. Facility Description

This SS&M Plan is required to address the affected source(s), including associated air pollution control and monitoring equipment. This section defines the source and the equipment that are addressed in this SS&M Plan.

2.1 Process Overview

The Clean Harbors Aragonite (Aragonite) Hazardous Waste Treatment facility is located near the rail siding of Aragonite in Tooele County, Utah approximately 60 miles west of Salt Lake City. The incinerator consists of waste feeding equipment, a horizontal rotary kiln with an afterburner chamber, and a gas conditioning and air emissions control train.

The incinerator is designed to process liquid, sludge, solid, and gaseous waste. Liquids and sludge are bulked up into tankage and then fed to the incinerator, or alternatively, fed directly from tank truck or container. Solids are bulked up into tankage and fed to the kiln through a drop chute. Gases are fed to the afterburner chamber from a cylinder feed station. Containers of liquids, sludge, and solids can be transferred and fed from tankage. Containers can also be fed directly to the kiln by a container feed system.

The air emissions control system consists of a spray dryer, followed by a baghouse, a saturator, a wet scrubber, a wet electrostatic precipitator, and an induced draft fan. The spray dryer evaporates the scrubber blow-down and there is no liquid effluent from the facility.

Slag and residue from the kiln, baghouse, and spray dryer discharge into roll-off boxes for removal to an off-site hazardous waste landfill.

2.2 Combustor Design

The Aragonite incinerator consists of two combustion chambers – a rotary kiln and a stationary rectangular afterburner. Solid wastes and sludge are fed to the front of the kiln. In the kiln the organic waste content is destroyed and its combustion products join the gas stream. Ash remains solid, often melts to form a molten slag, and discharges into a deslagger that cools the residue and empties the residue into a roll-off. Liquid is also fed to the front of the kiln both through burners and feed nozzles. The organic content in the waste feed provides most of the heat required for combustion. At times fuel oil and propane are used to provide additional heat. Combustion gases discharge from the kiln above required temperatures.

The combustion gases flow into the entrance of the afterburner. The afterburner stands vertically at the discharge end of the kiln. Waste organic liquid and aqueous liquid are fed to the afterburner in order to maintain the gas temperature at or above required temperatures. Gas residence time in the afterburner is greater than the 2.0 seconds required by Polychlorinated Biphenyl (PCB) incineration regulations.

Combustion gases discharge from the afterburner to a hot duct. This refractory lined duct contains the emergency safety vent and connects the afterburner with the gas conditioning and air emissions control train.

2.2.1 Rotary Kiln

The kiln is refractory lined and the refractory varies in type and depth along its length. The refractory gradually wears away as waste is fed. By experience, refractory is used that is most economical while lasting for an appropriate length of time. The kiln shell is 14 feet 5 1/4 inches in diameter at the feed end and 13 feet 5 3/8 inches in diameter at the discharge end. The kiln is driven by an electric motor that drives the unit through a girth gear. The kiln is set on trunnions at a 4% slope.

The kiln face (or front wall) is stationary, and the joint between the face and the rotating drum is supplied with two close fitting, counter-weighted seals. Air is blown between the seals in order to prevent any outflow of feed materials or combustion products. The kiln discharges into the afterburner chamber through a similar rotating-to-stationary connection. A separate cooling air system provides cooling to the rotating discharge end of the kiln. The kiln cooling air fan blows air over this section of the kiln. This air does not enter the combustion system but is vented back to the atmosphere. Once again, the discharge end seal system and the negative pressure prevents outflow of combustion products.

Bulk waste solids are fed into a feed hopper at the kiln front wall and enter the kiln through the solids feed chute. Drummed wastes are fed to the kiln through the container feed elevator and feed chamber inlet gate. Portions of the feed chute and container inlet are liquid cooled.

Waste liquids, sludge, and fuels are fed to the kiln through burners or nozzles at the kiln operating face (front wall). The kiln burner, A-104, is located on the South side and top of the front wall. The burner consists of a pilot lance that burns propane and lances that burn used fuel oil, and waste liquid. The lances are enclosed in a cylindrical burner can that penetrates the front

wall refractory. Combustion air, furnished by a fan, flows into the burner can around the lances and also directly into the kiln. The fan suction is drawn from the bulk solids tank enclosure and also vacuum exhaust from the vacuum truck drum consolidation station. The secondary air contains volatile organic content from the waste in those areas. Compressed air is used to atomize the liquids. Each lance is equipped with a safety shutoff system that requires fuel pressure, atomizing air pressure, and flame present in order to keep fuel flowing.

The front wall contains three nozzles that enter the kiln but do not use the burner. The first of these is the direct burn port, A-101. Waste pumped directly to the kiln from tanks, trucks, or containers is fed to this port. The second nozzle is the kiln aqueous port, A-102. Aqueous waste containing low organic content is fed through this port and piping allows it to be supplied from both tankage and the direct burn system. The third port is the sludge port, A-103. This port can also be supplied from tankage or the direct burn system. Each nozzle is provided with plant air for atomization and safety shutoff systems.

Kiln operating temperature is controlled by the operator. The kiln is operated under a slight vacuum in order to assure that there is no escape of untreated combustion off-gases to the atmosphere. Normal operation of the kiln front wall burner requires only a nominal auxiliary fuel rate to maintain a stable flame. Fuel oil and propane are used for preheating, post-heating, and for supplementing waste fuels to assure that the kiln temperature is maintained at the value required for waste destruction.

2.2.2 Afterburner

The afterburner chamber is a steel structure lined with refractory. The cross-sectional area of the afterburner chamber is 324.4 ft^2 and the internal dimensions are 17 feet 3 3/8 inches x 18 feet 9 1/4 inches x 36 feet 5 inches high. The kiln combustion gases flow through the afterburner. Liquid organic wastes from tankage and/or auxiliary fuel are fed to the afterburner chamber through two burners located on the North and South sides. Each burner consists of a pilot lance that burns propane and liquid lances that burn fuel oil or other waste liquids. The lances are enclosed in a cylindrical burner can that penetrates the afterburner refractory. Secondary air, furnished by a combustion air fan, flows into the burner can around the lances. Aqueous waste spray nozzles are also located in the afterburner chamber. Both the burner lances and aqueous waste nozzles are air atomized. Waste gases from compressed gas cylinders are also fed to the chamber through nitrogen-powered eductor using one of the South burner lances. Used fuel oil and propane are used for supplementary heating when the wastes being incinerated have insufficient heating value.

Ventilation from the tank farm and from the drum pumping station glove box is also fed to the afterburner. This ventilation contains volatile organic content.

The afterburner chamber provides sufficient volume so that combustion gases attain the required residence time for Polychlorinated Biphenyl (PCB) incineration (TSCA regulations require a minimum of 2.0 seconds for incineration of PCBs). Liquid waste is used to heat the combustion gases as they flow through the afterburner.

Following are the calculations to determine maximum combustion gas flow rate through the After Burner Chamber (ABC) to maintain a residence time of two (2) seconds.

<u>After Burner Chamber Volume</u>
Volume = 18.77 ft x 17.28 ft x 36.42 ft = 11,813 ft^3

<u>Stack Flow Rate with Residence Time of Two Seconds</u>
Flow Rate = (11,813 ft^3/2 seconds) x (60 seconds/minute)
= 354, 390 cfm @ 2012°F, 12.5 psia, and 25% moisture
= 354, 390 cfm x (68°F+460)°R/(2,012°F +460)°R x (12.5/14.7) x (1-25/100)
= 48,275 dscfm

2.2.3 Hot Duct and Emergency Vent

Combustion gases flow from the afterburner chamber into the hot duct. The duct is 8 feet in internal diameter directed steeply up, then steeply down. A relief vent is located at the highest elevation of this duct, which activates to vent the system and shut down waste feed under certain plant upset conditions. Under vented conditions there is a net inflow through all unsealed openings. Auxiliary fuel is injected to continue the combustion process of solid waste material still located in the kiln during any cutoff of waste feed or shutdown.

2.2.4 Location of Combustion Zone Temperature Devices

Three infrared sensors aimed at the point of kiln discharge measure kiln temperature. The average of two measurements is used to measure kiln temperature. The current Resource Conservation and Recovery Act (RCRA) permit also includes a provision that if one sensor fails, the measurement from the sensor still operating can be used if the temperature measured is at or above 1940 °F. The third is a back-up at this time.

The afterburner chamber is equipped with three conventional thermocouples extended through the refractory "ceiling" to monitor its exit temperature.

2.2.5 Hazardous Waste Residence Time

Subpart EEE defines hazardous waste residence time as follows [40 CFR §63.1201(a)]:

"Hazardous waste residence time means the time elapsed from cutoff of the flow of hazardous waste into the combustor (including, for example, the time required for liquids to flow from the cutoff valve into the combustor) until solid, liquid, and gaseous materials from the hazardous waste, excluding residues that may adhere to combustion chamber surfaces, exit the combustion chamber. For combustors with multiple firing systems whereby the residence time may vary for the firing systems, the hazardous waste residence time for purposes of complying with this subpart means the longest residence time for any firing system in use at the time of waste cutoff."

The residence time depends upon the definition of residue as well as the time that it takes for waste to discharge from the furnace and the time that it takes a lump of waste to heat to a high enough temperature to volatilize its organic content. For the Aragonite incinerator the calculations indicate that in order to remove the incinerator from Subpart EEE service, the kiln should operate for 55 minutes at operating temperature during which the kiln is rotated at 0.19 rpm followed by at least 5 minutes of cooling to freeze the slag.

2.3 Feed System Descriptions

2.3.1 Bulk Solids

Bulk solid waste is received by the facility in dump and roll-off trucks. The waste is sampled and analyzed before being emptied into one of three receiving tanks. A clamshell bucket removes waste from the receiving tanks and delivers it to the Apron Feeder hopper. The waste flows from the hopper onto an Apron feeder conveyor. This conveyor is made of overlapping metal tracks and meters waste into a top flop gate in the kiln feed chute where the waste is weighed. The apron feeder and flop gate scale work together with the feeder running intermittently to feed the amount of weight programmed by the scale. When the programmed amount is fed to the scale the apron feeder stops and the flop gate opens. Opening the flop gates drops the waste past a second gate which must be open to open the flop gates and discharge the waste from the feeding system to the kiln. The weight measured by the flop gate scale is transmitted to the plants computer system.

2.3.2 Bulk Liquids

Bulk liquid waste is delivered by over the road tank trucks and offloaded in the truck unloading building. Pumps deliver the bulk liquid waste from the truck unloading building to one of sixteen approximately 30,000-gallon capacity storage tanks. Wastes are transferred amongst the tanks to optimize "blends" for feed. The blended waste is pumped to either the kiln burner or one of the ABC burners.

Each burner blend feed line includes a control valve and a flow meter. The flow meter is a "Coriolis" mass flow meter that measures directly in pounds per minute. The Control Board Operator (CBO) adjusts the control valve to obtain the desired liquid feed rate. The feed rate measured by the flow meter is transmitted to the plant's computer system.

Aqueous waste with little organic content is handled in the same manner and uses the same tank system described above. These wastes are strictly segregated from organic (energetic) liquids.

2.3.3 Bulk Sludge

Sludge waste is liquid waste that contains significant amounts of solids. Because the solids will settle out and clog the piping, bulk sludge waste must be handled in a separate system.

Bulk sludge waste is received by over the road tank trucks. Sludge is emptied directly into a receiving tank or alternatively pumped from the tanker to a storage tank. From the receiving or storage tank the sludge is pumped through a re-circulation loop. A portion of the re-circulating sludge is fed through a flow meter to the kiln front wall A-103 nozzle. The flow meter is a "Coriolis" type meter that records directly in pounds per minute. The feed rate measured by the flow meter is transmitted to the plants computer system.

2.3.4 Direct Liquid Feed Systems

The Aragonite facility has equipment that allows liquids to be fed directly to the incinerator without passing through a storage tank.

Both the slag pad drive thru and the East bay of the truck unloading building are equipped with direct burn stations that allow tank trucks to be fed directly to the kiln. In each case pumps and valves are used to control the flow rate. The flow rate is measured by in-line flow meters as it is fed. Valves can allocate the flow toward either the direct burn nozzle or the sludge nozzle.

The direct burn systems are designed to supply the nozzle they are feeding at design capacity.

2.3.5 Containers

Containers are received at the facility in trucks and off-loaded onto one of the waste receiving docks. Aragonite personnel remove the containers from the vehicle to a scale where the container weight is recorded. Container piece count and container integrity are confirmed before additional movements. A representative number of containers are sampled to confirm the waste can be accepted. An acceptance marking is placed upon the drum before it is moved to storage or sent for processing or incineration.

Containers that can be fed directly to the kiln are placed upon a roller conveyor. The roller conveyor delivers the container to a scanning station were an operator scans its barcode. Each barcode is unique and allows the computer system to know container location, chemistry and

weight. Scanning the container lets the computer know which container is about to be fed to the kiln. An elevator lifts the container to the entrance of the kiln where it is pushed through the kiln front wall and drops inside the kiln. The computer system records the drum as incinerated when it is dropped into the kiln. Information is stored in a container database to track the weight and chemistry fed.

Containers may also be processed before being fed to the incinerator. Processing types include:

- Removing solids from containers and placing the solids into the bulk solids tanks. This waste is then fed to the kiln through the bulk solid waste feed system.
- Decanting liquid drums into a bulk liquid storage tank, tank trucks or direct burn vessels. The bulked up liquid waste is then fed to the kiln through the bulk liquid feed system or through a direct-burn feed system.
- Repackaging containers into other containers. This is done to avoid feeding too much energetic material or metals in one charge. Repacked containers are fed to the kiln through container feed system.

Liquid containers may also be pumped directly into the kiln through the sludge, aqueous, or direct burn nozzle. A "Coriolis" flow meter tracks the amount fed. This drum direct pumping system is designed to pump about four 55-gallon drum containers an hour.

2.3.6 Compressed Gas Cylinders

Compressed gas cylinders are delivered to Aragonite by truck and off-loaded for storage in an outdoor storage location. The cylinders are assigned a unique barcode and tracked in the same manner as containers. Weights and chemistry are included in the tracking.

Compressed gas cylinders are fed to the afterburner chamber. Each cylinder is connected to tubing and placed upon a scale. The scale records the loss in weight from the cylinder as the cylinder gas is fed. There are two scales at this station, one for larger cylinders and the other for lab size cylinders.

2.3.7 Waste Handling and Blending Operations

Feed Schedulers at Aragonite direct how waste is handled, processed and blended. The Feed Schedulers also direct how quickly a given waste will be fed and which feed port will be used.

Each day the Feed Schedulers prepare a Daily Production Plan that directs the incinerator operators on what will be fed during the day.

Dump and roll-off trucks containing bulk solid waste are emptied into one of three open top bulk solids tanks. The tanks are contained inside a " Procedure T" building that is ventilated to the kiln when that unit is operating, or alternatively, to backup carbon canisters when the kiln is not operating. The building contains a crane equipped with a clamshell bucket that can be used to move waste between tanks, to the apron feeder for feed to the incinerator, or to a shredder located inside the building above the tanks. Waste is moved between tanks, and shredded from one tank to another as directed by the Feed Schedulers. The Feed Schedulers also direct how the apron feeder is kept fed from several bins. A track hoe is sometimes used to mix bulk solid waste in the bins.

Tank trucks containing bulk liquids are pumped into a storage tank selected on the basis of compatibility, available space, and transfer plans. Bulk liquids from different storage tanks are blended in one of four blend tanks in order to prepare a waste mix with the desired heat content and chemistry. From the blend tank they are pumped to the incinerator. Alternatively bulk liquids can be pumped directly to the incinerator from a storage tank.

Bulk Sludge waste may be blended in the receiving tank or in the sludge storage tank.

The Facility Foremen direct the processing of container waste. They review container compatibility and chemistry and assemble groups of containers that can be processed in a similar fashion. For instance, containers of waste that are emptied into the bulk solids tanks must have an LEL below 25 percent and not contain large amounts of metals having feed rate limits.

2.3.8 Procedures for Rapidly Stopping Hazardous Waste Feed During Equipment Malfunction

In general any equipment malfunction will result in an Automatic Waste Feed Cut-Off (AWFCO) because of some operational parameter being outside of control limits. For liquid streams the control valve is closed. For bulk solids, the apron feeder shuts down. For direct feed containers the elevator is stopped.

Feed mechanisms and other equipment can also be stopped if the Control Board Operator pushes the manual stop button on the control board.

2.4 Air Emissions Control System

2.4.1 Spray Dryer

The spray dryer cools the hot combustion gases so that they can be filtered in the baghouse. Combustion gases are cooled by an evaporating brine solution from the scrubbing system. The spray dryer also eliminates the need for process liquid disposal. Some of the dried solids from the brine solution are collected by the screw bottoms of the spray dryer and discharged to roll-off boxes for off-site disposal. Most of the dried solids continue on with the combustion gases to the baghouse. The evaporated water joins the combustion gas stream.

Combustion gases flow downward through the dryer. The dryer is 72 feet 8 1/2 inches high. The internal diameter at the top entrance is 8 feet and the top thimble internal diameter is 11 feet 1 inch and about 10 feet long. The main section varies in internal diameter between 27 feet 2 ¼ inches to 28 feet 2 ¼ inches and is approximately 37 feet long. The dryer has a funnel shaped bottom equipped with screw conveyors to discharge solids to roll-off boxes.

The dryer is equipped with 40 nozzles that can be used to spray brine into the dryer. 16 nozzles spray into the top of the main section and 24 nozzles spray below those. The number of spray nozzles used varies with the heat content of the combustion gases. Some of the spray nozzles are equipped with remotely activated valves that can be used to turn them on or off. The nozzles are high-pressure single fluid nozzles.

2.4.2 Carbon Injection System

The carbon injection system delivers a weighed amount of activated carbon to the duct between the spray dryer and baghouse. The system consists of a storage bin that feeds two carbon-feeding trains. Each train has a rotary valve that periodically feeds carbon from the bin to a hopper mounted on a loss-in-weight scale. The scale feeds an eductor and piping that pneumatically conveys the weighed carbon to the duct. The eductor manufacturer recommends a motive airflow rate of 80 actual cubic feet per minute (acfm) for this unit.

2.4.3 Baghouse

The baghouse is a fabric filter that contains eight compartments with 240 filter bags in each compartment. The filter bags are 6 inches in diameter and 14 feet long. The bags are made from

16-ounce fiberglass and may be Teflon coated. Each compartment contains approximately 5,280 ft^2 of filter area.

The bags are cleaned by a pulse jet system that may be operated with the compartment on-line or off-line. On-line cleaning starts automatically when differential pressure across the baghouse reaches an adjustable set point. Both the inlet and outlet compartment valves remain open. Off-line cleaning starts at a higher set point. During off-line pulsing both the inlet and outlet dampers are closed.

Dust removed from the fabric by pulsing drops to hoppers in the bottom of each compartment. Each compartment contains a screw conveyor that moves the dust from the bottom of the compartment to a roll-off box discharge point for disposal at a hazardous waste facility.

2.4.4 Wet Scrubber

The wet scrubber consists of a saturator and two beds of packing separated by a chimney tray.

Gas from the baghouse at about 385°F enters the saturator, where a brine solution is sprayed into the hot gas stream to reduce its temperature to saturation (about 175°F). Brine that is not evaporated drains into the wet scrubber neutralization tank and is re-circulated. The purpose of the saturator is to cool the combustion gases from the baghouse temperature down to about 175°F while saturating the gas with moisture to improve the mass transfer rate in the packed beds. The saturator is 15 feet 3 inches high and consists of a bottom cylindrical section 5 feet 4 inches internal diameter by 11 feet 2 inches long. On top of this is mounted a short conical section. A short inverted conical section is mounted on top of that. Up to 300 gallons per minute of liquid are sprayed into the top of the unit through 8 spray nozzles that are aimed toward the center.

The saturated gas flows into the two-staged packed bed design wet scrubber where the upward flow of gas comes into contact with downward flow of neutralized brine solution. Brine that drains from each packed bed of the scrubber flows into separate conditioning loops. Each loop contains neutralization tanks, pumps and a heat exchanger. The circulating solution is alkaline and reacts with the acid content of the gases. The temperature of the gas stream is further reduced in the wet scrubber, which condenses the majority of the water in the gas stream. The amount of condensation depends upon operator controlled valve positions.

Each packed bed consists of a six foot deep bed of 3-inch Intalox saddles or, if alternative packing is used, a mass-transfer equivalent depth of packing. Liquid is introduced at the top of the lower bed using a launder distribution system. Liquid is distributed at the top of the unit using a system of distribution pipes. The tower is 14 feet 6 inches internal diameter and approximately 51 feet 10 inches high.

2.4.5 Induced Draft Fan

Gases then pass through an obsolete and de-energized wet electrostatic precipitator, and ductwork equipped with sample points for stack testing, to a fan. The induced draft fan provides the suction necessary to move combustion gases through the kiln and afterburner and gas treatment equipment. The fan is sized to deliver 90,000 acfm at 20 inches W.C. inlet pressure and 400 horsepower (HP). The fan is driven by a variable speed drive. The pressure measured in the afterburner chamber controls the speed of the fan.

2.4.6 Stack

Off-gases are discharged through a 60-inch internal diameter by 149-foot high fiberglass stack. The stack contains appropriate ports for Continuous Emission Monitor (CEM) sampling and additional nozzles for reference method sampling during trial burn and performance tests.

2.4.7 Air Emission Control Equipment Maintenance Practices

The Control Board Operator and Wet System Operators monitor the equipment in the air emissions control system closely. The Control Board Operator watches key indicators that signal problems for the different air emission control equipment as described below.

Table 2-1: Air Emission Control Equipment Key Indicators

Air Emission Control Equipment	Key Indicator
Spray Dryer	Outlet temperature
Baghouse	Opacity meter reading Pressure drop
Saturator	Outlet temperature
Wet Scrubber	Brine Flow Rate 1st Stage Brine Inlet pH 1st Stage Brine Flow Rate 2nd Stage Brine Inlet pH 2nd Stage Brine Outlet 2nd Stage
Induced Draft Fan	Flow Rate VFD Settings

In addition the area operator inspects the air emission control equipment during the shift looking for indications that maintenance may be needed. For example, should the area operator observe that the spray dryer residue is wet; action would be taken to determine which spray dryer nozzle is bad and replace it. The operator uses inspection checklists to identify key areas to inspect. Should the operator find a problem that needs craftsman repair, a work order is written and repairs are completed at the earliest appropriate time.

The plant Preventative Maintenance Program schedules preventative maintenance work orders for the air emissions control system. Much of this work is done during plant maintenance turnarounds when the equipment is not operating. Typical tasks would include changing baghouse bags, removal and replacement of scrubber packing, and realignment of WESP precipitator rods.

2.5 Process Monitoring

The incineration system is equipped with a computer-based distributed control system (DCS) to provide the process information necessary for efficient plant operation and safety. The DCS transfers data to a plant information system that records process information in a database to be used to prepare reports and to review past history.

The DCS is used to monitor process flows, temperatures, and pressures and transmit signals to the control room. The instrumentation system has the capabilities of controlling valves, motors, fans, and dampers as well as initiating waste feed cutoffs if permit operating limits are not maintained. Most of the equipment in the incinerator area is started and stopped by the DCS. The Continuous Monitoring System (CMS) performance evaluation test plan lists the incinerator instruments required by Subpart EEE.

2.5.1 Process Monitoring Devices

Table 2-2 lists the devices used to monitor compliance with the operating parameters associated with the incinerator. For those parameters that have field-installed equipment (e.g., flow meters, thermocouples, etc.), Table 2-2 includes the associated manufacturer, model number, and tag number. The field devices specified in Table 2-2 (i.e., those with a manufacturer, model number, and tag number) comprise the monitoring equipment required to be addressed in this SS&M Plan.

2.5.2 Automatic Waste Feed Cutoff System and Testing

The primary function of the AWFCO system is to stop the feed of hazardous waste if incineration conditions fall outside of permit limits. An AWFCO will occur whenever the operating parameter limits specified by Subpart EEE (as modified should the facility's application for alternative monitoring be approved), or an emission standard monitored by a CEM are exceeded. An AWFCO will also occur when a CMS instrument, except a CEM, exceeds its span or a component of the AWFCO system fails. Table 7-2 of the CMS performance evaluation test plan lists the instruments that measure parameters that can cause a waste feed cutoff.

The AWFCO system is tested weekly (once every 168 operating hours on waste). Once the test is started, a total waste feed cutoff is initiated by a simulated cause. The effects of this condition are field verified and recorded on forms. The control system simulates signals for each waste

feed cutoff and generates an alarm printout to indicate that each AWFCO operated properly. A detailed Waste Feed Cutoff System Protocol is kept as part of the plant operating record. Completed forms and print outs are also kept in the operating record.

2.6 Oxygen Correction Factor

Pursuant to 40 CFR 63.1206(c)(2)(iii), this SS&M Plan is required to identify a projected oxygen correction factor based on normal operations to use during periods of startup and shutdown. The HWC unit(s) typically operates in the 7 to 14 percent oxygen range. 15 percent oxygen is a maximum useful in "capping" the oxygen correction factor used to calculate CEM concentrations to 7% O_2, the regulatory requirement. Therefore, the maximum oxygen correction factor ([21% - 7%]/ [21% - max O_2]) to be used during periods of startup and shutdown is 2.33.

2.7 Waste Feeds During Startup and Shutdown

The feeding of hazardous waste to the incinerator will only occur when all operating limits are satisfied. Pursuant to the definitions of startup and shutdown included in Sections 3.0 and 4.0, respectively, the operating limits of the incinerator are not achieved during these time periods. Therefore, hazardous wastes will never be fed during periods of startup and shutdown. If it is decided in the future that hazardous wastes will be fed during periods of startup and shutdown, the information specified in 40 CFR 63.1206(c)(2)(v)(B) will be added to this SS&M Plan.

Table 2-2: Devices Used to Monitor Compliance					
TAG #	**Parameter Measured**	**Monitor Type**	**Manufacturer**	**Model Number**	**Required Calibration Frequency**
CEMS					
AT 2207A	Stack THC –CEM A	Flame Ionization Detector	JUM	VE-7	Daily
AT 2207B	Stack THC –CEM B	Flame Ionization Detector	Thermo Fisher	51i-HT	Daily
AT 2199A	Stack CO - CEM A	Non dispersive Infrared	Servomex	4900	Daily
AT 2199B	Stack CO - CEM B	Non dispersive Infrared	Servomex	4900	Daily
AT2200A	Stack O_2 -- CEM A	Paramagnetic	Servomex	4900	Daily
AT2200B	Stack O_2 -- CEM B	Paramagnetic	Servomex	4900	Daily
CPMS					
Waste Feed Systems					
FT1121	Kiln Blend Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1151	Kiln Aqueous Flow Rate	Coriolis Mass Flow Meter	Micro Motion	DS1005128SU	Monthly
TAG #	**Parameter Measured**	**Monitor Type**	**Manufacturer**	**Model Number**	**Required Calibration Frequency**
FT1184	ABC North Blend Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1221	ABC South Blend Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1253	ABC North Aqueous Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT1263	ABC South Aqueous Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT3018	Drum Direct Burn Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
FT4042	Sludge Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly
WT1035	Flop Gates Weigh Cells	Load Links	Mettler Toledo	JAGXTREME	Quarterly
WI1066	Container Scale	Load Cells	Weigh-Tronix	WI-125	Monthly
WT1102A	Cylinder Weight	Load Cells	Rice Lake	HP33-1K	Monthly
WT1102B	Small Cylinder Weight	Load Cells	Rice Lake	BM1818-300	Monthly
FT1171	Direct Burn Flow Rate	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 63 I	Monthly
FT3366	Corrosive Waste system	Coriolis Mass Flow Meter	Endress Hauser	Pro Mass 83	Monthly

Table 2-3: Devices Used to Monitor Compliance					
TAG #	**Parameter Measured**	**Monitor Type**	**Manufacturer**	**Model Number**	**Required Calibration Frequency**
Standard Instruments					
AT2104A	1st Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P or PH4506	Quarterly
AT2104B	1st Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P or PH4506	Quarterly
AT2129A	2nd Stage Rundown pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P or PH4506	Quarterly
AT2129B	2nd Stage Rundown pH	pH Analyzer	Johnson Yokogawa of Quantum	EXAPH 402 or Q45P or PH4506	Quarterly
AT2130A	2nd Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P or PH4506	Quarterly
AT2130B	2nd Stage Inlet pH	pH Analyzer	Johnson Yokogawa or Quantum	EXAPH 402 or Q45P or PH4506	Quarterly
AT2020A/ B	Baghouse Broken Bag Detectors	Optical Particle Counter	GE	CPM-750/700	Monthly
WT2037 A/B	Activated Carbon Feed Rate	Load Cells	Thermo Ramsey	Micro-Tech 2000	Quarterly
FT2066A	Carbon Injection Train 1 Air Flow Rate	Orifice Plate / dP Cell	Viatran	IDP10	annual
FT2066B	Carbon Injection Train 1 Air Flow Rate	Orifice Plate / dP Cell	Viatran	IDP10	annual
FT2092A	1st Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P	Quarterly
FT2092B	1st Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P	Quarterly
FT2095A	2nd Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AE14 Mag Flow Converter or Promag 50P	Quarterly
FT2095B	2nd Stage Flow Rate	Magnetic Flow Converter	Yokogawa or Endress Hauser	AE14 Mag Flow Converter or Promag 50P	Quarterly
FT2107	TMT Flow rate	Diaphragm metering pump	Tacmina	FC-1	Annual
FT2195	Stack Flow Rate	Annubar (Δp Converted to Flow Rate)	Rosemount	3051	Annual
TT2194	Stack Temperature	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
FT2081A/ B	Saturator Flow Rate	Magnetic flow converter	Yokogawa or Endress Hauser	AM11 Mag Flow Converter or Promag 50P	Annual
TT2082A/ B/C	Saturator Temp	Temp transmitter Type J thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
PIT1006A	Combustion Pressure	Pressure Switch	Rosemount	1151DP3	Annual
PIT1006B	Combustion Pressure	Pressure Switch	Rosemount	1151DP3	Annual
PIT1006C	Combustion Pressure	Pressure Switch	Rosemount	1151DP3	Annual
PT2044	Spray dryer top nozzle pressure	Pressure Transmitter	Rosemount	114G1200	Annual

Table 2-3: Devices Used to Monitor Compliance

TAG #	Parameter Measured	Monitor Type	Manufacturer	Model Number	Required Calibration Frequency
PT2045	Spray dryer bottom nozzle pressure	Pressure Transmitter	Rosemount	114G1200	Annual
TT2001A/ B/C	Spray Dryer Temp	Temp Transmitter/ Type J thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
PIT2020A	Baghouse Inlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2020B	Baghouse Outlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2093A	Scrubber Inlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2093B	Scrubber Outlet Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PIT2093C	Scrubber Middle Pressure	Pressure Transmitter	Rosemount	1151DP3	Annual
PT1018	Kiln Combustion Air Pressure	Pressure Switch	Rosemount	1151DP3	Annual
ST1003	Kiln speed	speed	Electro Sensor or Conveyor Components	SA420 or CMS-1G	Annual
TT1005A	Kiln Temperature	Infrared Pyrometer	E^2 Technology Corp.	Pulsar III M7000SR	Annual
TT1005B	Kiln Temperature	Infrared Pyrometer	E^2 Technology Corp.	Pulsar III M7000SR	Annual
TT1009A	ABC Temperature	Temp Transmitter/ Type K Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT1009B	ABC Temperature	Temp Transmitter/Type K Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT1009C	ABC Temperature	Temp Transmitter/Type K Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT2001A	Spray Dryer Temp	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT2001B	Spray Dryer Temp	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
TT2001C	Spray Dryer Temp	Temp Transmitter/Type J Thermocouple	Accutech	AI-2000 W/XP-HDC2-L	Annual
PSL1119A	Kiln Blend Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PDSL1124	Kiln Atomizing Air / Blend Δp Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1156	Kiln Aqueous Atomizing Air Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1157	Kiln Aqueous Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1119B	North ABC Blend Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PDSL1187	North ABC Atomizing	Pressure Switch	SOR Static O'Ring	44V1 or 4NX or	Annual

Table 2-3: Devices Used to Monitor Compliance					
TAG #	**Parameter Measured**	**Monitor Type**	**Manufacturer**	**Model Number**	**Required Calibration Frequency**
	Air / blend Δp switch		Control Devices or Ashcroft	LDDN4GGB25 or 4LG or 6NN	
PSL1196	South ABC Blend Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PDSL1224	South ABC Atomizing Air / Blend Δp Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1162	Direct Burn Atomizing Air Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1165B	North ABC Aqueous Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1256	North ABC Aqueous Atomizing Air Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1165C	South ABC Aqueous Pressure Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1266	South ABC Aqueous Atomizing Air Switch	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1107	Cylinder Eductor N_2 Pressure	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual
PSL1206	Glove Box Eductor N_2 Pressure	Pressure Switch	SOR Static O'Ring Control Devices or Ashcroft	44V1 or 4NX or LDDN4GGB25 or 4LG or 6NN	Annual

3. STARTUP AND SHUTDOWN PROCEDURES

40 CFR 63.6(e)(3)(i) requires the SS&M Plan to include "procedures for operating and maintaining the source during periods of startup and shutdown." This section of the SS&M Plan addresses this requirement for the incinerator.

Startup is defined in 40 CFR 63.2 as the setting in operation of an affected source or portion of an affected source for any purpose. Shutdown is defined there as the cessation of operation of an affected source or portion of it. Pursuant to 40 CFR 63.1206(b)(1), the HWC MACT emission standards and operating requirements apply at all times except:

- During periods of startup, shutdown, and malfunction; and
- When hazardous waste is not in the combustion chamber and you document in the operating record that you are complying with all otherwise applicable standards and requirements promulgated pursuant to the Clean Air Act Sections 112 or 129.

For the purposes of this SS&M Plan, the equipment that would be set into (or cease) operation is the equipment described in Section 2.0. However, equipment such as monitoring devices can be "in operation" and providing information when the entire combustion system and air pollution control equipment is not in operation. In addition, this SS&M Plan only applies when operating under the HWC MACT standards. Operating the unit under other modes of operation as described in 40 CFR 63.1209(q) are not covered by this plan. Therefore, startup is defined for the incinerator as beginning when the combustion gas moving equipment and air pollution control equipment have been started for the purpose of achieving operations pursuant to the HWC MACT standards and ends when normal operations are achieved. Shutdown is defined for the incinerator as beginning at the end of the hazardous waste residence time after waste feeds have ceased for the purpose of halting unit operation. Shutdown is defined as ending when the combustion gas moving equipment and air emissions control equipment has ceased operation.

The facility follows written procedures for both startups and shutdowns. These procedures are in place to ensure that the combustor operates safely and in a manner that minimizes emissions of hazardous air pollutants. Pursuant to 40 CFR 63.6(e)(3)(vi), the facility is allowed to "use the affected source's standard operating procedures (SOP) manual, or an Occupational Safety and Health Administration (OSHA) or other plan, provided the alternative plans meet all the requirements of this section and are made available for inspection or submitted when requested

by the Administrator." The facility has elected to reference existing procedures. Table 3-2 contains a listing of these procedures. This list is subject to change as procedures are updated, revised, modified, and/or developed. The most current list of facility startup procedures is maintained at the facility. The startup procedures are maintained at the facility and are accessible to the incinerator operators. These procedures will be made available for inspection and will be submitted to the Agency when requested.

Table 3-1: List of Startup and Shutdown Procedures
Procedure 05WP-17 - PLANT SHUTDOWN, STARTUP AND MALFUNCTION

4. MALFUNCTION PROCEDURES

40 CFR 63.6(e)(3)(i) requires the SS&M Plan to include "procedures for operating and maintaining the source during periods of … malfunction." In addition, 40 CFR 63.6(e)(3)(i) requires the SS&M Plan to include "a program of corrective action for malfunctioning process and air pollution control and monitoring equipment used to comply with the relevant standard." This section of the SS&M Plan addresses these requirements for the incinerator.

Malfunctions are defined in 40 CFR 63.2 as any sudden, infrequent, and not reasonably preventable failure of air pollution control and monitoring equipment, process equipment, or a process to operate in a normal or usual manner. Failures of equipment or processes that are caused in part by poor maintenance or careless operation are not included in the definition of malfunction. Malfunction types that are required to be addressed in this SS&M Plan are those that have the potential to cause significant releases of hazardous air pollutants (HAPs) to the environment. As such, equipment or process failures that are not reasonably expected to result in significant releases are not addressed by this plan.

Pursuant to 40 CFR 63.1206(b)(1), the HWC MACT emission standards and operating requirements apply at all times except:

- During periods of startup, shutdown, and malfunction; and
- When hazardous waste is not in the combustion chamber and you document in the operating record that you are complying with all otherwise applicable standards and requirements promulgated pursuant to the Clean Air Act Sections 112 or 129.

For the purposes of this SS&M Plan, the equipment related to malfunctions is the equipment described in Section 2.0. The equipment and monitoring devices required by the HWC MACT regulations are those that have the potential to cause the emission of HAPs. As such, the equipment described in Section 2.0 is the equipment related to HAP emissions. The HAPs and their surrogates that are regulated by the HWC MACT are summarized as follows:

- Chlorinated dioxins and furans (D/F);
- Mercury (Hg);
- The semi-volatile metals (SVM) cadmium and lead;
- The low volatility metals (LVM) arsenic, beryllium, and chromium;

- Hydrochloric acid/chlorine gas (HCl/Cl_2);
- Particulate matter (PM) as a surrogate for antimony, cobalt, manganese, nickel, and selenium; and
- Total hydrocarbons (THC), and destruction and removal efficiency (DRE) as a surrogate for other organic HAPs listed in the CAA.

The facility classifies malfunctions into two primary categories. The first category includes those items that automatically result in a shutdown of waste feeds to the incinerator. The second category includes those items that do not automatically result in a shutdown of waste feeds to the incinerator (i.e., manual shutdowns). Each of these categories is discussed further in the following sections.

4.1 Malfunctions – Automatic Shutdowns

The HWC MACT requires that the incinerator control system automatically cut off the hazardous waste feed when any of the operating parameters required by the regulation are exceeded, when the span value of a CMS detector is exceeded or the instrument malfunctions and a redundant instrument cannot make the measurement, and when any component of the automatic waste feed cutoff system fails. Examples of these types of shutdowns are:

- Pluggage of the sodium carbonate feeder resulting in brine pH lower than the operating limit.
- Failure of a spray dryer pump resulting in lack of brine feed to the spray dryer and spray dryer exit temperature above the operating limit.
- Failure of a waste feed pump resulting in an afterburner temperature below the operating limit.
- Failure of all three of the spray dryer temperature transmitters.
- Failure of both of the THC CEMS.

In addition to the regulatory required HWC MACT automatic waste feed shutdowns, the control system also automatically shuts down as required by the Utah Division of Solid and Hazardous Waste (UDSHW) permit. The UDSHW permit includes the requirements of the Resource Recovery and Conservation Act (RCRA) and the Toxic Substances Control Act (TSCA).

When an automatic waste feed cutoff occurs the following procedure is followed:

1. Determine if a CEM reading caused the AWFCO. If it was, operate without waste feed to the unit until the operating limit returns to permit limits. Keep all other operating limits within permit limits during that time period.
2. If a CEM reading did not cause the AWFCO, begin a one-hour burnout. During this period keep all operating limits within permit limits to the extent possible. Determine the reason for the AWFCO. If the reason is remedied before or at the end of the burnout return to waste feed when it is remedied and all operating parameters are within limit. If this is not the case lower the temperature of the kiln to 1700F.
3. Either continue to shut down the incinerator or hold at that temperature depending on the exact nature of the malfunction. Shut down, if needed, will be according to the incinerator shut down procedure.
4. Document the reason for the AWFCO and whether excess emissions were caused by it.

Aragonite has determined that hazardous waste is no longer present in the incinerator once a one-hour burnout has been completed and the kiln has been cooled to 1700°F. Section 2.2.5 discusses this in more detail.

4.2 Malfunctions – Manual Shutdowns

Some equipment or process malfunctions can occur that do not initiate an immediate shutdown of the hazardous waste feed streams and are referred to as manual shutdown malfunctions. Examples of manual shutdown malfunctions are:

- Identification of cracks, gaps, holes, etc. in the combustion chamber shell, ductwork, or air pollution control equipment noticed by the operator during inspections or unit walk thru.
- Kiln shell temperature measurements higher than normal that indicate the kiln brick needs to be replaced in a few weeks.
- Baghouse pressure increases indicating the baghouse bags are blinded.

The procedure and program for corrective action follows:

1. Operator identifies the malfunctioning equipment or process.
2. Determine whether the malfunctioning equipment or process will cause an AWFCO before the situation can be corrected. If so begin a burnout and lower kiln temperature to 1700°F before an AWFCO occurs. During the burnout keep operating parameters within permit limits.
3. If the malfunctioning equipment or process will not cause an AWFCO before the situation can be corrected, determine whether the malfunctioning equipment will cause a significant release of HAPs. If so, stop waste feed and begin a burnout. During the burnout keep operating parameters within permit limits. If the malfunctioning equipment can be repaired before or at the end of the burnout, return to waste feed when it is remedied and all operating parameters are within limit. If this is not the case lower the temperature of the kiln to 1700F.
5. If repair cannot be completed before the end of the burnout, either continue to shut down the incinerator or hold at 1700°F depending on the exact nature of the malfunction. Shut down, if needed, will be according to the incinerator shut down procedure.
4. Document the reason for the malfunction and whether excess emissions were caused by it.
5. If the malfunction will not cause an AWFCO before the situation can be corrected and does not cause a significant release of HAPs, than the process is not correctly classified as a malfunction and normal maintenance procedures will be used to correct the problem.

5. ACTIONS TO PREVENT MALFUNCTIONS

5.1 Regulatory Requirements

40 CFR 270.235 addresses integration of the RCRA and HWC MACT regulations. Facilities with existing RCRA permits may request that RCRA permit conditions be removed. Aragonite wishes to make that request that RCRA permit conditions be removed.

40 CFR 270.235 requires that the Utah Division of Air Quality approve the SS&M Plan for incinerators requesting removal of RCRA permit conditions for incinerators. The HWC MACT regulations at 40 CFR 63.1206 (c)(2) further require that SS&M Plans for incinerators that request removal of RCRA requirements "include a description of potential causes of malfunctions, including release from emergency safety vents, that may result in significant release of hazardous air pollutants, and actions the source is taking to minimize the frequency and severity of those malfunctions." This section of this document satisfies that requirement.

5.2 Causes of Malfunctions

The equipment and monitoring devices required by the HWC MACT regulations are those that have the potential to cause the emission of HAPs. As such, the equipment described in Section 2.0 is the equipment related to HAP emissions. The HAPs or surrogates that are regulated by the HWC MACT are summarized as follows:

- Chlorinated dioxins and furans (D/F);
- Mercury (Hg);
- The semi-volatile metals (SVM) cadmium and lead;
- The low volatility metals (LVM) arsenic, beryllium, and chromium;
- Hydrochloric acid/chlorine gas (HCl/Cl_2);
- Particulate matter (PM) as a surrogate for antimony, cobalt, manganese, nickel, and selenium; and
- Total hydrocarbons (THC), and destruction and removal efficiency (DRE) as a surrogate for other organic HAPs listed in the CAA.

The HWC MACT regulations define operating parameters for each of these categories. For instance compliance with the DRE requires that a minimum temperature be maintained, production rate or flue gas flow rate be below a maximum, hazardous waste feed rate be below a maximum value, and the that waste firing system operating parameters be maintained. The values for these limits are set by testing or, in some cases, based upon manufacturer's recommendations. The requirements for the various operating parameters were set after careful study by the Environmental Protection Agency. The intent was that if incinerator operations were kept within the operating parameter limits then significant releases of HAPs would not occur.

The HWC MACT requires that the incinerator control system automatically cut off the hazardous waste feed when any of the operating parameters required by the regulation are exceeded, when the span value of a CMS detector is exceeded or the instrument malfunctions and a redundant instrument cannot make the measurement, and when any component of the automatic waste feed cutoff system fails. This section describes the potential causes of AWFCOs and Emergency Vent Openings and describes the actions being taken to minimize their frequency and severity.

5.3 Actions Being Taken to Prevent Malfunctions

The following tables provide the details of the Aragonite program to avoid malfunctions. Table 6-1 lists the operating parameters required by the HWC MACT, and TSCA. Also listed are operating parameters, such as Saturator Flow and Temperature, that when exceeded can cause significant disruption to the system. The table also lists the HAP categories that require that operating parameter (some parameters are not required by the HWC MACT) and the table number that addresses that parameter. Tables for minimum baghouse pressure and minimum scrubber gas pressure drop are not included. The facility has not experienced exceedances for these parameters while burning waste.

The tables that address each parameter are fault trees in tabular form. For example in Table 6-2 a primary cause for kiln low temperature cutoff is the infrared pyrometers reading incorrectly. That can in turn be caused by slag covering the line of sight or infrared pyrometer failure or the temperature not being high enough when the measurement fails to one pyrometer. Different preventative actions address each of these sub causes and are listed in the furthest right column. If it was needed to go to another level of sub causes in order to present the preventative actions these would be listed in the sub sub causes column.

The tables leave enough room for four levels of causes. Aragonite considers this program a work in progress. When incident reviews of malfunctions indicate that further preventative actions are necessary they will be added to the tables.

Table 5-1: Summary of Preventative Action Tables		
Automatic Waste Feed Cutoff	**Operating Parameters Required:**	**Table**
Kiln Gas Exit Temperature Kiln Waste firing parameters (mfg spec)	DRE, Dioxin	Table 5-2
Afterburner Exit Temperature Afterburner Waste firing parameters (mfg spec)	DRE, Dioxin	Table 6-3
Afterburner exit gas, wet % O2	Toxic Substances Control Act	Table 5-4
Spray Dryer Exit Temperature	Dioxin, SVM, LVM	Table 5-5
Activated Carbon Feed Rate Activated Carbon ΔP or Flow Rate (mfg spec)	Dioxin, Mercury	Table 5-7
Saturator Exit Temperature.		Table 5-9
First Stage Scrubber Brine pH	Chlorine	Table 5-10
First Stage Scrubber Brine Flow Rate Minimum Scrubber Liquid Feed Pressure (mfg spec)	Mercury, Chlorine	Table 5-11
Second Stage Scrubber Brine pH Second Stage Scrubber Rundown pH	Chlorine	Table 5-10
Second Stage Scrubber Brine Flow Rate Minimum Scrubber Liquid Feed Pressure (mfg spec)	Mercury, Chlorine	Table 5-11
Stack Flow Rate	DRE, Dioxin, Particulate, LVM, Chlorine	Table 6-10
Feed rate of waste to the kiln	DRE, Dioxin, Particulate, SVM, LVM,. Chlorine	No table – individual feed streams reviewed to identify (and stop) high constituent rates in a preventative fashion .
Feed rate of pumpable waste to the kiln	DRE, Dioxin, Particulate, SVM, LVM, Chlorine	
Feed rate of waste to the afterburner	DRE, Dioxin,. Particulate, SVM, LVM, Chlorine	
Total PCB feed rate	Toxic Substances Control Act	
Total SVM feed rate	SVM	
Total LVM Feed Rate	LVM	
Pumpable feed LVM Feed Rate	LVM	
Total Mercury Feed Rate	Mercury	
Total Chlorine	SVM, LVM, Chlorine	
Maximum Combustion Pressure	Pressure	Table 6-11
High CO or THC		Table 5-2
Baghouse Opacity		Table 5-3
Power Outage	Referred to by other tables	Table 5-4
Control System Outage	Referred to by other tables	Table 5-5
Emergency Vent Opening		Table 5-6
Manual Emergency Stop Button	Referred to by other tables	Table 5-7

Table 5-2: Kiln Temperature Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-2.1	Infrared Pyrometers Reading Incorrectly	Slag covering line of sight.			Operator removal of slag; Turnaround cleanout of afterburner.
		Infrared pyrometer failure.			Redundant instrument; Preventative Maintenance program; Calibration per schedule.
		Temperature is not high enough if one pyrometer fails and switches to second pyrometer.			Permit Change (RCRA and AO).
6-2.2	No Fuel	Automatic Waste feed Cutoff (AWFCO).			Program for preventing AWFCOs listed in other Tables.
			Fuel Supply Failure	System or pump failure	Redundant pump system
		Burner Flameout.	Burner Management System failure		Quarterly BMS Check.
			Sparker dirty		Rebuild and check equipment during turnarounds.
			Bad Sparker wire insulator		Rebuild and check equipment during turnarounds.
			Flame sensor aimed incorrectly		Rebuild and check equipment during turnarounds.
6-2.3	Operator Error	Don't notice HRA dropping.			Control Board Operator Training; Incident Follow-up.
6-2.4	Waste Type	Smoke blinds infrareds.			Control Board operator adjusts airflow and waste feed rate.
		Low Btu waste cools kiln.			Control Board Operator changes waste feed or adds auxiliary fuel.
		Energetic waste.	Anticipating Cutoffs reducing fuel		Control Board Operator Training and experience.
			AWFCO caused by energetic waste		Program for preventing AWFCOs listed in other tables.
6-2.5	Control System Failure				See Table 6-15 for Control System failure.
6-2.6	Power Failure				See Table 6-14 for Power failure.

Table 5-3: Afterburner Temperature Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-3.1	Afterburner temperature indicators reading incorrectly.				Redundant Temperature Indicators (TT1009A, TT1009B, TT1009C).
6-3.2	No Fuel	Automatic Waste Feed Cutoff (AWFCO).			Program for preventing AWFCOs listed in other tables.
		Burner Flameout.	Burner Management System failure.		Quarterly BMS Check.
			Fuel Supply failure		Redundant pump system
			Sparker dirty.		Rebuild and check equipment during turnarounds.
			Bad Sparker wire insulator.		Rebuild and check equipment during turnarounds.
			Flame sensor aimed incorrectly.		Rebuild and check equipment during turnarounds.
6-3.3	Operator Error	Don't notice HRA dropping.			Control Board Operator Training; Incident Follow-up.
6-3.4	Waste Type	Low Btu waste cools afterburner.			Control board Operator changes waste feed or adds auxiliary fuel.
6-3.5	Control System Failure				See separate table for Control System failure.
6-3.6	Power Failure				See separate table for Power failure.

Table 5-4: Afterburner Wet % O_2 Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-4.1	Energetic Containers				CBO lowers fuel feed and increases airflow; Remove energetic containers from job; Repack into smaller containers.
6-4.2	Energetic Bulk	Energetic Bulk Material.			CBO lowers fuel feed and increases airflow; Remove energetic containers from job; Mixes bulk material better with other materials.
		Plugged lines blown free.			CBO training to reduce/adjust waste feed to avoid issue; AWFCO with this material.
		Burner ON too fast.			CBO training to reduce/adjust waste feed to avoid issue; AWFCO with this material.
6-4.3	Bad Oxygen Meter				Redundant instrument; CBO monitors for differences between instruments.

Table 5-5: Spray Dryer Temperature Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-5.1	Spray dryer temperature indicators reading incorrectly.				Control Board Operator monitors deviation; Redundant Temperature Indicators (3) that automatically check against each other; Scheduled Preventative Maintenance and Calibration and/or Replacement.
6-5.2	Loss of ID Fan.	Power Outage.			See Table 5-14: Power Failure.
		Fan Variable Frequency Drive Failure.			Redundant VFD; Turn on quickly enough to avoid HRA loss.
6-5.3	No Cooling Brine **AND** Raw Water Not Available	First Stage Pump Failure.			Redundant Pump.
		Strainer Pluggage.	Backup strainer not ready for service		Operator training; Bypass valve.
		Raw Water not Available.	Plant water supply well is down;		Control Board Operator checks inventory and closes down before water runs out.
			Automatic switch over instrumentation fails.		Manually activate plant water valve; Turnaround preventative maintenance.
			Pipe failure		Turnaround preventative maintenance.
		Spray Nozzles Clogged.			Add chemical descalant; Operator check during walk around.
		Spray Dryer Pump Failure.			Redundant Pump.
		Header Pipes Clogged.			Add chemical descalant; Inspect/cleanout as necessary during shutdown.
		Pump Cavitation	Air introduced to header		Turnaround preventative maintenance

Table 5-6: Spray Dryer Temperature Cutoff (continued)					
6-5.4	Energetic Container				Control Board Operator adjustment of fuel and air; Switch to plant water; Open additional spray nozzles; Investigate hot container and remove or remediate similar containers from feed.
6-5.5	Control System Failure				See Table 5-15: Control System Failure.
6-5.6	Power Failure				See Table 5-14: Power Failure.

Table 5-7: Activated Carbon Below Permissive Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-6.1	Loss of System	PLC Failure	CPU Fault		Clear fault, redundant system.
			CPU Failure		Replace CPU, redundant system.
			Bad Power Supply		Replace power supply, redundant system.
			I/O Card Failure		Replace I/O card, redundant system.
			No Utility Power		See Table 5-14: Power Failure.
		Loss of Air Pressure	Loss of Compressor		Redundant Compressors.
			Broken Lines		Redundant Line.
			Air control solenoid valve won't open or close.	CPU fault	Clear fault, redundant system.
				Bad solenoid	Replace solenoid, redundant system.
				Bad valve	Replace valve, redundant system.
			ΔP Instrument Incorrect		Repair, calibrate or replace instrument, redundant system.
		Loss of Feeder Controller	Controller Failure		Replace controller, redundant system.

Table 5-8: Activated Carbon Below Permissive Cutoff (continued)					
		Scale Failure	No Utility Power		See Table 5-14: Power Failure.
			Out of Calibration		Replace scale, redundant system.
					Scale calibrated quarterly, redundant system.
			Carbon build up around platform.		Operator cleans area, redundant system.
		Power Failure			Table 5-14: Power Failure.
		No Carbon Fed	Plugged Line / plugged hopper	Chunks in Carbon	Clean line, redundant system, circulate carbon to break up chunks
		No Carbon Fed	Line Leakage		Repair line. Daily inspections by area operator. Redundant system.
			Eductor Plugged		Clean the eductor, redundant system.
			Incorrect feed rate programmed in the controller.		Reprogram correct feed rate, redundant system.
			No Carbon		Carbon ordering is based on calculations used with current feed rates.
			Vibrator motor not working.		Preventative Maintenance, repair or replace vibrator, redundant system.
6-6.2	Control System Failure				See Table 5-15: Control System Failure.

Table 5-9: Saturator High Temperature Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-7.1	Pump Failure				Automatic Switch to Fire Water; Redundant Pump; Preventative maintenance schedule followed.
6-7.2	Plugged Nozzles and Header				Chemical Descalant; Turnaround maintenance; Operator Nozzle inspections.
6-7.3	Lose Tank Level	Not enough liquid added.			Visual Inspection; Control board Operator monitoring and direction to fill tank.
6-7.4	Instrument Failure	Level instruments.			Operator inspection of tank level instruments.
		Flow instruments.			Turnaround maintenance; Control Board Operator monitoring.
		Temperature instruments.			Redundant instruments; Use best two of three readings; Control board Operator monitoring.
6-7.5	Scrubber will not drain.	Too high first stage scrubber/ saturator flow.			Control Board Operator monitoring of scrubber pressure drop.
		Mud in Scrubber outlet.			Turnaround maintenance.

Table 5-10: 1st and 2nd Stage Low pH and 2nd Stage Rundown pH					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-8.1	Not Enough Soda Ash Added.	Soda Ash Pump Fails.			Redundant Pump.
		Piping plugs.	Density Meter failure calls for more soda ash than needed and get solid in solution.		Manual soda ash solution density checks 3 times/shift; Turnaround maintenance and calibration.
		Soda ash screw fails.			Manual soda ash solution density checks 3 times/shift.
		Addition valves fail.			Turnaround Maintenance.
		Run out of soda ash.			Inventory system.
6-8.2	pH Probes Fail				Monitor for deviation; PM twice quarterly; Redundant probe.
6-8.3	Addition Control Loop Tuning Bad				Control Engineer monitors regularly.
6-8.4	Waste Stream Contains High Chlorine or Sulfur **AND** Control Board Operator Not Aware.				Chemistry available to Control Board Operator.

Table 5-11: 1st and 2nd Stage Low Flow & Minimum Liquid Feed Pressure Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-9.1	Plugged Strainer **AND** Redundant Strainer not ready for service.	Soda ash lumps.	Soda Ash Baghouse moist.		Operator walk-around of soda ash tank and soda ash baghouse.
			Soda Ash solution density meter bubbler plugged.		Manual Soda Ash solution density checks regularly; Turnaround maintenance and calibration.
		Mud and Scale.			Cleanout Tanks during Turnaround.
		Redundant strainer not ready for service.			Clean out redundant strainer before it is needed; Operator Training.
6-9.2	Pump Failure				Redundant Pump.
6-9.3	Heat Exchanger Pluggage				Back flush regularly; Turnaround maintenance; Operator walk-around.
6-9.4	Tank Empty	Level Transmitter Failure.			Operator monitors regularly.
6-9.5	Flowmeter Out of Calibration				Calibrate per schedule.
6-9.6	Valve or Pipe Failure				Turnaround maintenance.

Table 5-10: High Stack Flow Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-11.1	High Stack Temperature	High Cooling Water Temperature	Bypass valve fails open.		CBO Alarm; Operator Inspection; Local Temperature Indicators.
			Heat exchanger back flush		CBO adjust controls before back flush
			Tower unable to cool.	Clogged packing.	Chemical treatment Program; Turnaround Maintenance.
		Low Cooling Water Flow	Heat Exchanger Valve (TV2131) fails closed or SV2155 has low tower level.		CBO Alarm; Operator inspection of screens; Fails open; Inspection during turnaround.
			Cooling Tower Pump Fails.		Redundant Pump.
			Screens plugged.		Operator inspection.
6-11.2	Leakage	Incineration Port Open			CBO Alarm; Operator inspection.
		Lost Deslagger Liquid Seal	Level Instrument failure.		CBO Alarm; Operator inspection.
			Loss of makeup water.		Control board Alarm; Turn on plant water.
6-11.3	Annubar Failure				Purge cycle; Turnaround maintenance.

Table 5-11: High Combustion Zone Pressure Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-13.1	ID Fan Failure	Variable Frequency Drive/Motor/ Transformer failure.			Turnaround maintenance Redundant VFD.
		Fan Wheel Failure			Turnaround maintenance; Hastelloy fan construction.
6-13.2	Plug in Pant Leg	We have time to react to this because it does not cause an instantaneous pressure spike.			Inspect for pluggage every shift; Clean out pluggage with power shots.
6-13.3	Buildup Fall	Spontaneous Fall			Visual inspection with power shots.
		Powershot Removal			Lower Deslagger level.
		Steel Can With Waste Glob			Reference Table 5-4: Afterburner Wet % O2 Cutoff.
6-13.4	Pressure Indicator Failure				Redundant pressure indicators; Comparison of pressure readings; Calibration and preventative maintenance; Operator checks to confirm port is clear.
6-3.5	Plug in system	Plug in Pantleg	Plug in scrubber		Change out packing / Reduce feed rates
6-13.6	Waste Feed	Energetic Drums	Too much energy fed at one time.		Repack into smaller charge; Increase air and decrease other fuel; Feed Analysis Plan (FAP) & Packaging Guidelines.
			Rogue material inside drum.		Inspection of drum material; Remove problem drum profiles from job; Feed Analysis Plan (FAP) & Packaging Guidelines.
			Energetic liquid fed in container.		Inspect drums before feeding and remove energetic liquids from drum line; Remove pumpable material from container and feed through liquid port, Robe Roller, Drum Pumping Station; Feed Analysis Plan (FAP) & Packaging Guidelines.

Table 5-12: High CO or THC Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-14.1	Waste Feed	Energetic Containers.	Too much energy fed at one time.		Repack into smaller charges; Increase air, decrease other fuel .
			Rogue material inside drum.		Inspection of drum material; Remove problem drum profiles from job.
			Energetic liquid fed in container.		Inspect drums before feeding and remove energetic liquids from drum line; Remove pumpable material from container and feed through liquid port, Robe Roller, Drum Pumping Station.
		Energetic bulk solids and liquids.	Feeding too much material.		Decrease feed rate. Reference Table 6-4 for energetic materials.
			Need more air flow.		Increase air flow.
		Field operator adjustment without Control board notification.			Training.
6-14.2	Instrument Failure				Redundant instrument; Daily maintenance and scheduled calibration.

Table 5-13: Baghouse Opacity / Pressure Drop Cutoff					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-15.1	Baghouse Bypass	Manual Bypass.			Operator Training;
		High spray dryer outlet temperature.			See Table 5-5: Spray Dryer Temperature Cutoff.
		Low spray dryer exit temp.	Too many nozzles on line.		Take off nozzles.
			Temperature indicator failure.		Redundant temperature indicators; Takes closest two of three temperatures
			Dryer on water **AND** Cannot switch back to brine.	Valve failure.	Turnaround maintenance
		High differential pressure.	Baghouse not cleaning bags. CBO gets alarm with gradual pressure increase.	Cleaning sequence not working.	Repair cleaning sequence.
				Bags wet or clogged.	Replace bad spray dryer nozzles; Let bags dry out; Conduct off line cleaning sequence.
			Differential Pressure Instrument failure.		Turnaround maintenance.
			Pressure tubing clogged.		Purge.
		Loss of Air Pressure.	Power failure.		See Table 5-14: Power Failure.
			Loss of compressor.		Redundant compressors.

Table 5-13: Baghouse Opacity / Pressure Drop Cutoff (continued)					
6-15.2	Baghouse Bag Failure	Chemical attack.			Measure fluorides when suspect high fluoride feed; Curtail high fluoride waste feed rate if necessary; Open compartments and inspect for dust if opacity.
		Physical attack.			Inspect cage holes and cages when bags are changed; Trained operators supervise bag installation; Dye testing conducted during maintenance turnarounds; Conduct physical testing on bags if opacity is high; Open compartments and check for dust on clean side if opacity.
6-15.3	Baghouse Compartment Failure				Inspect/repair during maintenance turnarounds; Isolate the compartment.
6-15.4	Leak Between Clean/Dirty Ductwork				Inspect/repair during maintenance turnarounds.
6-15.5	Dust in Outlet Duct	Spray dryer dust during bypass.			Clean out area during turn around.
		Rust from corrosion.			Inspect during maintenance turnarounds and remove if necessary.
6-15.6	Leaking Bypass Damper				Inspect during maintenance turnarounds.
6-15.7	Control System Failure				See Table 5-15: Control System Failure.
6-15.8	Opacity Meter Incorrect				Monthly inspection and window cleaning; Monthly air purge check; Reference O&M Plan.
6-15.9	Power Failure				See Table 5-14: Power Failure.
6-15.10	Random Spikes	Rust in system			Clean out during shutdown

Table 5-14: Power Failure					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-16.1	Utah Power Utility loss **AND** Generator does not start before an AWFCO occurs or Emergency Safety Vent opens.	Generator does not start before an AWFCO occurs or Emergency vent opens			This is a malfunction. Operator training on switch over to generator power; Keep generator on standby; Weekly generator tests; Preventative maintenance.
6-16.2	Cannot get variable frequency drive on-line before AWFCO occurs.	Spray Dryer VFD			This is a malfunction. Operator qualification and training.
		Induced Draft fan VFD			This is a malfunction. Operator qualification and training.
6-16.3	Cannot get air compressors back on-line before Emergency Safety Vent opens.				This is a malfunction. Operator qualification and training.

Table 5-15: Control System Failure					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-17.1	Loss of System	DPU Failure	Processor Fault		Redundant DPU's.
			Memory Fault		Redundant DPU's.
			Bad Power Supply		Redundant DPU's.
			I/O Communication Failure		Redundant DPU's.
			Highway Controller Fault		Redundant DPU's.
			Excessive Temperature	AC Failure	Routine Maintenance.
		Loss of Electrical Power	UPS Failure	Bad Batteries	Routine inspection and maintenance; Replace Batteries When Needed.
			Emergency Generator Failure		Test Generator Weekly.
		Highway Failure			Redundant Highway's.
6-17.2	No Communication With Field Devices	SIM Fault			Replace SIM.
		I/O Card Fault			Replace Card.
		Power Supply Failure			Replace Power Supply.

Table 5-16: Emergency Safety Vent Opening					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-18.1	High Spray Dryer Temperature				See Table 5-1: Summary of Preventative Action Tables.
6-18.2	Afterburner High Pressure				See Table 5-11: High Combustion Zone Pressure Cutoff.
6-18.3	High Saturator Temperature				See Table 5-9: Saturator High Temperature Cutoff.
6-18.4	Manual Opening				See Table 5-17: Manual Emergency Stop Button.
6-18.5	Loss of Air Pressure				See Table 5-14: Power Failure.

Table 5-17: Manual Emergency Stop Button					
Ref #	**Cause**	**Sub Cause**	**Sub-Sub Cause**	**Sub-Sub-Sub Cause**	**Preventative Action**
6-19.1	Unintended Push				Button Guard; Control Board Operator Training.
6-19.2	Act of God or War				None Possible.
6-19.3	Control Board Operator or Operator cannot get plant under control.				Control Board Operator and Operator Training.

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6. RECORDKEEPING

The current version of this SS&M Plan is maintained in the facility operating record pursuant to 40 CFR 63.1206(c)(2)(iv). The SS&M Plan will be made available upon request for inspection and copying by the regulatory agency pursuant to 40 CFR 63.6(e)(3)(v). If revised, all previous versions of this SS&M Plan will be retained at the facility for at least 5 years following the revision and will be made available upon request for inspection and copying by the regulatory agency pursuant to 40 CFR 63.6(e)(3)(v).

The facility maintains records that demonstrate that the procedures specified in this SS&M Plan Each time the incinerator starts up, shuts down, or responds to a malfunction each step of the procedure is signed off by the responsible operator or maintenance technician. The signed off procedure is retained as part of the operating record.

The facility maintains records on the occurrence and duration of each startup, shutdown, or malfunction event for the incinerator. In addition, records are maintained on the nature and cause of any malfunction (if known) on the CMS devices. This information will be used to satisfy periodic and immediate reporting requirements.

Pursuant to 40 CFR 63.1206(b)(5), change is defined as any change in design, operation, or maintenance practices that were documented in the Comprehensive Performance Test Plan, Notification of Compliance, or SS&M Plan. If a change is made that does not adversely affect compliance with applicable emission standards or operating practices, this SS&M Plan must be revised to reflect the change. Changes that do adversely affect compliance with applicable emission standards or operating practices, must follow the requirements of 40 CFR 63.1206(b)(5)(i).

Section 6 of this document describes the actions the incinerator is taking in order to prevent malfunctions from occurring. This information is included in order to comply with the requirements contained in 40 CFR 270.235(a)(1)(iii), (a)(2)(iii), or (b)(1)(ii) to address RCRA concerns of minimizing emissions during startup, shutdown, and malfunction events. This SS&M Plan will be submitted to the regulatory agency for review and approval.

This SS&M Plan may be periodically revised to reflect changes in equipment or procedures, to add procedures to address events that have occurred, or if required by the regulatory agency. Such revisions will be performed in accordance with the provisions of 40 CFR 63.6(e)(vii), (viii), and (ix).

Appendix F

CLEAN HARBORS ARAGONITE LLC.

CPT PLAN

Notice of Complaince

July 1, 2015

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Hazardous Waste Combustor

Notification of Compliance

For The

Clean Harbors Aragonite Incinerator

Clean Harbors Aragonite, LLC
11600 North Aptus Road
Aragonite, Utah 84029

EPA ID Number UTD981552177

July 1, 2015

Previous Versions
January 16, 2013
Revised May 10, 2013

Notification of Compliance
Certification Statement
[40 CFR 63.9 (h)(2)(i)(G); 63.1207(j)(2); 63.1210(d)]

This document is the Notification of Compliance (NOC) for the hazardous waste incineration system operated by Clean Harbors Aragonite, LLC (CHA). This NOC has been prepared in accordance with the requirements of 40 CFR Part 63 Subpart EEE – National Emission Standard for Hazardous Air Pollutants from Hazardous Waste Combustors.

I hereby certify, based upon information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate, and complete:

- The hazardous waste incineration system is in compliance with the emission standards of 40 CFR Part 63 Subpart EEE for existing incinerators [40 CFR 63.1219(a)], which became effective on October 14, 2008;
- Operating limits have been established pursuant to 40 CFR 63.1209 that ensure compliance with the emission standards; and
- All required continuous emission monitoring systems (CEMS) and continuous monitoring systems (CMS) have been installed, calibrated, and tested to verify compliance with the requirements of 40 CFR Part 63 Subpart EEE.

Michael Marlowe
Printed Name

Signature

Facility General Manager
Title

Date

1.0 Method Used to Determine Compliance

[*40 CFR 63.1210(d); 1207(j)*]

1.1. Introduction

Clean Harbors Aragonite, LLC (CHA) owns and operates a hazardous waste incineration complex located in Aragonite, Utah. CHA destroys hazardous wastes in an incineration system currently operating under a State of Utah Hazardous Waste Permit (EPA ID No. UTD981552177) and a Title V Clean Air Act Air Permit (Permit Number 4500048002).

CHA has proven the performance of the incineration equipment to meet the final National Emissions Standards for Hazardous Air Pollutants (NESHAPS) from Hazardous Waste Combustors (HWC) (*40 CFR 63 Subpart EEE*) by a Confirmatory Performance Test (CfPT) as required by *40 CFR 63.1207(d)(2)*. This notification of compliance (NOC) was developed to certify compliance with the applicable emission standards of *40 CFR 63.1219(a)* for dioxins and furans, carbon monoxide (CO) and total hydrocarbons (THC).

This NOC is being submitted to State of Utah and the USEPA Region 8 in accordance with *40 CFR 63.9(h)* and *40 CFR 63.1210(d)* and is maintained in the facility operating record.

The CfPT also included emissions testing as required under the State of Utah Hazardous Waste Permit and the Title V Clean Air Act Air Permit

1.2 Confirmatory Performance Test April 2015

CHA has demonstrated compliance with the final emission standards by performance testing on April 14, 15 and 17, 2015. These performance tests followed the requirements for a Confirmatory Performance Test required by *40 CFR Part 63 Subpart EEE* and were performed in conjunction with other CAA and RCRA permit required performance tests at the facility. Results from these performance tests are summarized in Section 2 of this NOC.

The confirmatory test results serve as the basis for this updated Notification of Compliance. The confirmatory tests do not establish any new operating parameter limits. Operating parameters limits (OPL's) remain the same as those established in the previous NOC dated May 10, 2013, which was based upon the Comprehensive Performance Test Report of January 16, 2013.

This updated NOC presents the dioxins and furans, carbon monoxide (CO), and total hydrocarbons (THC) emission results to demonstrate compliance with NESHAPS HWC emission standards. The results for other air emission parameters, as required under the Hazardous Waste Permit and Air Permit, are also included in this NOC for reference purposes. The previous NOC dated May 10, 2013 is appended to and incorporated into

this NOC, and all operating parameter limits continue to apply and are used by the facility for the Automatic Waste Feed Cutoff System (AWFCO). Readers should review the appended and incorporated NOC of May 10, 2013 for all OPL's details and the results of the previous Comprehensive Performance Test.

The CfPT consisted of three replicate sampling runs for one mode of operation with a baghouse inlet temperature of <400 °F. During each of the three test runs, samples were collected to determine emission levels of dioxin/furan, carbon monoxide (CO), and total hydrocarbons (THC) as required under *40 CFR EEE*. In addition, samples for particulate (PM), total chlorine (HCl and Cl_2), mercury, low volatile metals (LVM), semi volatile metals (SVM) and polychlorinated biphenyl (PCB) were collected as required by the Hazardous Waste Permit and Air Permit. During the performance test there were no significant deviations from the approved test plan.

The samples were collected by Air Pollution Testing, Inc. personnel and delivered to either Test America or the APT laboratory for analysis. The Test America facility is certified by the Utah Bureau of Laboratory Improvement (BLI) for the applicable analytical methods. Process samples (waste feed samples) were collected by CHA personnel for analysis by the CHA laboratory.

The facility's continuous emissions monitoring system (CEMS) data were used to document emission level of carbon monoxide (CO), total hydrocarbons (THC), oxygen (O_2), carbon dioxide (CO_2), oxides of nitrogen (NO_x), and sulfur dioxide (SO_2). The facility continuous monitoring system (CMS) was used monitor waste feed rates and operating conditions.

This NOC is maintained in the facility operating record as specified in the Final Standards for National Emissions Standards for Hazardous Air Pollutants for Hazardous Waste Combustors. The compliance date for meeting the final emission standards was October 14, 2008 as specified at *40 CFR 63.1206 (a)(1)(ii)*. The operating parameter limits were established in the previous NOC (May 10, 2013) and are based on the results of the Comprehensive Performance Test (CPT) performed October 2012. These operating parameter limits remain the same and are not changed when confirmatory testing is performed.

This updated NOC, based on the 2015 Confirmatory Performance Test, is being submitted to the State of Utah (UDSHW and UDAQ) and USEPA Region 8 with the final CfPT Report (June 2015) for the Confirmatory Performance Test conducted April 14, 15 and 17, 2015. The full report for these confirmatory performance tests with all supporting data is being submitted to the State of Utah (UDSHW and UDAQ) and USEPA Region 8 in the report titled: *Test Report: MACT, CAA and RCRA 2015 Performance Test performed April 2015,* completed in June 2015 along with this NOC. The CfPT was performed in accordance with the approved CfPT Plan version 1.0 dated February 2015. and the approved QAPP revision 2.0 dated April 2015. CHA is requesting that the State of Utah and USEPA Region 8 review the final Confirmatory Performance Test Report and this NOC, and issue a finding of compliance.

1.3 Background on Compliance with MACT and Previous NOC's

The regulations for the National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors (NESHAPS - HWC or MACT) (*40 CFR 63 Subpart EEE*) were revised and final standards issued for incinerators on October 12, 2005 (FR Vol. 70, No 196, 59402). These regulations established final emission standards for existing incinerators [*40 CFR 63.1219(a)*] and set a final compliance date of October 14, 2008 [*40 CFR 63.1206(a)(1)(ii)*].

CHA completed performance testing in 2007 and 2008 and submitted a Notification of Compliance on October 27, 2008. The NOC showed that the CHA incineration system was in compliance with the final HWC standards. The NESHAPS-HWC regulations (*40 CFR 63.1207(d)*) require additional Comprehensive Performance Tests (CPT) be performed within 61 months following the start of the previous CPT. The most recent CPT was performed on October 16-18, 2012 with a final report and NOC issued in January 2013. The NOC was revised in May 2013. The NESHAPS-HWC require that a Confirmatory Performance Test (CfPT) be performed within 31 months of completion of the last Comprehensive Performance Test (CPT). The CfPT, which is the basis of this NOC, was required to be performed by May 16, 2015. This requirement was met as the 2015 CfPT was initiated on April 14, 2015 and testing was completed on April 17, 2015.

This NOC is being submitted to the Utah Division of Air Quality, Utah Division of Solid and Hazardous Waste, and USEPA Region 8 with the final CfPT report (January 2013) in accordance with 40 CFR 63.1207(j)(2). This NOC does not establish any new operating parameter limits.

It should be noted that the CHA facility currently has operating parameter limits (OPLs) established in the UDSHW RCRA permit Module 5 and Module 17 (PCB); some of which are redundant with the NESHAPS-HWC and CAA operating parameter limits. The UDSHW Hazardous Waste Permit was modified after the 2012 CPT and RCRA trial burn to adjust certain OPL's in the permit to match the NESHAPS-HWC operating parameter limits. If any of the NESHAPS-HWC or CAA OPLs are redundant with and different from the Hazardous Waste Permit, the more stringent of the two operating parameter limits apply.

2.0 Compliance with Emission Standards – Test Results

This NOC was developed to certify compliance with the applicable emission standards of *40 CFR 63.1219(a)* for dioxin and furans, CO and THC as defined in the NESHAPS-HWC standards for existing hazardous waste incinerators. This certification is based on the Confirmatory Performance Test requirements and Notice of Compliance requirements at *40 CFR 63.1207(d)(2) and 63.1207(j)(2)*.

2.1 Emission Standards

The specific NESHAPS-HWC emission standards for this updated NOC are listed below. All concentration limits are specified as corrected to seven percent oxygen (7% O_2).

- Control of dioxin/furan emissions to a concentration less than 0.40 nanograms toxic equivalent quotient (TEQ) per dry standard cubic meter (ng TEQ/dscm) *40 CFR 63.1219(a)(1)(i)(B).*

- Control of carbon monoxide (CO) emissions to a concentration less than 100 ppmv (dry) or total hydrocarbon (THC) less than 10 ppmv – CHA has demonstrated compliance with both standards. CHA uses either CO or THC as the AWFCO parameter, as allowed by teh NESHAPS-HWC. *40 CFR 63.1219(a)(5).*

The appended NOC revised May 10, 2013 lists the other applicable NESHAPS-HWC emission standards and the established operating parameters limits. Compliance with the above referenced standards are the only requirements to be demonstrated during a CfPT.

This CfPT was also performed to demonstrate compliance with the UDSHW Hazardous Waste Permit and the UDAQ Air Permit emission standards, as required in those permits. The emission results for the parameters specified in those permits are also included in this NOC for reference. See the Hazardous Waste Permit and Air Permit for additional information.

2.2 Emission Results – Compliance with Final Emission Standards

Table 2-1 shows the emissions results for dioxins and furans, CO and THC obtained during the Confirmatory Performance Test run under normal operating conditions for the incineration system as measured on April 14, 15, and 17, 2015. The emission standards are the final hazardous waste incinerator emission standards, which became effective October 14, 2008. These data confirm compliance with the final NESHAPS HWC emissions standards.

Table 2-2 shows the emission results for the parameters required under the UDSHW Permit, including PM, HCl/Cl_2, SVM, LVM, Hg, CO, dioxins/furans, and PCB-DRE. Table 2-3 shows the emission results required under the UDAQ Air Permit, including PM, HCl/Cl_2, CO, THC, SO_2, NO_x, SVM, LVM, Hg, Be, Ni, and dioxins/furans.

Table 2.1
Comparison with HWC MACT Standards

Clean Harbors Aragonite – Aragonite Utah					
Emissions Data	***Run #1***	***Run #2***	***Run #3***	**Average**	**Limits**
PCDD/F (ng/dscm TEQ @ 7% O_2)	0.028	0.022	0.030	0.027	***0.40[1]***
Baghouse Inlet Temp. (°F)	385	385	385	385	**<400**
CO (ppmvd @ 7% O_2)[2]	1.0	3.5	4.8	3.1	***100***
THC (ppmvd @ 7% O_2)[2]	0.1	0.0	0.5	0.2	***10***
Parameters not required by NESHAPS-HWC CfPT - included for informational purposes					
PM (mg/dscm @ 7% O_2)	4.3	4.0	2.4	3.6	***28***
$HCl+Cl_2$ as HCl eqv. (ppmvd @ 7% O_2)	0.90	0.85	0.23	0.66	***32***
SVM, Pb+Cd (µg/dscm @ 7% O_2)	0.65	0.44	0.43	0.51	***230***
LVM, As+Be+Cr (µg/dscm @ 7% O_2)	1.26	2.38	1.61	1.75	***92***
Mercury (ug/dcsm @ 7% O_2)	48.1	12.4	3.5	21.3	***130***

[1]Limit is when baghouse inlet temperature is <400 F.
[2] Data are the averages of testing during the Method 23A testing excluding operational pauses and pauses due to port changes. Run 1 corresponds to April 14, 2015; Run 2 corresponds to April 15,2015; Run 3 corresponds to April 17, 2015.

Table 2.2
Summary of Regulatory Compliance – Utah Division of Hazardous Waste Permit

Clean Harbors Aragonite – Aragonite Utah					
Emissions Data	***Run #1***	***Run #2***	***Run #3***	**Average**	**Limits**
PM (gr/dscf @ 7% O_2)	0.0019	0.0017	0.0010	0.0016	***0.015***
PM (mg/dscm @ 7% O_2)	4.3	4.0	2.4	3.6	***34***
HCl (ppm @ 7% O_2)	0.517	0.811	0.186	0.505	***77***
SVM, Pb+Cd (µg/dscm @ 7% O_2)	0.65	0.44	0.43	0.51	***240***
LVM, As+Be+Cr (µg/dscm @ 7% O_2)	1.26	2.38	1.61	1.75	***97***
Hg (µg/dscm @ 7% O_2)	48.1	12.4	3.5	21.3	***1762***
CO (ppmvd @ 7% O_2)[1]	1.0	3.5	4.8	3.1	***100***
PCDD/F (ng/dscm TEQ @ 7% O_2)	0.028	0.022	0.030	0.027	***0.40***
PCB - DRE (%)	99.999999	99.999999	99.999999	99.999999	***99.9999***
[1]Calculated from CEMS minute by minute concentration.					

Table 2.3
Summary of Regulatory Compliance – Utah Division of Air Quality

Clean Harbors Aragonite – Aragonite Utah Scrubber Outlet					
Emissions Data	***Run #1***	***Run #2***	***Run #3***	**Average**	**Limits**
PM (gr/dscf @ 7% O_2)	0.0019	0.0017	0.0010	0.0016	***0.013***
PM (mg/dscm @ 7% O_2)	4.3	4.0	2.4	3.6	***28***
HCl+Cl_2 (ppmvd @ 7% O_2)	0.90	0.85	0.23	0.66	***32***
Cl_2 (ppmvd @ 7% O_2)	0.38	0.04	0.04	0.15	***8.5***
CO (ppmvd @ 7% O_2)[1]	1.0	3.5	4.8	3.1	***100***
THC (ppmvd @ 7% O_2)[1]	0.1	0.0	0.4	0.2	***10***
SO_2 (ppmvd @ 7% O_2)[1]	0.1	10.7	1.7	4.2	***91***
NO_X (lb/hr)[2]	38.3	38.3	41.4	39.3	***44.18***
SVM, Pb+Cd (µg/dscm @ 7% O_2)	0.65	0.44	0.43	0.51	***230***
LVM, As+Be+Cr (µg/dscm @ 7% O_2)	1.26	2.38	1.61	1.75	***92***
Hg (µg/dscm @ 7% O_2)	48.1	12.4	3.5	21.3	***130***
Be (g/24 hr)	0.024	0.024	0.025	0.024	***9.18***
Ni (µg/dscm @ 7% O_2)	2.67	1.41	0.77	1.61	***5090***
PCDD/F (ng/dscm TEQ @ 7% O_2)	0.028	0.022	0.030	0.027	***0.40***[4]
Baghouse Inlet Temp. (°F)[3]	385	385	385	385	**<400**

[1]Data are the averages of testing during the Method 23A testing excluding operational pauses and pauses due to port changes. Run 1 corresponds to April 14, Run 2 corresponds to April 15, Run 3 corresponds to April 17.
[2]Calculated from CEMS concentration and Method 23A sampling train flow rates.
[3]Limit is for baghouse inlet temperature is <400 F.
[4]Limit is when baghouse inlet temperature is <400 F.

2.3 Operating Parameter Limits (OPLs)

[*40 CFR 63.1209(j) through (p)*]

The NESHAPS HWC standard specifies operating parameters for each control system that must be tracked by the Continuous Monitoring System (CMS). Specific control of these parameters yields compliance with the NESHAPS HWC emissions limits. All of the parameters relevant to the incinerator operations were established by completion of the Comprehensive Performance Test (CPT) in October 2012, and are based on the NOC revised May 10, 2013.

The confirmatory performance test, the subject of this NOC update, does not set any new operating parameter limits. Operating parameters limits remain the same as those established in the previous NOC dated May 10, 2013. The NOC dated May 10, 2013 is appended to and incorporated into this NOC and all operating parameter limits continue to apply and are used by the facility for compliance purposes and operation of the Automatic Waste Feed Cutoff System (AWFCO).

Readers should review the appended and incorporated NOC version of May 10, 2013 for all OPL details and results of the previous Comprehensive Performance Test. The only change to the appended NOC of May 10, 2013 is a clarification/correction stating that the carbon carrier airflow rate is based on a minimum HRA airflow rate limit in accordance with the MACT EEE regulations *40 CFR 63.1209(k)(6)(ii).*

Hazardous Waste Combustor

Notification of Compliance

For The

Clean Harbors Aragonite Incinerator

Clean Harbors Aragonite, LLC
11600 North Aptus Road
Aragonite, Utah 84029

EPA ID Number UTD981552177

January 16, 2013

Revised May 10, 2013
(Updated Chlorine Feed Rate Limit)
(Updated Table A-1 Summary of 2012 CPT Results)

Notification of Compliance
Certification Statement
[40 CFR 63.9 (h)(2)(i)(G)]

This document is the Notification of Compliance (NOC) for the hazardous waste incineration system operated by Clean Harbors Aragonite, LLC (CHA). This NOC has been prepared in accordance with the requirements of 40 CFR Part 63 Subpart EEE – National Emission Standard for Hazardous Air Pollutants from Hazardous Waste Combustors.

I hereby certify, based upon information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate, and complete:

- The hazardous waste incineration system is in compliance with the emission standards of 40 CFR Part 63 Subpart EEE for existing incinerators [40 CFR 63.1219(a)], which became effective on October 14, 2008;
- Operating limits have been established pursuant to 40 CFR 63.1209 that ensure compliance with the emission standards; and
- All required continuous emission monitoring systems (CEMS) and continuous monitoring systems (CMS) have been installed, calibrated, and tested to verify compliance with the requirements of 40 CFR Part 63 Subpart EEE.

_____ _____

Printed Name Signature

_____ _____

Title Date

1.0 Method Used to Determine Compliance
[*40 CFR 63.9(h)(2)(i)(A)*]

1.1. Introduction

Clean Harbors Aragonite, LLC (CHA) owns and operates a hazardous waste incineration complex located in Aragonite, Utah. CHA destroys hazardous wastes in an incineration system currently operating under a State of Utah Hazardous Waste Permit (EPA ID No. UTD981552177) and a Title V Clean Air Act Air Permit (Permit Number 4500048002).

CHA has proven the performance of the incineration equipment to meet the final Hazardous Waste Combustor Rule standards (40 CFR 63 Subpart EEE). This notification of compliance (NOC) was developed to certify compliance with the applicable emission standards of *40 CFR 63.1219(a)* and to specify operating limits to ensure continuing compliance in accordance with *40 CFR 63.1209*.

This NOC is being submitted to State of Utah and the USEPA Region 8 in accordance with *40 CFR 63.9(h)* and Subpart EEE, and is maintained in the facility operating record.

1.2 Comprehensive Performance Test October 2012

CHA has demonstrated compliance with the final emission standards by performance testing in October 2012. These performance tests followed the requirements for a Comprehensive Performance Test required by 40 CFR Part 63 Subpart EEE and were performed in conjunction with other CAA and RCRA permit required performance tests at the facility. Results from these performance tests are summarized in Section 2 of this NOC.

The full report for these performance tests with all supporting data have been submitted to the State of Utah (UDSHW and UDAQ) and USEPA Region 8 in the report titled: *Test Report: MACT, CAA and RCRA 2012 Performance Test performed October 2012, January 2013*, submitted on January 16, 2013.

The operating parameter limits (OPLs) established in this NOC are based on the results of the 2012 Comprehensive Performance Test (CPT) in accordance with *40 CFR 63.1209.* These operating limits are described and summarized in Section 3.0 of this NOC.

The CPT consisted of three replicate sampling runs for one mode of operation with a baghouse inlet temperature of <400 ^{o}F. During each of the three test runs, samples were collected to determine emission levels of particulate (PM), total chlorine (HCl and Cl_2), mercury, low volatile metals (LVM), semi volatile metals (SVM), dioxin/furan, destruction and removal efficiency (DRE), polychlorinated biphenyl (PCB), carbon monoxide (CO), and total hydrocarbons (THC). During the performance test there were no significant deviations from the approved test plan.

The samples were collected by Air Pollution Testing, Inc. personnel and delivered to either Test America or the APT laboratory for analysis. The Test America facility is certified by the Utah Bureau of Laboratory Improvement (BLI) for the applicable analytical methods. Process samples (waste feed samples) were collected by CHA personnel for analysis by the CHA laboratory and outside BLI certified laboratories contracted by the facility.

The facility continuous emissions monitoring system (CEMS) data were used to document emission level of carbon monoxide (CO), total hydrocarbons (THC), oxygen (O_2) and carbon dioxide (CO_2). The facility continuous monitoring system (CMS) was used monitor waste feed rates and operating conditions.

1.3 Background on Compliance with MACT and Previous NOC's

The regulations for the National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors (HWC-MACT) (*40 CFR 63 Subpart EEE*) were revised and final standards issued for incinerators on October 12, 2005 (FR Vol. 70, No 196, 59402). These regulations established final emission standards for existing incinerators [*40 CFR 63.1219(a)*] and set a final compliance date of October 14, 2008 [*40 CFR 63.1206(a)(1)(ii)*].

CHA completed performance testing in 2007 and 2008 and submitted a Notification of Compliance on October 27, 2008. The NOC showed that the CHA incineration system was in compliance with the final HWC standards. The HWC-MACT regulations (*40 CFR 63.1207(d)*) require additional Comprehensive Performance Tests (CPT) be performed within 61 months following the start of the previous CPT. The most recent CPT was started in October 2007 with additional testing in May 2008. Therefore, the current CPT, which is the basis of this NOC, was required to be performed by November 17, 2012. This requirement was met as the 2012 CPT was initiated on October 16, 2012 and testing was completed on October 18, 2012.

This NOC is being submitted to the Utah Division of Air Quality, Utah Division of Solid and Hazardous Waste, and USEPA Region 8 with the final CPT report (January 2013) in accordance with 40 CFR 63.1207(j)(1)(ii). This NOC establishes updated operating parameter limits based on the CPT as detailed in Section 3. These updated operating parameter limits are the HWC-MACT-CAA operating limits established as the compliance limits as of January 16, 2013 in accordance with 40 CFR 63.1207(j)(1)(ii).

It should be noted that the CHA facility currently has operating parameter limits (OPLs) established in the UDSHW RCRA permit, some of which are redundant with the HWC-MACT and CAA operating parameter limits. For those HWC-MACT-CAA OPLs that are redundant with the RCRA permit, the more stringent of the two operating parameter limits apply. If the redundant RCRA OPL's are more stringent, then they will remain as the compliance limit(s) until such time as the RCRA OPL(s) is modified to adjust those OPL's to be equal to the HWC-MACT-CAA OPL's established in this NOC.

2.0 Compliance with Emission Standards and Operating Limits – Test Results

[*40 CFR 63.9 (h)(2)(i)(B); 63.9(h)(2)(i)(C); 63.9(h)(2)(i)(D)*]

This NOC was developed to certify compliance with the applicable emission standards of *40 CFR 63.1219(a)* for existing hazardous waste incinerators. The operating parameter limits specified in this NOC were identified to ensure continuing compliance with the emission standards, based on actual test data.

2.1 Emission Standards and Test Results

The specific emission standards for this NOC are listed below. All concentration limits are specified as corrected to seven percent oxygen (7% O_2).

- 99.99 percent Destruction and Removal Efficiency (DRE)
- Control of dioxin/furan emissions to a concentration less than 0.40 nanograms toxic equivalent quotient (TEQ) per dry standard cubic meter (ng TEQ/dscm) corrected to 7% O_2, provided that the combustion gas temperature at the inlet to the initial particulate matter control device (CHA baghouse) is 400 ^{0}F or lower.
- Control of mercury emissions to a concentration less than or equal to 130 micrograms per dry standard cubic meter (ug/dscm) at maximum Hg feed rate.
- Control of semi-volatile metal (SVM - cadmium and lead) emissions to a concentration less than or equal to 230 ug/dscm at maximum SVM feed rates.
- Control of low-volatility metal (LVM - arsenic, beryllium, and chromium) emissions to a concentration less than or equal to 92 ug/dscm at maximum LVM feed rates.
- Control of carbon monoxide (CO) emissions to a concentration less than 100 ppmv (dry) or total hydrocarbon (THC) less than 10 ppmv – CHA has demonstrated compliance with both. CHA uses either CO or THC, as the AWFCO parameter, as allowed by HWC-MACT (*40 CFR 63.1219(a)(5)(ii)*) and by the CHA air permit.
- Control of hydrogen chloride/chlorine emissions to a concentration less than or equal to 32 ppmv (as HCl) at maximum chlorine feed rate.
- Control of particulate emissions to less than or equal to 28 milligrams per dry standard cubic meter or 0.013 grains per dry standard cubic foot (gr/dscf).

During the October 2012 performance tests CHA demonstrated compliance with all of the final emission standards. All emission parameters were tested and no data-in-lieu of was used in the development of this Notice of Compliance. Compliance with the dioxin/furan limit was demonstrated with baghouse inlet temperature (spray dryer outlet temperature) operating at less than 400 °F. DRE was measured for two Principal Organic Hazardous Constituents (POHC), namely hexachloroethane and monochlorobenzene. DRE was also measured for PCBs.

Table 1 summarizes the findings of the 2012 performance tests and demonstrates compliance with the emission standards.

2.2 Operating Parameter Limits - Identification and Test Results

The operating parameters and operating limits to ensure continuing compliance with the final emission standards have been identified and established. The MACT standard specifies operating parameters for each control system [*40 CFR 63.1209*], which must be tracked by the Continuous Monitoring System (CMS). Specific control of these parameters will yield compliance with the MACT emissions limits. All of the parameters relevant to the above unit operations were established by completion of performance tests or based on manufacturers specifications where applicable.

A summary of the operating parameter limits (OPLs) established based on the 2012 performance tests is presented in Table 2. These operating limits are based on the average of three test runs from the applicable performance test. In most cases the average is the average of the test runs averages, but as specified in the HWC regulations, the OPLs for gas flow rate (stack flow), pumpable and total waste feed rate to the kiln, and total waste feed rate to the afterburner chamber (ABC) are based on the average of the maximum hourly rolling average (max HRA) for the three test runs.

Several operating parameter limits are established to ensure compliance with more than one emission standard. As an example minimum combustion chamber temperature is set to ensure compliance with the dioxin/furan standard and with the DRE standard. In accordance with the HWC-MACT regulations (*40 CFR 63.1209(i)*), if the performance test for such standards are not performed simultaneously, the most stringent limit for a parameter derived from the performance test applies. For the 2012 CPT, there were four sampling trains/sampling methods used. While most of the trains were run on the same day and at nearly the same time, the actual sampling times and port change times were not identical. Therefore, when an operating parameter limit applies to more than one standard, the most stringent (highest applicable minimum or lowest applicable maximum) was selected as the operating limit. As an example dioxin/furan and DRE for HCE was run with Method 0010/0023A, while DRE for MCB was run with a separate sampling train with Method 0030. The sample times were different for these two methods, therefore, the highest minimum average temperature for either Method 0010/23A or Method 0030 was selected as the operating limit for minimum kiln temperature and minimum ABC temperature.

The MACT operating limits established from these test data are shown in Table 2 along with the monitoring basis and the sample set (sample train/sampling methods) which was used to establish the operating parameter limit. Table 2 also shows which parameters are controlled by an Automatic Waste Feed Cutoff (AWFCO). Each operating limit is discussed in more detail in Section 3.

Table 1: Summary of 2012 CPT Emission Results

Clean Harbors Aragonite – Aragonite Utah 2012 CPT Results					
Emissions Data	***Run #1***	***Run #2***	***Run #3***	**Average**	**Limits**
PM (gr/dscf @ 7% O_2)	0.0058	0.0052	0.0097	0.0069	***0.013***
PM (mg/dscm @ 7% O_2)	13.3	11.9	22.1	**15.8**	***28***
HCl+Cl_2 (ppmvd @ 7% O_2)	0.18	0.18	0.20	**0.18**	***32***
SVM, Pb+Cd (µg/dscm @ 7% O_2)	1.0	14.5	37.9	**17.8**	***230***
LVM, As+Be+Cr (µg/dscm @ 7% O_2)	7.6	12.7	10.5	**10.3**	***92***
Hg (µg/dscm @ 7% O_2)	31.5	11.7	11.6	**18.3**	***130***
PCDD/F (ng/dscm TEQ @ 7% O_2)	0.038	0.043	0.039	**0.040**	***0.40***[1]
CO (ppmvd @ 7% O_2)[2]	4.6	3.8	3.7	**4.0**	***100***
THC (ppmvd @ 7% O_2)[2]	0.9	1.0	1.1	**1.0**	***10***
HCE - DRE (%)	99.99993	99.99992	99.99994	99.99993	***99.99***
MCB - DRE (%)	99.9998	99.9998	99.9998	99.9998	***99.99***
PCB - DRE (%)	99.999999	99.999999	99.999999	99.999999	***99.9999***[3]

[1]Limit is for baghouse inlet temperature is <400 F.
[2]Calculated from CEMS concentration during Method 23A/0010 sampling train operation.
[3]HWC-MACT only requires DRE of 99.99%, but TSCA/RCRA require PCB DRE of 99.9999%

Table 2: CHA Operating Parameter Limits

Operating Parameter Limits	Monitoring Basis	Units	Established Limit	2012 Performance Test Sampling Period Basis[1]	Automatic Waste Feed Cutoff
Total Waste Feed (2)					
Kiln	Max HRA	lbs/hr	24,198	D/F-DRE	Y
Afterburner I	Max HRA	lbs/hr	8,678	D/F-DRE	Y
Kiln Pumpable Waste Feed (2)	Max HRA	lbs/hr	6,731	VOST-DRE	Y
Chlorine feed rate	12-hr RA	lbs/hr	2,319	SVM-LVM	Y
Total LVM feed rate	12-hr RA	lbs/hr	501	SVM-LVM	Y
Pumpable LVM feed rate	12-hr RA	lbs/hr	501	SVM-LVM	Y
Total SVM feed rate	12-hr RA	lbs/hr	811	SVM-LVM	Y
Mercury feed rate	12-hr RA	lbs/hr	0.76	SVM-LVM-Hg	Y
Kiln Temperature	Min HRA	°F	1,800	D/F-DRE	Y
ABC Temperature	Min HRA	°F	2,020	VOST-DRE	Y
Stack Flow (2)	Max HRA	acfm	77,147	PM-Cl_2/HCl	Y
Baghouse Inlet Temperature	Max HRA	°F	393	D/F-DRE	Y
Activated Carbon Feed Rate	Min HRA	lbs/hr	25.6	D/F-DRE	Y
1st Stage Scrubber Flow	Min HRA	gpm	1,882	PM-Cl_2/HCl	Y
1st Stage Scrubber Inlet pH	Min HRA	std units	5.47	PM-Cl_2/HCl	Y
2nd Stage Scrubber Flow	Min HRA	gpm	1,996	PM-Cl_2/HCl	Y
2nd Stage Scrubber Inlet pH	Min HRA	std units	6.36	PM-Cl_2/HCl	Y
TMT Feed Rate	Min HRA	lbs/hr	2.47	SVM-LVM-Hg	Y

Table 2: CHA Operating Parameter Limits (continued)

Operating Parameter Limits	Monitoring Basis	Units	Established Limit	2012 Performance Test Sampling Period Basis[1]	Automatic Waste Feed Cutoff
Carbon Monoxide	Max HRA	ppmv, 7% O2	100	By Regulation	Y[3]
Total Hydrocarbon	Max HRA	ppmv, 7% O2	10	By Regulation	Y[3]
Combustion Chamber Pressure	Min pressure differential	inches of wc	(4)	NA (5)	Y
Baghouse pressure drop	Min pressure differential	inches of wc	1.8	NA (5)	Y
Activated Carbon Carrier Flow Rate	Min HRA	acfm	80	NA (5)	Y
1st Stage Scrubber Pressure Drop	Min HRA	inches of wc	0.5	NA (5)	Y
2nd Stage Scrubber Pressure Drop	Min HRA	inches of wc	0.5	NA (5)	Y

(1) Some operating parameters apply to more than one emission parameter in which case the most stringent (lowest for maximum limits and highest for minimum limits) demonstrated value of the various tests applies. This column shows which test runs apply for setting the operating parameter limit. See Section 3 parameter discussions more detail.

(2) The total and pumpable waste feed rates, and stack flow rate are based on the average of the max hourly rolling average of three test runs per the regulations; All other data based on the average rates during each run and the average of the three run averages.

(3) Combustor MACT rules and CHA's air permit allows use of either THC or CO. CHA uses one of these parameters for the AWFCO.

(4) Combustion chamber negative pressure is an alternative monitoring approach using kiln seals. See Section 3 of NOC for specifications.

(5) NA- not applicable - these operating parameter limits are set by manufacturer's specification or in the case of combustion pressure by approved alternative monitoring approach. These limits are not set during the performance test. See Sections 3.2.4, 3.3.3, 3.3.4, and 3.4.3 for more detail.

2.3 CMS Performance Evaluation Test

A CMS performance evaluation test was performed in October 2012 prior to the start of the performance tests. The audit report, including updated equipment lists and calibrations is maintained in the operating record. The report found all equipment tags properly listed and verified AWFCO and calibrations. Improvement to the documentation and filing system were recommended and were started. One instrument tag was added to the maintenance tracking system.

The CMS system is checked and evaluated on an ongoing basis as part of the CMS operating and maintenance program. The CMS system is reviewed at least once per year to ensure that all calibrations and equipment maintenance are performed as required to ensure proper operation of the CMS. CEMS are calibrated and maintained in accordance with regulatory requirements.

The annual RATA was performed in April and May 2012 and all CEMs met performance requirements. The quarterly calibration gas test was performed in August 2012 , just prior to the start of the CPT.

3.0 Final Operating Limits

The basis for the establishment of the operating parameter limits (OPLs) to ensure continuing compliance with the emission standards is the facility Comprehensive Performance Test (CPT) that was performed in October, as detailed in the Performance Test report submitted to the UDSHW, UDAQ and USEPA Region 8 on January 16, 2013.

The previous Notice of Compliance and OPL's were based on a combination of Comprehensive Performance Tests performed in 2007 and 2008, and *data-in-lieu of* testing taken from RCRA performance tests in 2001 and 2003. The 2012 CPT included testing of all of the emission standards in the HWC-MACT regulations (40 CFR Subpart EEE) including DRE, dioxin/furans, LVM, SVM, mercury, PM, and CL_2/HCl, CO, and THC. Therefore, all of the OPL's are based on current data and no *data-in-lieu of* testing is used for establishing these performance based OPL's.

Previously, CHA established OPL's for two operating modes, an operating mode with the baghouse inlet temperature greater than 400 ^{o}F and. operating with the baghouse inlet temperature at 400 ^{o}F or less. The difference in baghouse inlet temperature impacts the emission limit for dioxin and furans and is also an established operating limit for LVM and SVM. CHA decided to only test under one operating mode during the 2012 CPT, and therefore, under this NOC only one operating mode is established, namely for the baghouse operating at 400 ^{o}F or less. (OPL established at a maximum of 393 ^{o}F).

3.1 Waste Feed Limitations

The feed rate limits below are tracked by a combination of waste analysis, statistical tracking, and mass feed rate monitoring. The elements of waste analysis and data management are detailed in the facility Feedstream Analysis Plan. All limits are derived directly from the 2012 Comprehensive Performance Test.

3.1.1 Maximum Waste Feed Rate
[40 CFR 63.1209(j)(3) and 63.1209(k)(4)]

Maximum total waste feed rates and maximum pumpable waste feed rates are operating parameter limits for good combustion practice and are mandated for dioxin and furan control and for DRE control. Individual waste feed flow rates at each feed location are summed to yield individual combustion chamber totals and pumpable feed rate totals. The other constituent feed parameters (chlorine, metals) are calculated using these waste feed data by port and the constituent concentration in the waste feeds.

Attachment A, Table A-1 shows the results for the 2012 performance test. The total and pumpable feed rate limits are based on the average of the maximum hourly rolling averages for the three test runs.

The kiln maximum HRA total waste feed rate is based on the combined dioxin/furan and HCE DRE test runs. The VOST-DRE test runs had a slightly higher average total kiln maximum HRA waste feed rate compared to the dioxin/furan-DRE test runs. Therefore, the average of the maximum HRA waste feed rates for the dioxin/furan-DRE test runs sets the maximum HRA for total kiln waste feed rate.

The kiln maximum pumpable HRA waste feed rate is based on the VOST-DRE test runs. The dioxin/furan-DRE test runs had a slightly higher average kiln pumpable maximum HRA waste feed rate compared to the VOST-DRE test runs. Therefore, the average of the maximum HRA pumpable waste feed rates for the VOST-DRE test runs sets the maximum HRA for pumpable kiln waste feed rate.

The ABC total and pumpable feed rates are the same, as all waste fed to the ABC is pumpable material. The dioxin/furan-DRE test runs set the maximum HRA ABC feed rate limit. The VOST-DRE test runs had a slightly higher average ABC maximum HRA feed rate compared to the dioxin/furan-DRE test runs. Therefore, the average of the maximum HRA waste feed rates for the dioxin/furan-DRE test runs sets the maximum HRA for the ABC waste feed rate.

All of these waste feed limits are controlled as hourly rolling averages (HRA).

Maximum Waste Feed Limits - Maximum Hourly Rolling Average

Kiln Pumpable Waste Feed (lbs/hr)	Kiln Total Waste Feed (lbs/hr)	Afterburner Total and Pumpable Waste Feed (lbs/hr)
6,731	24,198	8,678

3.1.2 Maximum Total Chlorine and Chloride Feed Rate
[40 CFR 63.1209(o)(1)(i); 63.1209(n)(4)]

This limit is required to ensure compliance with total chlorine and chloride (HCl/Cl_2) emission standards. The LVM and SVM standards also require that a maximum total chlorine feed rate be established. The feed rate is measured and controlled on a 12-hr rolling average (12-RA) basis. The 2012 performance test runs results are summarized in Attachment A, Table A-1.

The limit is based on the average of the test run averages for the chlorine feed rate for the three test runs performed in 2012 performance test. The maximum chlorine feed rate limit is set by the SVM test runs, as the average chlorine feed rate for the SVM test runs is slightly lower than the average chlorine feed rate during the Cl_2/HCl test runs.

Maximum Chlorine Feed Limit - Maximum 12-hr Rolling Average

Chlorine (lbs./hr)
2,319

3.1.3 Maximum Total Mercury Feed Rate
[40 CFR 63.1209(l)(l)(1)(i)]

Mercury is a specific emission standard and is controlled by the mercury feed rate limit to the incinerator and by the scrubber operating parameter limits described later in this section. Mercury was spiked to the incinerator during the 2012 performance test.

The mercury feed rate data and emission data from the 2012 performance test were used to extrapolate the maximum mercury feed rate limit. An extrapolation methodology was approved in the CPT plan. The methodology involves plotting the average mercury feed rate in lbs/hr against the average mercury emission rate in ug/dscm @7% O_2. Using a linear regression line, the maximum feed rate is extrapolated from the point where the regression line crosses the mercury emission limit. Attachment A, Table A-2 and Figure A-1 present the data and the extrapolation line.

The extrapolated maximum mercury feed rate limit is 0.76 lbs/hr. The average System Removal Efficiency (SRE) for mercury was demonstrate to be 98.2%. The previous performance test for mercury performed in 2007 showed an extrapolated mercury feed rate limit of 0.72 lbs/hr. Thus, results for the 2007 and 2012 performance test for mercury were similar.

Mercury is controlled on a 12-hour rolling average (12-hr RA) basis.

Maximum Mercury Feed Limit – Maximum 12 Hour Rolling Average

Mercury (lbs/hr)
0.76

3.1.4 Maximum Total Semi-Volatile Metals Feed Rate
[40 CFR 63.1209(n)(2)(ii)]

SVM (cadmium and lead) is a specific emission standard and is controlled by SVM feed limit to the incinerator and by the baghouse operating parameter limits described later in this section. Further, SVM requires that a maximum baghouse inlet temperature be established [*40 CFR 63.1209(n)(1)*] and a maximum total chlorine and chloride feed rate be established [*40 CFR 63.1209(n)(4)*]. Lead (SVM metal) was spiked to the incinerator during all of the performance tests.

The SVM feed rate data and emission data from 2012 were used to extrapolate the maximum SVM feed rate limit. An extrapolation methodology was approved in the original CPT plan. The methodology involved plotting the average SVM feed rate in lbs/hr against the average SVM emission rate in ug/dscm @7% O_2. Using a linear

regression line, the maximum SVM feed rate was extrapolated from the point where the regression line crosses the SVM emission limit. Attachment A, Table A-3 and Figure A-2 present the data and the extrapolation line.

The extrapolated SVM maximum feed rate limit is 811 lbs/hr. The average System Removal Efficiency for SVM is 99.997%.

SVM is controlled on a 12-hour rolling average basis.

Maximum SVM Feed Rate Limit - Maximum 12 Hour Rolling Average

SVM (lbs/hr)
811

3.1.5 Maximum Total and Pumpable Low-Volatile Metals Feed Rate
[40 CFR 63.1209(n)(2)(ii); 63.1209(n)(2)(vi)]

LVM (arsenic, beryllium, chromium) is a specific emission standard and is controlled by LVM feed rate limits to the incinerator and by the baghouse operating parameter limits described later in this section. Further, LVM requires that a maximum baghouse inlet temperature be established [*40 CFR 63.1209(n)(1)*] and a maximum total chlorine and chloride feed rate be established [*40 CFR 63.1209(n)(4)*]. Also, given the low volatility of metals, system removal efficiency can be impacted by the type (liquid or solid) of feed to the incinerator. Therefore, LVM is regulated for both pumpable feed rates and total feed rates. CHA decided to set a single maximum chromium feed rate for both total and pumpable LVM. Therefore, only pumpable (liquid) Chromium (LVM metal) was spiked during all of the performance tests. Only the pumpable portion of the LVM waste feed rate was used for the determination of the both the pumpable and total LVM feed rate limits. The pumpable feed rate represented over 98% of the LVM fed during the performance tests.

The pumpable LVM feed rate data and emission data from 2012 were used to extrapolate the maximum total and pumpable LVM feed rate limits. An extrapolation methodology was approved in the original CPT plan. The methodology involved plotting the average LVM pumpable waste feed rate in lbs/hr against the average LVM emission rate in ug/dscm @7% O_2. Using a linear regression line, the LVM maximum feed rate is extrapolated from the point where the regression line crosses the LVM emission limit. Attachment A, Table A-4 and Figures A-3 present the data and the extrapolation lines.

The extrapolated LVM maximum feed rate limit is 501 lbs/hr. The average System Removal Efficiency for LVM is 99.998%.

LVM is controlled on a 12-hour rolling average.

Maximum LVM Feed Limits (Pumpable and Total)
Maximum12 Hour Rolling Average Basis

LVM – Pumpable (pph)	LVM – Total (pph)
501	501

3.1.6 Ash Feed rate
[40 CFR 63.1209(m)(3)]

CHA has a variance from monitoring ash approved by the State of Utah. Ash feed rates during the performance tests were well above normal levels as required by the regulations. CHA was maximizing solids content to the kiln to maximize waste feed rate and thus was operating at higher than normal ash levels. Ash feed rates during the performance tests are presented in Table A-1 for informational purposes.

3.2 Combustion Chamber Limitations

CHA measures and monitors physical data from the combustion process to demonstrate that the incinerator is operating in accordance with the emission standards.

3.2.1 Minimum Combustion Chamber Temperature
[40 CFR 63.1209(j)(1); 63.1209(k)(2)]

Minimum combustion chamber temperature is an operating parameter used to demonstrate and maintain compliance with the DRE and dioxins/furans emission standards. CHA met the DRE standard and the dioxins/furan emissions limits for all test results in 2012. The temperature limits are stated as minimum, on an HRA basis.

The limits are derived directly from the performance test data and are based on the average of the three test runs performed. Attachment A, Table A-1 presents the minimum temperature data The minimum kiln operating temperature is based on the VOST MCB-DRE and the combined dioxin/furan-HCE-DRE tests, which had the same average minimum kiln temperature.

The minimum ABC temperature is based on the 2012 VOST-DRE data. The VOST - DRE test runs had a slightly higher average ABC temperature compared to the dioxin/furan test runs. Therefore, the minimum temperatures from the VOST (DRE-MCB) tests set the minimum temperature operating parameter limit for the ABC.

Minimum Combustion Temperature Limits – Minimum Hourly Rolling Average

Kiln	ABC
1,800	2,020

3.2.2 Maximum Combustion Gas Flow Rate
[40 CFR 63.1209(j)(2); (k)(3); (l)(2); (m)(2); (n)(5); (o)(2)]

CHA uses stack flow rate measured on a continuous basis in the stack as the measurement of combustion gas flow rate. Maximum stack flow rate is used to show acceptable residence time in the combustion chamber and in the scrubbing equipment. Stack flow is directly related to combustion chamber efficiency and is an operating parameter related to compliance with DRE and dioxin/furans. Stack flow rate is also an operating parameter for PM, total chlorine and chloride, mercury, LVM, and SVM, as it also impacts the baghouse and wet scrubber efficiency. Therefore, the lowest average of the maximum HRAs from the dioxin/furan, VOST-DRE, metals, and PM/Cl_2/HCl test runs sets the operating limit. The average of the test run maximum hourly rolling averages was calculated for each test run for each test method and then averaged in accordance with the regulations.

Attachment A, Table A-1 presents the average of the maximum hourly rolling averages for the stack flow data for the 2012 performance tests. The PM/CL_2/HCl test runs had a slightly lower hourly rolling average for stack flow rate when compared to the dioxin/furan, VOST-DRE, and metals test runs. Therefore, the maximum hourly rolling average stack flow rate from the PM/Cl_2/HCl test runs sets the maximum stack flow rate limit.

The stack flow rate limits are stated as a maximum on an HRA basis.

Incinerator Maximum Stack Flow Limit – Maximum Hourly Rolling Average

Stack Flow Rate (acfm)
77,147

3.2.3 Maximum Carbon Monoxide Concentration / Total Hydrocarbon Concentration

Maximum CO and THC concentrations are parameters used to demonstrate compliance with the DRE and dioxins/furans emission standards. The CO limit is set by the MACT emission standards at a concentration of 100 ppmv, on a dry basis, corrected to 7% oxygen. The THC limit is 10 ppmv. A continuous emission monitoring system (CEMS) is used to demonstrate compliance with this standard. CHA uses either CO or THC, as the AWFCO parameter, as allowed by MACT and by the CHA air permit. The selected parameter is tracked on an HRA basis in accordance with *40 CFR 1219(a)(5)(ii)*.

3.2.4 Maximum Combustion Chamber Pressure
[40 CFR 63.1206(c)(5)]

The maximum combustion chamber pressure limit is intended to prevent fugitive emissions from the incineration system. By operating below atmospheric pressure, any

leak point on the incinerator is ensured to draw ambient air into the system and not emit gases from the system. The standard calls for an instantaneous AWFCO when the pressure exceeds atmospheric. CHA has installed air-pressurized double mechanical seals on each end of the kiln, and a variety of AWFCO limits preclude fugitive emissions. This alternative monitoring approach was approved by USEPA in a letter dated October 19, 2004.

CHA controls fugitive emissions by use of kiln shrouds at each end of the rotary kiln. Under normal operating conditions, the induced draft fan maintains the maximum combustion zone pressure below ambient pressure. CHA injects air into the inlet and outlet shrouds to maintain approximately 0.5 inches of water pressure. During transient pressure spikes, the pressurized shrouds act as barriers to prevent any gas leaks from the combustion zone. The following conditions apply to the shrouds:

(1) CHA injects air into the inlet and the exit shrouds such that the difference between pressure in each shroud and the secondary combustion chamber (SCC) is a minimum of 0.2 inches of water column;

(2) The facility measures pressures in the SCC and in each shroud of the rotary kiln on a continuous basis. The pressure differential Operating Parameter Limit (OPL) and AWFCO for each inlet and outlet shroud are set independent of each other;

(3) Anytime the pressure difference between each shroud and the SCC is less than 0.2 inches of water column, and the pressure in the SCC is equal to zero or higher, the AWFCO is triggered instantaneously;

(4) If the shroud fan fails, and the pressure in the SCC is greater than the ambient pressure, an AWFCO is triggered instantaneously; and

(5) If the pressure difference in each shroud and the secondary combustion chamber is at least 0.2 inches water column, and the pressure in the secondary combustion chamber is higher than ambient pressure for more than 10 seconds, the AWFCO is triggered instantaneously.

(6) The "instantaneous AWFCO" in all the above conditions means that the waste feed is cut off within one second of any pressure OPL exceedance, provided the pressure is measured on a continuous basis in the kilns and the shrouds.

3.3 Baghouse Operating Parameters - Limitations

CHA measures and monitors physical data on the baghouse to ensure that the operating conditions are in accordance with the combustor regulations.

3.3.1 Maximum Baghouse Inlet Temperature
[40 CFR 63.1209(k)(1); 63.1209(n)(1)]

Maximum baghouse inlet temperature is an operating parameter that must be established for determining the emission standard that applies for dioxin/furan and also is a control parameter for SVM/LVM. The baghouse inlet temperature limit is controlled as maximum temperature on an HRA basis.

The baghouse inlet temperature is named spray dryer exit temperature in the plant DCS and in the CPT report records. They are the same location in the facility. Attachment A, Table A-1 presents the data for the average of the test run averages for the baghouse inlet temperature. The limit for maximum baghouse temperature is based the 2012 dioxin/furan and LVM/SVM tests. The average 2012 temperature data are identical for the dioxin/furan and the LVM/SVM performance tests.

Maximum Baghouse Inlet Temperature Limit – Maximum Hourly Rolling Average

Baghouse Inlet Temperature
393 °F

3.3.2 Activated Carbon Feed Rate Limit
[40 CFR 63.1209(k)(6); 63.1209(l)(3)]

CHA feeds activated carbon to the gas stream before the baghouse. The carbon feed is designed to reduce dioxin/furan emissions and to impact mercury removal efficiency. Therefore, a minimum activated carbon feed rate based on performance data is a required operating parameter.

Table A-1 presents the data for the average of the test run averages for the activated carbon feed during the 2012 performance tests. The minimum activated carbon feed rate limit is set by the both the mercury and dioxin/furan test runs, as the average feed rate was identical for both tests.

Activated carbon is controlled on a minimum HRA basis.

Minimum Carbon Feed Rate Limit – Minimum Hourly Feed Rate

Maximum Carbon Feed Rate
25.6 lbs/hr

3.3.3 Other Baghouse Operating Limits
[40 CFR 63.1206(c)(8); 1209(m)(1)(iv)(D)]

The combustor rules require that a baghouse have a leak detection system to monitor baghouse condition. The leak detection system must meet the requirements of *40 CFR 63.1206(c)(8)(ii)*. CHA has installed a leak detection system that meets these

requirements. The system is based on monitoring opacity and maximum opacity is an AWFCO.

The combustor rules also require that other operating parameters based on manufacturers specifications be considered and implemented as appropriate. CHA has established a minimum pressure drop across the baghouse as an indicator operating parameter. The minimum pressure drop is 1.8 "W.C. Pressure drop is monitored continuously and is an AWFCO.

3.3.4 Other Activated Carbon Injection System Limitations
[40 CFR 63.1209(k)(6)(ii); 63.1209(k)(6)(iii)]

The combustor rules specify that a minimum HRA carrier fluid flow rate or pressure drop be established for the carbon injection system. CHA uses an injection that monitors and controls the carrier flow rate. The minimum HRA carrier flow rate established based on the manufacturers specifications is 80 acfm. The operating limit is based on a minimum HRA value and is an AWFCO.

The combustor rules also requires that the activated carbon used in the system during the performance test continue to be used until a subsequent performance test. CHA has specified the activated carbon used for the performance tests and documented the carbon specification in the operating record.

3.4 Packed Tower Scrubber Limitations

CHA measures and monitors physical data on the scrubbing equipment to ensure that the incinerator is operating in accordance with emission standards.

3.4.1 Minimum Scrubber Water pH
[40 CFR 63.1209(o)(3)(iv)]

A minimum scrubber water pH is required as operating limit to meet the total chlorine and chloride emission standard. The pH sets the system's ability to neutralize acid gases. CHA operates two scrubbers in series, separated by a chimney tray. A minimum pH operating limit is established for the inlet to each stage. The pH operating limit is stated as a minimum, on an HRA basis.

Attachment A, Table A-1 presents the pH data for the 2012 performance tests. The chlorine maximum feed rate is based on the average of the test run averages for the Cl_2/HCl tests.

1st Scrubber Minimum Inlet Water pH - Minimum Hourly Rolling Average

pH (S.U.)
5.47

2nd Scrubber Minimum Inlet Water pH – Minimum Hourly Rolling Average

pH (S.U.)
6.36

3.4.2 Minimum Scrubber Water Flow Rate
[40 CFR 63.1209(o)(3)(v)]

A minimum scrubber water flow rate is used to ensure that the scrubber has enough water to contact the gases in the scrubber and maintain a proper gas to liquid ratio (at maximum stack airflow rate and minimum scrubber water flow rate). CHA uses scrubber water flow rate limits in conjunction with stack flow rate to demonstrate on continuing compliance for total chlorine and chloride emissions, and for mercury emissions per the combustor rules. The minimum flow rate limit is set for each scrubber and is based on the average of the three test runs performed. The water flow rates are monitored and controlled on a minimum HRA basis.

Attachment A Table 1 presents the summary data for the 2012 performance tests. The minimum water flow rates for the both 1st and 2nd stage scrubbers are based on the CL_2/HCl performance tests, as the average for the Cl_2/HCl tests was slightly higher than the average flow rates for the metals tests. Therefore, the minimum water flow rates are based on the higher flow rates demonstrated during the Cl_2/HCl tests.

1st Scrubber Water Minimum Flow Rate – Minimum Hourly Rolling Average

Water Flow Rate (gpm)
1,882

2nd Scrubber Water Minimum Flow Rate – Minimum Hourly Rolling Average

Water Flow Rate (gpm)
1,996

3.4.3 Other Wet Scrubber Limitations
[40 CFR 63.1209(o)(3)(ii); 63.1209(o)(3)(iii)]

The minimum pressure drop across the packed towers is set based manufacturer specification. The minimum pressure drop is set at 0.5 "W.C. for each scrubber stage.

The pressure drop is monitored and controlled on a HRA basis, and the minimum pressure drop is an AWFCO.

The manufacturer of the scrubber, nozzles, and water delivery system requires water to be delivered to the top of the packing. There is no minimum pressure specification, just that sufficient pressure be maintained to deliver the required water flow rate, which is an established operating parameter limit. Flow rate monitoring determines that sufficient pressure is available to deliver the required minimum water flow rate to each scrubber. Water flow is indicator of sufficient pressure is an AWFCO.

3.4.4 TMT Operating Limitation

CHA feeds the chemical TMT to the scrubber system to help with mercury removal in the wet scrubber. A minimum feed rate for TMT is an operating limit demonstrated during the 2012 performance tests. TMT feed rate is controlled and monitored on a HRA basis and the minimum HRA is an AWFCO.

Attachment A, Table A-1 presents the data for the average TMT feed rate during the 2012 performance test. The feed rate average was 2.47 lbs/hr.

Minimum TMT Feed Rate – Minimum Hour Rolling Average

TMT Feed Rate (lbs/hr)
2.47

3.5 Residence Time
[*40 CFR 63.1206(b)(11)*]

The combustor rules require that the residence time for hazardous waste in the system be calculated and included the NOC. The calculation for hazardous waste residence time was supplied in the CPT Plan as required and is included in Attachment B to this NOC.

4.0 Analysis Demonstrating Major Source
[*40 CFR 63.9 (H)(2)(I)(E)*]

Subpart EEE, 40 CFR 63.1200, directs that every applicable source is a major source.

5.0 Air Pollution Control Equipment Description

[40 CFR 63.9 (H)(2)(I)(F)]

The overall control efficiency of the air pollution control equipment meets the MACT requirements.

5.1 Spray Dryer

The spray dryer cools the hot combustion gases so that they can be filtered in the baghouse. Combustion gases are cooled by evaporating the brine solution from the scrubbing system. The spray dryer also eliminates the need for process liquid disposal. Some of the dried solids from the brine solution are collected by the screw bottoms of the spray dryer and discharged to rolloff boxes for off-site disposal. Most of the dried solids continue on with the combustion gases to the baghouse. The evaporated water joins the combustion gas stream.

Combustion gases flow downward through the dryer. The dryer is 72 feet 81/2 inches high. The internal diameter at the top entrance is 8 feet and the top thimble internal diameter is 11 feet 1 inch and about 10 feet long. The main section varies in internal diameter between 27 feet 2 ¼ inches to 28 feet 2 ¼ inches and is approximately 37 feet long. The dryer has a funnel shaped bottom equipped with screw conveyors to discharge solids to rolloff boxes.

The dryer is equipped with 40 nozzles that can be used to spray brine into the dryer. Sixteen nozzles spray into the top of the main section and twenty-four nozzles spray below those. The number of spray nozzles used varies with the heat content of the combustion gases. Some of the spray nozzles are equipped with remotely activated valves that can be used to turn them on or off. The nozzles are high-pressure single fluid nozzles.

Combustion gases exit the dryer at less than less than or equal to 393 ^{o}F on an hourly rolling average basis in accordance with the limit set by the performance test.

5.2 Carbon Injection System

The carbon injection system delivers a weighed amount of activated carbon to the duct between the spray dryer and baghouse. The system consists of a storage bin that feeds two carbon-feeding trains. Each train has a rotary valve that periodically feeds carbon from the bin to a hopper mounted on a loss-in-weight scale. The scale feeds an eductor and piping that pneumatically conveys the weighed carbon to the duct. The eductor manufacturer recommends a motive airflow rate of 80 actual cubic feet per minute (acfm) for this unit. A minimum HRA airflow rate of 80 acfm is the established operating limit.

5.3 Baghouse

The baghouse is a fabric filter that contains eight compartments with 240 filter bags in each compartment. The filter bags are 6 inches in diameter and 14 feet long. Each compartment contains approximately 5,280 ft^2 of filter area.

The bags are cleaned by a pulse jet system that may be operated with the compartment on-line or off-line. On-line cleaning starts automatically when differential pressure across the baghouse reaches an adjustable set point. Both the inlet and outlet compartment valves remain open. Off-line cleaning starts at a higher set point. During pulsing both the inlet and outlet dampers are closed.

Dust removed from the fabric by pulsing drops to hoppers in the bottom of each compartment. Each compartment contains a screw conveyor that moves the dust from the bottom of the compartment to a rolloff box discharge point for disposal at a hazardous waste facility.

5.4 TMT-15 Dosing System

TMT-15, a 15% aqueous solution of Trimercapto-s-triazine, trisodiom salt ($C_3N_3S_3Na_3$, CAS-RN 17766-26-6), is added to the brine in the acid gas scrubbing system in order to precipitate any oxidized mercury that is not removed by adding activated carbon. The solution is added by a peristaltic pump to the scrubber brine. The precipitate either settles in the scrubber system and is removed during maintenance turnarounds or is pumped to the spray dryer with the blowdown from the brine and removed by the baghouse.

5.5 Wet Acid Gas Scrubber

The wet acid gas scrubber consists of a saturator and two beds of packing separated by a chimney tray.

Gas from the baghouse enters the saturator, where a brine solution is sprayed into the hot gas stream to reduce its temperature to saturation (about 175°F). Brine that is not evaporated drains into the wet scrubber neutralization tank and is re-circulated. The purpose of the saturator is to cool the combustion gases from the baghouse temperature down to about 175°F while saturating the gas with moisture to improve the mass transfer rate in the packed beds. The saturator is 15 feet 3 inches high and consists of a bottom cylindrical section 5 feet 4 inches internal diameter by 11 feet 2 inches long. On top of this is mounted a short conical section. A short inverted conical section is mounted on top of that. About 300 gallons per minute of liquid are sprayed into the top of the unit through twelve spray nozzles that are aimed toward the center.

The saturated gas flows into the two-staged packed bed design wet scrubber where the upward flow of gas comes into contact with downward flow of neutralized brine solution. Brine that drains from each packed bed of the scrubber flows into separate conditioning

loops. Each loop contains neutralization tanks, pumps and a heat exchanger. The circulation solution reacts with the acid content of the gases. The temperature of the gas stream is further reduced in the wet scrubber, which condenses the majority of the water in the gas stream. The amount of condensation depends upon the heat exchanger setting.

Each packed bed contains a six-foot thickness of 3-inch Intalox saddles or, if alternative packing is used, a mass transfers equivalent depth of packing. Liquid is introduced at the top of the lower bed using a launder distribution system. Liquid is distributed at the top of the unit using a system of distribution pipes. The tower is 14 feet 6 inches internal diameter and approximately 51 feet 10 inches high.

5.6 Induced Draft Fan

The induced draft fan provides the suction necessary to move combustion gases through the kiln and afterburner and gas treatment equipment. The fan is sized to deliver 90,000 acfm at 20 inch W.C. inlet pressure and 400 horsepower (HP). The fan is driven by a variable speed drive. The pressure measured in the afterburner chamber controls the speed of the fan.

5.7 Stack

Off-gases are discharged through a 60-inch internal diameter by 149-foot high fiberglass stack. The stack contains appropriate ports for Continuous Emission Monitor (CEM) sampling and for reference method sampling during trial burn and performance tests.

ATTACHMENT A

PERFORMANCE TEST SUMMARY TABLES AND FIGURES

Table A-1: Summary of Operating Parameter Results 2012 CPT by Test Method						
Operating Parameter	**Monitoring Basis**	**Units**	**Dioxin/Furan-DRE Methods 0023A/0010**	**VOST-DRE Method 0030**	**Metals Method 29**	**PM/CL_2/HCl Methods 5/26A**
			Average	**Average**	**Average**	**Average**
Total Waste Feed (1)						
Kiln	Max HRA	lbs/hr	**24,198**	24,200	24,046	22,584
Afterburner I	Max HRA	lbs/hr	**8,678**	8,697	8,680	8,556
Kiln Pumpable Waste Feed (1)	Max HRA	lbs/hr	6,757	**6,731**	6,864	6,570
Chlorine feed rate	12-hr RA	lbs/hr	2,338	2,336	**2,319**	2,320
Total and Pumpable LVM Feed Rate	12-hr RA	lbs/hr	NC	NC	**55.9**	NC
Total SVM feed rate	12-hr RA	lbs/hr	NC	NC	**62.8**	NC
Mercury feed rate	12-hr RA	lbs/hr	NC	NC	**0.10**	NC
Ash feed rate	12-hr RA	lbs/hr	NC	NC	11,438	10,803
Kiln Temp	Min HRA	°F	**1,800**	**1,800**	1,802	1,809
ABC Temp	Min HRA	°F	2,017	**2,020**	2,025	2,028
Stack Flow (1)	Max HRA	ACFM	77,398	77,398	77,278	**77,147**
Baghouse Inlet Temperature	Min HRA	°F	**393**	393	393	393
Carbon Injection Rate	Min HRA	lb/hr	**25.6**	25.6	**25.6**	25.6
1st Stage Scrubber pH	Min HRA	S.U.	5.85	5.86	5.76	**5.47**
1st Stage Scrub Flow Rate	Max HRA	GPM	1,885	1,884	1,881	**1,882**
2nd Stage Scrubber pH	Min HRA	S.U.	6.53	6.55	6.51	**6.36**
2nd Stage RnDn pH	Min HRA	S.U.	6.49	6.51	6.36	**6.28**
2nd Stage Scrub Flow Rate	Max HRA	gpm	1,992	1,993	1,992	**1,996**
TMT Flow	Min HRA	lb/hr	2.46	2.46	**2.47**	2.52
Carbon Monoxide	Max HRA	ppmv, 7% O2	4.1	4.1	4.5	4.6
Total Hydrocarbon	Max HRA	ppmv, 7% O2	0.51	0.51	0.5	0.55

(1) Rates based on the average of the maximum HRA per MACT 63.1209(j)(2)(i) and (3)(ii); (k)(3)(i) and (k)(4)(ii)
All other averages are based on the average of the test run averages
BOLD = Most Stringent of the applicable data

Table A-2 Mercury Data for 2012 Performance Tests					
	units	Run 1	Run 2	Run 3	Average
Hg Feed Rate	pph	0.100	0.100	0.120	0.107
Hg limit	ug/dscm	130	130	130	130
Hg Emission rate	ug/dcsm	31.531	11.683	11.567	18.260
Extrapolation - point(1)	pph	0.412	1.113	1.349	0.759
Hg Emission rate	pph	0.0033	0.0012	0.0012	0.0019
SRE	%	96.70	98.80	99.00	98.22
Extrapolation by linear line using all run data yields 0.783 pph					
Extrapolation by linear line using average of three runs per approved CPT yields 0.759 pph					
2007 Performance Test Extrapolation by linear line for all data yielded 0.718 pph					
(1)Extrapolation Point - (MACT limit/emission rate) X Hg feed rate					

Table A-3 SVM Data for 2012 Performance Tests					
	units	Run 1	Run 2	Run 3	Average
SVM Feed Rate	pph	55.3	66.4	66.7	62.8
SVM limit	ug/dscm	230	230	230	230
SVM Emission rate	ug/dcsm	1.00	14.5	37.9	17.80
Extrapolation -point		12719.00	1053.24	404.78	811.46
SVM Emission rate	pph	0.00010	0.0015	0.0040	0.00187
SRE	%	99.9998	99.9977	99.9940	99.9970
Extrapolation by linear line using all run data yields 782 pph					
Extrapolation by linear line using average of three runs per approved CPT yields 811 pph					
2008 Performance Test Extrapolation by linear line for all data yielded 2248 pph					
(1)Extrapolation point - (MACT limit/emission rate) X SVM feed rate					

Table A-4 LVM Data for 2012 Performance Tests					
	units	Run 1	Run 2	Run 3	Average
Pumpable LVM Feed Rate	pph	59.6	52.8	55.3	55.9
LVM limit	ug/dscm	92	92	92	92
LVM Emission rate	ug/dcsm	7.6	12.7	10.5	10.27
Extrapolation -point(1)	pph	721.474	382.488	484.533	500.922
LVM Emission rate	pph	0.00080	0.00137	0.00107	0.00108
SRE	%	99.9987	99.9974	99.9981	99.9981
Extrapolation by linear line using all run data yields 507 pph					
Extrapolation by linear line using average of three runs per approved CPT yields 501 pph					
2008 Performance Test Extrapolation by linear line for all data yielded 766 pph					
(1) Extrapolation-point - (MACT limit/emission rate) X LVM feed rate					

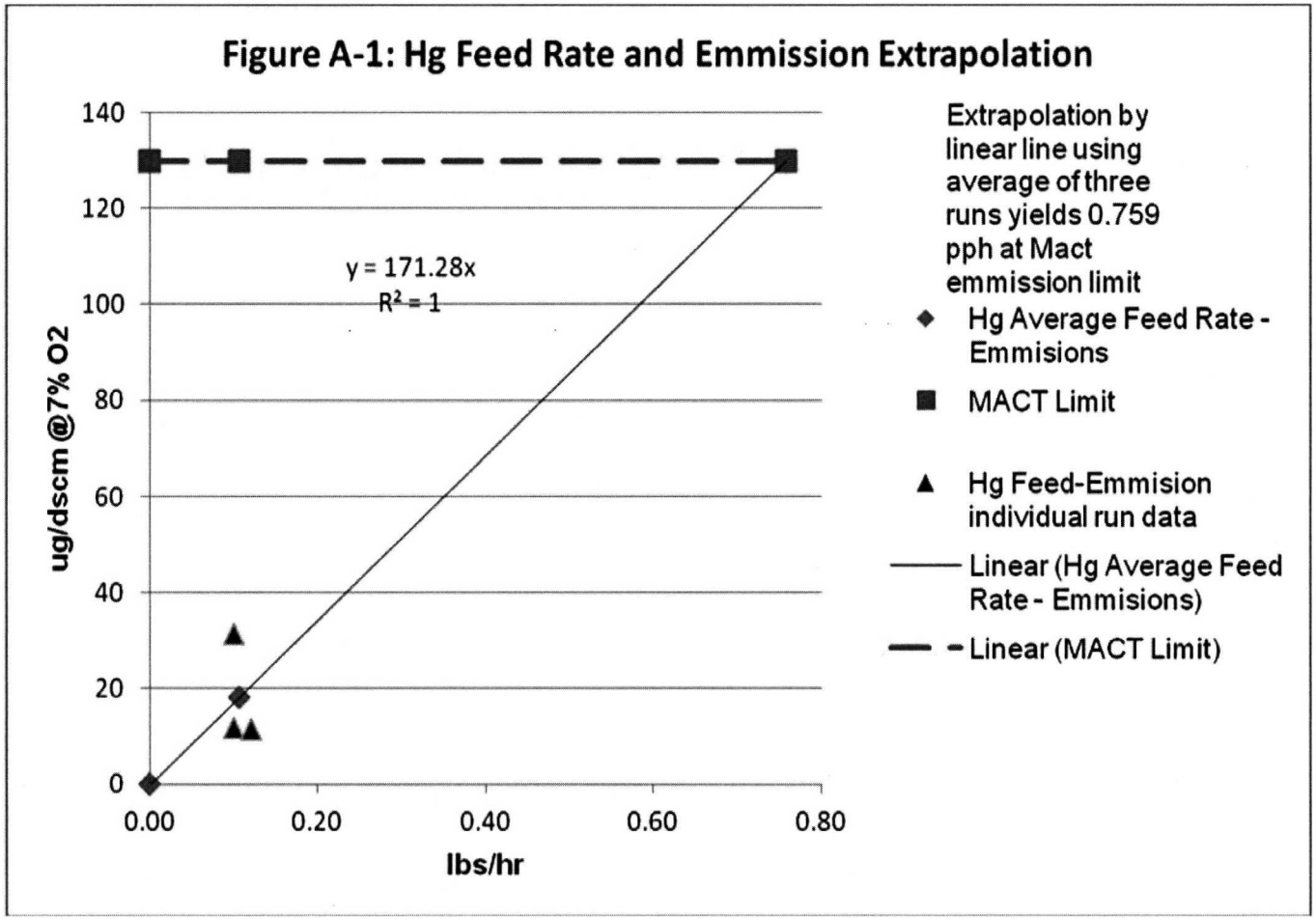
Figure A-1: Hg Feed Rate and Emmission Extrapolation
140
120
100
80
60
40
20
0
ug/dscm @7% O2
y = 171.28x
R² = 1
0.00
0.20
0.40
0.60
0.80
lbs/hr
Extrapolation by linear line using average of three runs yields 0.759 pph at Mact emmission limit
Hg Average Feed Rate - Emmisions
MACT Limit
Hg Feed-Emmision individual run data
Linear (Hg Average Feed Rate - Emmisions)
Linear (MACT Limit)

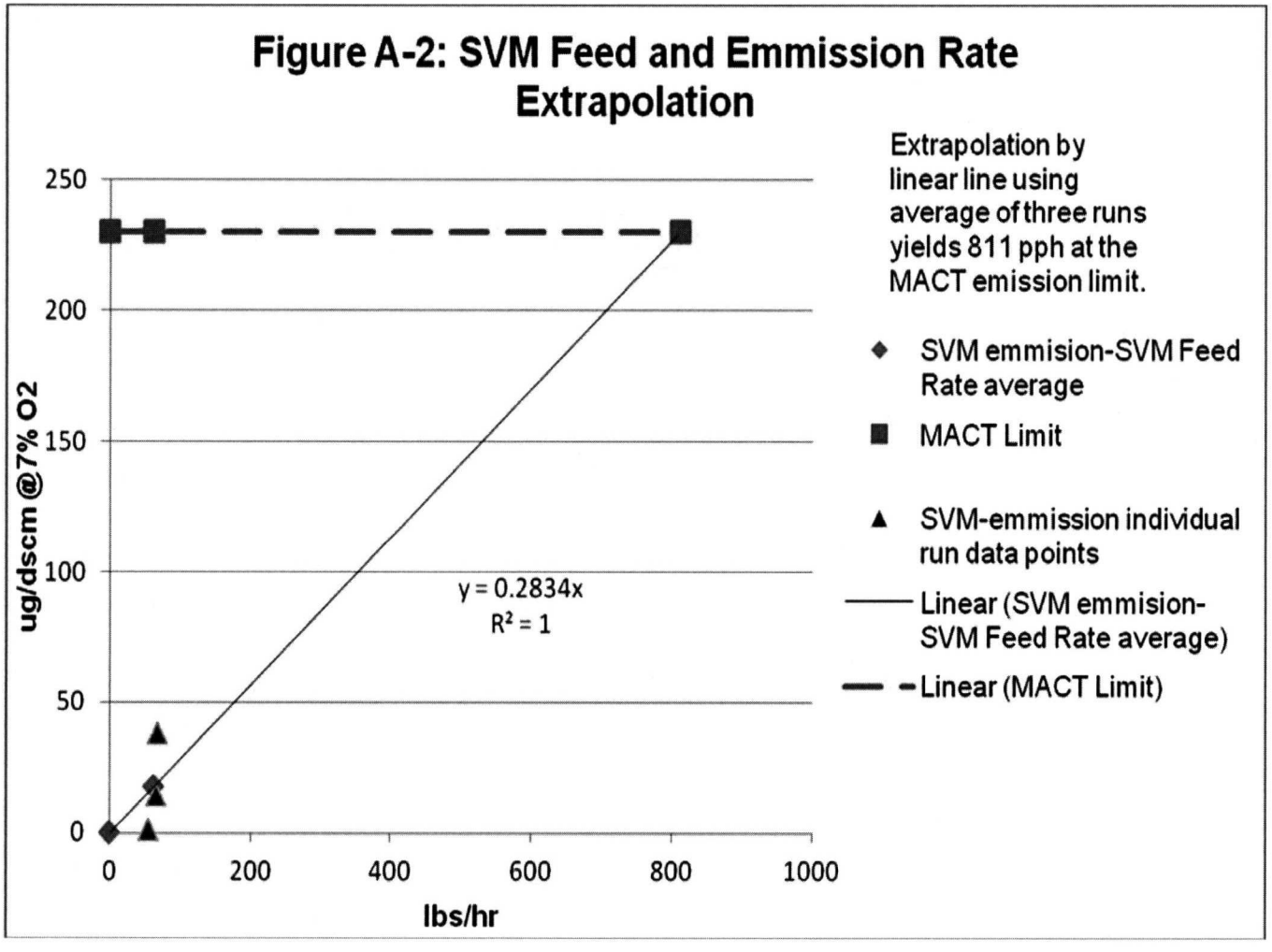
Figure A-2: SVM Feed and Emmission Rate Extrapolation
Extrapolation by linear line using average of three runs yields 811 pph at the MACT emission limit.
SVM emmision-SVM Feed Rate average
MACT Limit
SVM-emmission individual run data points
Linear (SVM emmision-SVM Feed Rate average)
Linear (MACT Limit)
y = 0.2834x
R² = 1
ug/dscm @7% O2
lbs/hr
0
50
100
150
200
250
0
200
400
600
800
1000

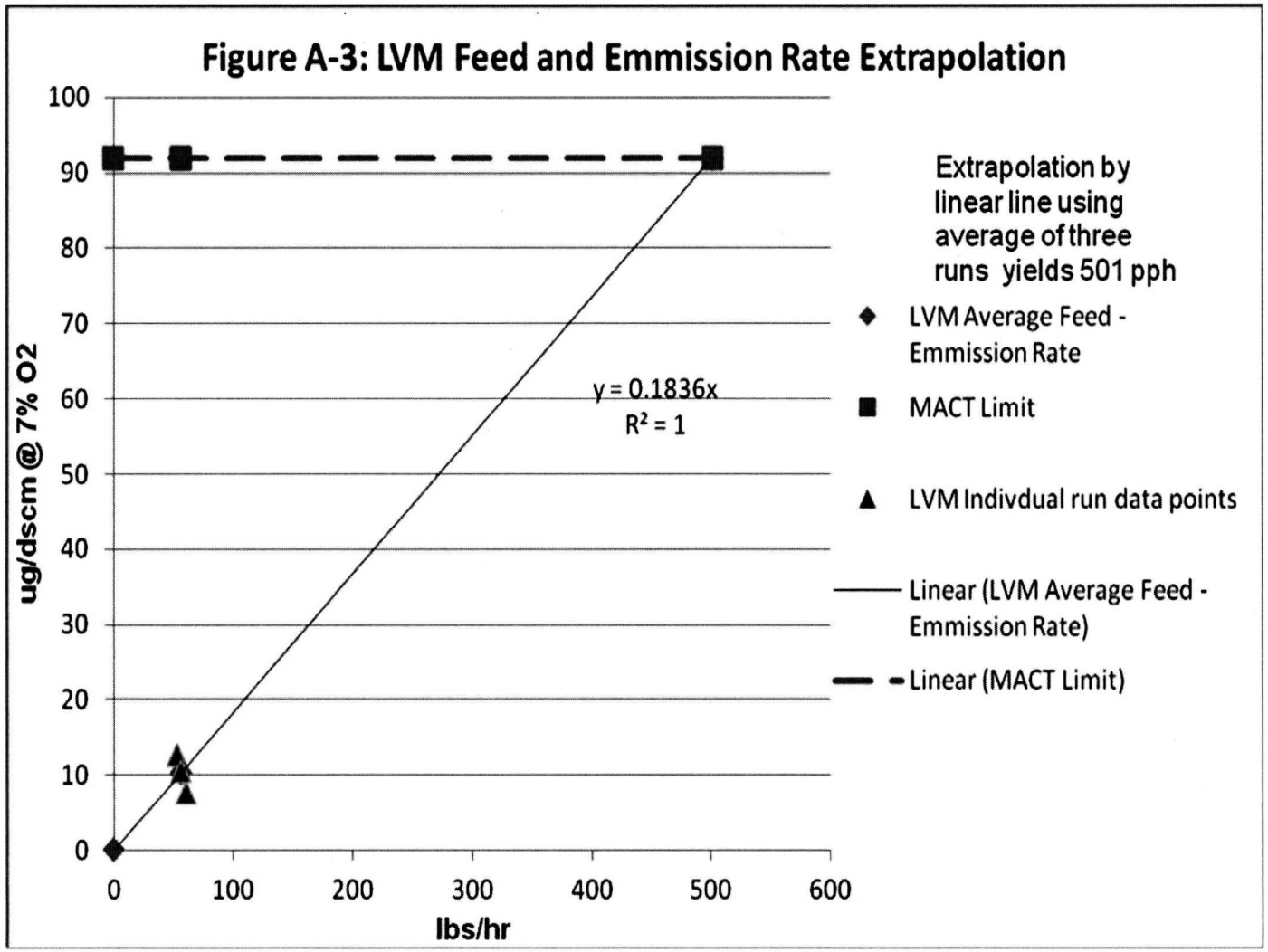
Figure A-3: LVM Feed and Emmission Rate Extrapolation
ug/dscm @ 7% O2
lbs/hr
0
10
20
30
40
50
60
70
80
90
100
0
100
200
300
400
500
600
y = 0.1836x
R² = 1
Extrapolation by linear line using average of three runs yields 501 pph
LVM Average Feed - Emmission Rate
MACT Limit
LVM Indivdual run data points
Linear (LVM Average Feed - Emmission Rate)
Linear (MACT Limit)

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ATTACHMENT B

HAZARDOUS WASTE RESIDENCE TIME CALCULATIONS

1.0 CONCLUSION

The calculations that follow indicate that the maximum system residence time mandates a 55 minute period at operating temperature during which the kiln is rotated at 0.27 rpm followed by at least 5 minutes of cooling to freeze the slag. A net one-hour time period is thus used for shutdown planning purposes.

2.0 DEFINITIONS

2.1 Definition of Hazardous Waste Residence Time [40 CFR §63.1201(a)]

The definition of Hazardous Waste residence time is provided in 40 CFR §63.1201 as follows:

"Hazardous waste residence time means the time elapsed from cutoff of the flow of hazardous waste into the combustor (including, for example, the time required for liquids to flow from the cutoff valve into the combustor) until solid, liquid, and gaseous materials from the hazardous waste, excluding residues that may adhere to combustion chamber surfaces, exit the combustion chamber. For combustors with multiple firing systems whereby the residence time may vary for the firing systems, the hazardous waste residence time for purposes of complying with this subpart means the longest residence time for any firing system in use at the time of waste cutoff."

2.2 Definition of Residue.

The facility's definition of residue follows:

> Residue is processed hazardous waste that adheres to the surface of a combustion chamber and does not emit fumes in excess of the emission requirements established by the Hazardous Waste Combustor MACT.

3.0 CALCULATION METHOD

The Aragonite incinerator consists of a slagging rotary kiln, an afterburner, and a gas cleaning train. Liquid wastes are fed to the kiln and afterburner burners and aqueous atomizing lances. Solid wastes and liquids that contain solids are fed only to the kiln.

Waste fed thru the burners and atomizing lances immediately enters the gas stream. When this waste is shutoff the organic combustion products and any volatilized metals are conveyed thru the two combustion chambers and the gas cleaning system together with the gas stream. The residence time for the gas stream and the combustion products is on the order of 3 minutes.

Wastes containing solids are fed through a variety of openings to the rotating circumference of the kiln. The liquid and organic content of this waste evaporate and combust, then enter the gas stream. The remaining ash melts to form a slag that gradually

moves down the kiln and discharges into a water bath and conveying system, that places it into rolloff bins for future transport to disposal. When waste is cutoff the organic and liquid content of the kiln solids continue to evaporate and burn until they have left the solid. At times metal fumes can be generated from the solid waste and molten slag until the temperature is lowered sufficiently to freeze the slag. Ultimately, the inert fraction of the waste will travel thru the kiln and discharge from it. This time is significantly longer than the gas residence time and defines the residence time for the incinerator.

The calculations that follow estimate the time that is necessary for solids to be discharged from the kiln as a function of kiln rotation speed and the time necessary to remove organics from the waste. The results of these calculations determine the holding time necessary. Since all of the slag does not drain out of the kiln, the slag needs to be cooled so that it solidifies following this holding time and the becomes residue. A calculation is included that justifies the assumption that frozen slag will not emit metals above those allowed in the gas cleaning system exhaust.

4.0 CALCULATIONS

4.1 Solid discharge time

See Microsoft Excel Program kilnflow.xls which is available from the facility upon request. This calculation, based on standard rotary kiln design parameters, reports a solids residence time in this kiln of 55 minutes when rotation is 0.27 rpm.

4.2 Organic Removal time

This calculation is based upon the time necessary to volatilize 1,3,5-Triphenylbenzene, which has a boiling point of 460°C (860°F), and is the highest boiling point organic listed in the fifteenth edition of Lange's Handbook of Chemistry, Table 1.15 – Physical Constants of Organic Compounds.

Assume that when the center of the largest expected solid piece of waste reaches 860°F, all of the organic has left the waste. 12" is the largest chunk usually observed except for whole drums that have not released their contents. Whole drums will generally not be held inside the kiln by adherence to the slag.

Calculating the holding time necessary for the center of a sphere 6" in radius with an initial temperature of 70°F and a surface exposed to 2012°F to diameter to reach 860°F using the charts and method described in Principles of Heat Transfer, Kreith, 1967, p148 – 166. (See especially Figure 4-12):

$$(Tr/r0 - T\infty)/(T\theta=0 - T\infty) = (860-2012)/(70-2012) = 0.5932$$

where:

$T\infty$ = Temperature at the surface of the particle = 2012°F
$Tr/r0$ = Temperature at center of particle = 860 °F
$T\theta=0$ = Temperature of particle at time zero = 70 °F

$ks/h*r = 0$

where:

ks = thermal conductivity
r = radius
h = heat transfer coefficient between surface and fluid

Assuming zero as the value for this equation is equivalent to assuming the heat transfer rate to the fluid is very high.

From the chart $a\theta/r^2 = .11$

Where:

a =thermal diffusivity, ft^2/hr =.03 (Kreith, Table A-2, wet soil)
θ= time, hr
r = radius, ft = .5

$\theta = .11*(.5)(.5)/(.03) = .92$ hr = 55 min

4.3 Mass Transfer Rate of Metals From Frozen Slag

4.3.1 Calculation for diffusion through a film

The monograph Diffusion In and Through Solids (1941) written by Richard M. Barrer contains the following information on diffusion of air through porcelain:

Temp °C	Permeability constant x 10^9 (cc/sec/cm^2/mm/cm Hg)	
	Sample I	Sample II
25	.00106	
400	.00106	
600	.00212	
800	.0032	
1000	.0161	.0012
1200	.077	.022
1300	.32	.117

The permeability constant is the quantity transferred/ unit time/ unit area of unit thickness under a standard concentration or pressure difference.

$N_A = P * [(\Delta p * z_p) / (\Delta p_p * z)]$

where:

N_A = rate of diffusion/ unit cross sectional area
Δp = gas pressure at z = 0
z = thickness
subscript p = as given by permeability constant

Here the units of N_A are :

$[cc_A /(\sec\ cm^2\ mm\ thickness\ cmHg)]$

It would be useful to have N_A in units in lb mole/ft^2 hr *cm Hg * mmHg. Calculating a conversion factor:

cc_A *(1/1000) $liters_A$ *(1/22.4)gmoles/liter (1/453.6) lb mole/gmole =cc_A 9.8419×10^{-8}

$$\frac{cc_A}{(\sec \cdot cm \cdot cm \cdot mmthickness \cdot cmHg} \cdot \frac{liters_A}{1000 cc_A} \cdot \frac{gmole_A}{22.4 liters_A} \cdot \frac{lbmole_A}{453.6 gmole_A} \cdot \frac{929.034 cm^2}{ft^2} \cdot \frac{3600 \sec}{hr}$$

Thus:

N_A,$lbmole_A$/ (ft^2 hr) = P, in units given * .3292*(Δp, cmHg / z, mm)

using 1 mm for z, 1 cm Hg for vapor pressure, and P= $.0161 \times 10^{-9}$

N_A= 5.30×10^{-12} $lbmoles_A/ft^2hr$

The kiln, when coated with slag is approximately 12 ft in diameter and 40 feet long. Accordingly its surface area is 3.14 * 12* 40 = 1507 ft^2. Multiplying this diffusion rate times the area gives 7.99×10^{-9} lb moles/hr.

Also assuming a maximum flowrate of 44,100 dry standard cubic feet/minute = 44,100 *60 / 35.3147 = 74,926 dry standard cubic meters/hr.

$$\frac{7.99 \times 10^{-9} lbmole}{hr} \cdot \frac{453.6 gmole}{lbmole} \cdot \frac{10^6 \mu gmole}{gmole} \cdot \frac{hr}{74{,}926 dscm} = 4.8371^{-5} \mu gmole / dscm$$

For Cadmium and lead , lead has the highest atomic weight at 207.19. For lead the concentration would be 207.19 x 4.3871x 10^{-5} = .01 µg/dscm. The regulated limit is 230 µg/dscm and the estimate predicts an emission 23,000 times lower than the requirement.

For Arsenic, Beryllium, and Chromium, arsenic has the highest atomic weight at 74.922. For arsenic the concentration would be 74.922 * 4.3871 x 10^{-5} = .0033 µg/dscm. The regulated limit is 92 µg/dscm and the estimate predicts an emission 27,900 times lower than the requirement.

Mercury is a very high volatility metal that is unlikely to persist in the kiln solids. Even so, by the same calculation, gas levels will be over .0097, over 13,000 times less than the regulated limit of 130 µg/dscm.

4.3.2 Correcting for porosity, pressure, and thickness

Correcting for porosity:

Perry's Chemical Engineering Handbook, 4th edition, page 4-10, Table 4-5 gives a value of about 200 ft^2 of surface / ft^3 of bed for 0.2 in diameter particles. Each square foot of surface, for a six inch thick bed, will therefore have 100 ft^2 of surface area. If we assume particles (ash) instead of slag in the kiln, we multiply by this factor to be conservative.

Correcting for pressure:

The vapor pressure cannot be more than 1 atmosphere. This is 76 times the 1 cm assumed. Even at elevated kiln temperatures, metal fumes do not approach this, but we will assess the mathematical impact anyway.

Correcting for thickness:

1 mm is a reasonable and conservative number. The basis for this assumption is the fact that the slag surface will have time to emit metals before it freezes.

Effect of corrections:

For Cadmium and lead, .01 *76*100 = 76 µg/dscm, still less than the standard.

For Arsenic, Beryllium, and Chromium, .0033 *76* 100 = 25.1 µg/ dscm, again less.

For Mercury, .0097 * 76 * 100 = 73.8 µg/ dscm, again well less.

5.0 RESULTS

Solid Discharge Time - 55 min at 0.27 rpm

Organic Removal Time – 55 min

Mass transfer thru solid slag – below emission limits when frozen

6.0 DISCUSSION

The residence time should be based upon the calculated time for solids to discharge from the furnace, and the time necessary for the solids left in the kiln to become residue that does not emit organics and more than the regulated amount of metals from the hot vent.

The organic removal time calculations indicate that 55 minutes at temperature is necessary to "cook" the solids so that all organics are removed. This is based upon a maximum solid sphere of 12" in diameter. This is the largest piece usually observed except for whole drums that have not released their contents. Whole drums will leave, not be held inside the kiln by adherence to the slag. These calculations assume that the center of each sphere must reach 860°F, the highest boiling point for any organic compound listed in Lange's Handbook of Chemistry.

The calculations of metal mass transfer from a frozen slag are based upon data taken for air diffusing through porcelain. They are an estimate of the amount emitted. Even when it is assumed that the vapor pressure is fully 1 atmosphere and the slag is somewhat porous they estimate numbers lower than those required by the air permit. The calculations were done using a slag temperature of 1832°F (1000°C), a temperature at which slag will be frozen.

The solids discharge time is dependent upon the rotation speed of the kiln. At .27 rpm it is 55 minutes, the same as the time required for organics to be destroyed.

The calculations indicate that the residence time depends upon both a holding time at temperature and solidifying the slag. The calculations indicate the kiln should be held at temperature for 55 minutes and then cooled for about 5 minutes to allow the slag to solidify.

Appendix G
CLEAN HARBORS ARAGONITE LLC.
CPT PLAN

Hazardous Waste Residence Time

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1.0 CONCLUSION

The calculations that follow indicate that the maximum system residence time mandates a 55 minute period at operating temperature during which the kiln is rotated at 0.27 rpm followed by at least 5 minutes of cooling to freeze the slag. A net one-hour time period is thus used for shutdown planning purposes.

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The facility's definition of residue follows:

Residue is processed hazardous waste that adheres to the surface of a combustion chamber and does not emit fumes in excess of the emission requirements established by the Hazardous Waste Combustor MACT.

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The Aragonite incinerator consists of a slagging rotary kiln, an afterburner, and a gas cleaning train. Liquid wastes are fed to the kiln and afterburner burners and aqueous atomizing lances. Solid wastes and liquids that contain solids are fed only to the kiln.

Waste fed thru the burners and atomizing lances immediately enters the gas stream. When this waste is shutoff the organic combustion products and any volatilized metals are conveyed thru the two combustion chambers and the gas cleaning system together with the gas stream. The residence time for the gas stream and the combustion products is on the order of 3 minutes.

Wastes containing solids are fed through a variety of openings to the rotating circumference of the kiln. The liquid and organic content of this waste evaporate and combust, then enter the gas stream. The remaining ash melts to form a slag that gradually moves down the kiln and discharges into a water bath and conveying system, that places it into rolloff bins for future transport to disposal. When waste is cutoff the organic and liquid content of the kiln solids continue to evaporate and burn until they have left the solid. At times metal fumes can be generated from the solid waste and molten slag until the temperature is lowered sufficiently to freeze the slag. Ultimately, the inert fraction of the waste will travel thru the kiln and discharge from it. This time is significantly longer than the gas residence time and defines the residence time for the incinerator.

The calculations that follow estimate the time that is necessary for solids to be discharged from the kiln as a function of kiln rotation speed and the time necessary to remove organics from the waste. The results of these calculations determine the holding time necessary. Since all of the slag does not drain out of the kiln, the slag needs to be cooled so that it solidifies following this holding time and the becomes residue. A calculation is included that justifies the assumption that frozen slag will not emit metals above those allowed in the gas cleaning system exhaust.

4.0 CALCULATIONS

4.1 Solid discharge time

See Microsoft Excel Program kilnflow.xls which is available from the facility upon request. This calculation, based on standard rotary kiln design parameters, reports a solids residence time in this kiln of 55 minutes when rotation is 0.27 rpm.

4.2 Organic Removal time

This calculation is based upon the time necessary to volatilize 1,3,5-Triphenylbenzene, which has a boiling point of 460°C (860°F), and is the highest boiling point organic listed in the fifteenth edition of Lange's Handbook of Chemistry, Table 1.15 – Physical Constants of Organic Compounds.

Assume that when the center of the largest expected solid piece of waste reaches 860°F, all of the organic has left the waste. 12" is the largest chunk usually observed except for whole drums that have not released their contents. Whole drums will generally not be held inside the kiln by adherence to the slag.

Calculating the holding time necessary for the center of a sphere 6" in radius with an initial temperature of 70°F and a surface exposed to 2012°F to diameter to reach 860°F using the charts

and method described in Principles of Heat Transfer, Kreith, 1967, p148 – 166. (See especially Figure 4-12):

$$(Tr/r0 - T\infty)/(T\theta=0 - T\infty) = (860-2012)/(70-2012) = 0.5932$$

where:

$T\infty$ = Temperature at the surface of the particle = 2012°F
$Tr/r0$ = Temperature at center of particle = 860 °F
$T\theta=0$ = Temperature of particle at time zero = 70 °F

$$ks/h*r = 0$$

where:

ks = thermal conductivity
r = radius
h = heat transfer coefficient between surface and fluid

Assuming zero as the value for this equation is equivalent to assuming the heat transfer rate to the fluid is very high.

From the chart $a\theta/r^2 = .11$

Where:

a =thermal diffusivity, ft^2/hr =.03 (Kreith, Table A-2, wet soil)
θ= time, hr
r = radius, ft = .5

$\theta = .11*(.5)(.5)/(.03) = .92$ hr = <u>55 min</u>

4.3 Mass Transfer Rate of Metals From Frozen Slag

4.3.1 Calculation for diffusion through a film

The monograph Diffusion In and Through Solids (1941) written by Richard M. Barrer contains the following information on diffusion of air through porcelain:

Temp °C	Permeability constant x 10^9 (cc/sec/cm^2/mm/cm Hg)	
	Sample I	Sample II
25	.00106	
400	.00106	
600	.00212	
800	.0032	
1000	.0161	.0012
1200	.077	.022
1300	.32	.117

The permeability constant is the quantity transferred/ unit time/ unit area of unit thickness under a standard concentration or pressure difference.

$$N_A = P * [(\Delta p * z_p) / (\Delta p_p * z)]$$

where:

N_A = rate of diffusion/ unit cross sectional area
Δp = gas pressure at z = 0
z = thickness
subscript p = as given by permeability constant

Here the units of N_A are :

$$[cc_A / (\text{sec cm}^2 \text{ mm thickness cmHg})]$$

It would be useful to have N_A in units in lb mole/ft^2 hr *cm Hg * mmHg. Calculating a conversion factor:

$$cc_A * (1/1000) \text{ liters}_A * (1/22.4) \text{gmoles/liter } (1/453.6) \text{ lb mole/gmole} = cc_A \; 9.8419 \times 10^{-8}$$

$$\frac{cc_A}{(\text{sec} \cdot cm \cdot cm \cdot mmthickness \cdot cmHg} \cdot \frac{liters_A}{1000 cc_A} \cdot \frac{gmole_A}{22.4 liters_A} \cdot \frac{lbmole_A}{453.6 gmole_A} \cdot \frac{929.034 cm^2}{ft^2} \cdot \frac{3600 \text{ sec}}{hr}$$

Thus:

N_A,lbmole$_A$/ (ft^2 hr) = P, in units given * .3292*(Δp, cmHg / z, mm)

using 1 mm for z, 1 cm Hg for vapor pressure, and P= .0161 x 10^{-9}

N_A= 5.30 x10^{-12} lbmoles$_A$/ft^2hr

The kiln, when coated with slag is approximately 12 ft in diameter and 40 feet long. Accordingly its surface area is 3.14 * 12* 40 = 1507 ft^2. Multiplying this diffusion rate times the area gives 7.99 x 10^{-9} lb moles/hr.

Also assuming a maximum flowrate of 44,100 dry standard cubic feet/minute = 44,100 *60 / 35.3147 = 74,926 dry standard cubic meters/hr.

$$\frac{7.99\times10^{-9}\,lbmole}{hr}\cdot\frac{453.6gmole}{lbmole}\cdot\frac{10^{6}\,\mu gmole}{gmole}\cdot\frac{hr}{74{,}926dscm}=4.8371^{-5}\,\mu gmole/dscm$$

For Cadmium and lead , lead has the highest atomic weight at 207.19. For lead the concentration would be 207.19 x 4.3871x 10^{-5} = .01 µg/dscm. The regulated limit is 230 µg/dscm and the estimate predicts an emission 23,000 times lower than the requirement.

For Arsenic, Beryllium, and Chromium, arsenic has the highest atomic weight at 74.922. For arsenic the concentration would be 74.922 * 4.3871 x 10^{-5} = .0033 µg/dscm. The regulated limit is 92 µg/dscm and the estimate predicts an emission 27,900 times lower than the requirement.

Mercury is a very high volatility metal that is unlikely to persist in the kiln solids. Even so, by the same calculation, gas levels will be over .0097, over 13,000 times less than the regulated limit of 130 µg/dscm.

4.3.2 Correcting for porosity, pressure, and thickness

Correcting for porosity:

Perry's Chemical Engineering Handbook, 4th edition, page 4-10, Table 4-5 gives a value of about 200 ft^2 of surface / ft^3 of bed for 0.2 in diameter particles. Each square foot of surface, for a six

inch thick bed, will therefore have 100 ft^2 of surface area. If we assume particles (ash) instead of slag in the kiln, we multiply by this factor to be conservative.

Correcting for pressure:

The vapor pressure cannot be more than 1 atmosphere. This is 76 times the 1 cm assumed. Even at elevated kiln temperatures, metal fumes do not approach this, but we will assess the mathematical impact anyway.

Correcting for thickness:

1 mm is a reasonable and conservative number. The basis for this assumption is the fact that the slag surface will have time to emit metals before it freezes.

Effect of corrections:

For Cadmium and lead, .01 *76*100 = 76 μg/dscm, still less than the standard.

For Arsenic, Beryllium, and Chromium, .0033 *76* 100 = 25.1 μg/ dscm, again less.

For Mercury, .0097 * 76 * 100 = 73.8 μg/ dscm, again well less.

5.0 RESULTS

Solid Discharge Time - 55 min at 0..27 rpm

Organic Removal Time – 55 min

Mass transfer thru solid slag – below emission limits when frozen

6.0 DISCUSSION

The residence time should be based upon the calculated time for solids to discharge from the furnace, and the time necessary for the solids left in the kiln to become residue that does not emit organics and more than the regulated amount of metals from the hot vent.

The organic removal time calculations indicate that 55 minutes at temperature is necessary to "cook" the solids so that all organics are removed. This is based upon a maximum solid sphere of 12" in diameter. This is the largest piece usually observed except for whole drums that have not released their contents. Whole drums will leave, not be held inside the kiln by adherence to the slag. These calculations assume that the center of each sphere must reach 860°F, the highest boiling point for any organic compound listed in Lange's Handbook of Chemistry.

The calculations of metal mass transfer from a frozen slag are based upon data taken for air diffusing through porcelain. They are an estimate of the amount emitted. Even when it is assumed that the vapor pressure is fully 1 atmosphere and the slag is somewhat porous they estimate numbers lower than those required by the air permit. The calculations were done using a slag temperature of 1832°F (1000°C), a temperature at which slag will be frozen.

The solids discharge time is dependent upon the rotation speed of the kiln. At .27 rpm it is 55 minutes, the same as the time required for organics to be destroyed.

The calculations indicate that the residence time depends upon both a holding time at temperature and solidifying the slag. The calculations indicate the kiln should be held at temperature for 55 minutes and then cooled for about 5 minutes to allow the slag to solidify.